VERITAS NetBackup™ 5.1 for DB2

System Administrator's Guide

for UNIX

N12343B

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Preface

This guide describes how to install, configure, and use VERITAS NetBackup for DB2 agent on a UNIX platform.

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 Administrator's Guide for Windows, Volumes I and II* if you have a Windows server.

This document is the same as `NetBackup_AdminGuide_DB2_UNIX.pdf` distributed with the NetBackup for DB2 on UNIX software.

Audience

This guide is intended for the:

- DB2 database system administrator responsible for configuring and using the 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 User's Guide for UNIX*
  - *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 the following DB2 database topics:
  - DB2 Administration
  - DB2 Commands, particularly `DB2 BACKUP`, `RESTORE`, and `ROLLFORWARD`.
  - DB2 User Exit Program

What Is In This Guide?

This guide is organized as follows:

- The Introduction provides an overview of terminology for NetBackup for DB2 on UNIX.
- The Installation chapter explains how to install NetBackup for DB2 on UNIX on your system.
- The Configuration chapter explains how to configure your system to use NetBackup for DB2 on UNIX. This information supplements the NetBackup System Administrator Guides.
- Using NetBackup for DB2 on UNIX explains how to use this product to backup and restore your databases. This information supplements the NetBackup manuals.

- Using NetBackup for DB2 with SAP provides guidelines for using SAP, DB2, and NetBackup together.
- NetBackup for DB2 with Advanced Client explains how to use NetBackup for DB2 with NetBackup Advanced Client to perform snapshot backups of your DB2 database.
- Troubleshooting provides troubleshooting information.

The Configuration for a DB2 EEE (DPF) Environment appendix contains special instructions for DB2 databases in a DB2 Enterprise - Extended Edition (EEE) or Database Partitioning Feature (DPF) environment.

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 DB2, 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 DB2 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 DB2 training
- read current white papers related to NetBackup for DB2

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 DB2 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 DB2 Manuals

The following manuals, along with the online help, are included in the NetBackup for DB2 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.

DB2 Manuals

For IBM DB2, you may also need the following manuals from IBM:

- *IBM DB2 Universal Database for UNIX Quick Beginnings*
- *IBM DB2 Universal Database for UNIX Command Reference*
- *IBM DB2 Universal Database Data Recovery and High Availability Guide and Reference*

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 DB2 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.

Conventions <Variable/Emphasis>(Continued)

Convention	Description
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.
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 DB2 integrates the database backup and recovery capabilities of DB2 commands with the backup and recovery management capabilities of NetBackup.

This chapter introduces NetBackup for DB2 and how it relates to both DB2 commands and NetBackup. Read this chapter for a description of:

- Terminology for NetBackup for DB2
- Features of NetBackup for DB2
- Technical Overview of NetBackup for DB2

Terminology for NetBackup for DB2

NetBackup Terms

This section describes NetBackup terms as they apply to NetBackup for DB2.

NetBackup	NetBackup backs up and restores files, directories, raw partitions, and databases on client systems that have DB2 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. In the case of DB2, user-directed operations are performed on the DB2 client via DB2 interfaces.
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 DB2 wizards are used to create backup and recovery templates used to perform DB2 backup and restore operations. These wizards are initiated from the NetBackup Backup, Archive, and Restore interface. A shell script should be written for situations where a template does not provide all of the required functionality.

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

NetBackup for DB2 Terms

Full Backup	A full backup copies all blocks into the backup. (`DB2 BACKUP DB SAMPLE`)

Incremental Backup	An incremental backup is a backup of only those blocks that have changed since a previous backup. DB2 allows you to create and restore incremental backups of tablespaces and complete databases.
Differential Incremental Backup	In a differential incremental backup, you back up all blocks that have changed since the most recent full or incremental backup. (`DB2 BACKUP DB SAMPLE INCREMENTAL DELTA`)
Cumulative Incremental Backup	In a cumulative incremental backup, you back up all blocks that have changed since the most recent full backup. Cumulative incremental backups reduce the work needed for a restore by ensuring that you only need one cumulative incremental backup at restore time. Cumulative backups typically require more space and time than Differential Incremental Backups, however, because they contain all modifications since the last full backup. (`DB2 BACKUP DB SAMPLE INCREMENTAL`)
Automated Restore	An automated restore coordinates the restoration of a full backup and all associated incremental backups. A single automated restore will restore a full backup, an optional cumulative incremental backup, and one or more differential incremental backups. (`DB2 RESTORE DB SAMPLE INCREMENTAL AUTOMATIC`)
`bpdbsbdb2`	NetBackup for DB2 provides a command line utility, `bpdpsbdb2`, that initiates template based user-directed backup and recovery. This utility is also used to generate DB2 shell scripts from templates created by the Backup Wizard.

DB2 Database Terms

This section describes DB2 database terms as they apply to NetBackup for DB2.

`BACKUP DATABASE` *command*	`BACKUP DATABASE` is a DB2 UDB command which initiates the backup of a database. For details, refer to *IBM DB2 Universal Database Command Reference.*
`RESTORE DATABASE` *command*	`RESTORE DATABASE` is a DB2 UDB command which initiates the restore of a DB2 database. For details, refer to *IBM DB2 Universal Database Command Reference.*
`ROLLFORWARD DATABASE` *command*	`ROLLFORWARD DATABASE` is a DB2 UDB command which initiates the rollforward recovery of transactions recorded in database logs. For details, refer to *IBM DB2 Universal Database Command Reference.*
DB2 script	A DB2 script contains `BACKUP DATABASE` or `RESTORE DATABASE` commands.

User Exit Program	A program that manages the backup and recovery of the DB2 archived logs, used during rollforward recovery. The program is called `db2uext2`.
Vendor I/O Library	The Vendor I/O Library contains I/O functions provided by NetBackup for DB2 in a shared library. The Vendor I/O Library is used by the `BACKUP DATABASE` and `RESTORE DATABASE` commands to send data buffers between a DB2 database and NetBackup.
UDB	Universal Database.
EEE	The IBM DB2 Enterprise - Extended Edition environment. This refers to a database that is distributed across multiple hosts, or partitions. In a non-EEE environment, the database is typically centralized on a single host.
DPF	Database Partitioning Feature. This is equivalent to the Extended Edition Environment (EEE), where a database is distributed across multiple hosts, or partitions.

Features of NetBackup for DB2

This section describes the NetBackup for DB2 main features.

NetBackup for DB2 main features

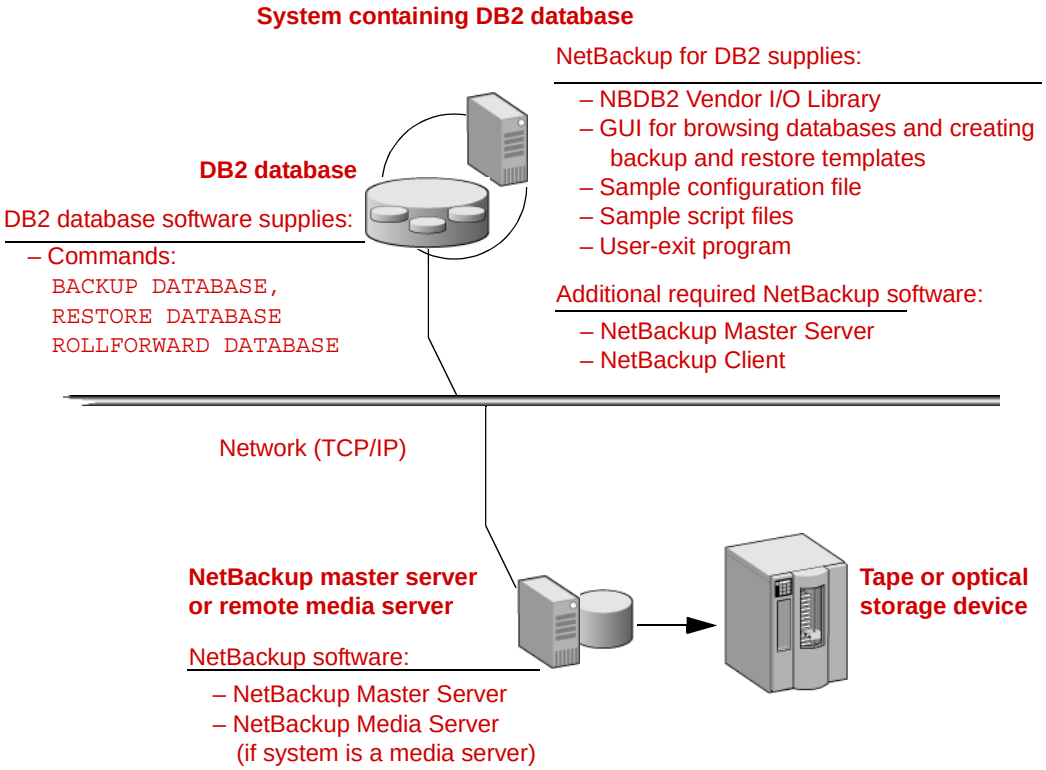
Feature	Description
Media and device management	All devices supported by Media Manager are available to NetBackup for DB2.
Scheduling facilities	NetBackup scheduling facilities on the master server can be used to schedule automatic and unattended DB2 backups. This also lets you choose the times when 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 DB2 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 DB2 and regular file system backup and restore operations	All backups and restores are run simultaneously and transparently without any action from the NetBackup administrator. A DB2 administrator can run database backup and restore operations through NetBackup or use DB2 commands 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 DB2 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 DB2 databases can also reside on hosts that are different from the devices on which NetBackup stores the backups.

NetBackup for DB2 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 DB2 from the NetBackup graphical user interface on the master server. A database administrator can also use the IBM DB2 Control Center or Command Line Processor to start user-directed backup and restore operations.
Parallel backup and restore operations	NetBackup for DB2 supports the parallel backup and restore capabilities of the DB2 commands. This permits the user to run more than one tape device at a time for a single DB2 backup or restore, thereby reducing the time necessary to complete the operation.

Technical Overview of NetBackup for DB2

The example network in the following illustration shows the major components in a NetBackup for DB2 configuration.



The storage devices are connected to the NetBackup master server or a remote media server. Both the master server and the remote media server must have NetBackup server software installed.

The host with the DB2 database must be a NetBackup client and have NetBackup for DB2 installed.

NetBackup for DB2 Components

Following are the main components in the NetBackup for DB2 system.

NBDB2 Vendor I/O Library

The NetBackup vendor library is used by DB2 commands when executing backups and restores. The location of the vendor library is

On Solaris and Linux: *install_path*`/NetBackup/bin/nbdb2.so`

On Solaris 64 bit: *install_path*`/NetBackup/bin/nbdb2.so64`

On AIX and HP-UX: *install_path*`/NetBackup/nbdb2.sl`

On AIX and HP-UX 64 bit: *install_path*`/NetBackup/bin/nbdb2.sl64`

(for example, `/usr/openv/netbackup/bin/nbdb2.sl`).

The library is called by the `DB2 BACKUP` and `RESTORE` commands, with the `LOAD` parameter. For example,

```
BACKUP DB SAMPLE … LOAD /usr/openv/netbackup/bin/nbdb2.sl
```

DB2 User-Exit Program

A user-exit program is used by DB2 to backup and restore database log files. The location of the DB2 user-exit program is <*DB2_INSTANCE*>`/sqllib/adm/db2uext2`. The user-exit program is invoked by the DB2 `BACKUP` and `ROLLFORWARD` commands. For example,

```
ROLLFORWARD DB SAMPLE … TO END OF LOGS …
```

Backup and Recovery Wizards

NetBackup for DB2 provides wizards that enable you to create backup and recovery templates. You invoke the wizards by browsing for and selecting a DB2 database object in the Backup, Archive, and Restore interface. After you supply the appropriate information about the operation, a template is created that can be run immediately or stored on the server (for backup templates). You can use the stored backup templates in scheduled backups through a NetBackup policy, or to perform manual backups on the NetBackup for DB2 client.

Sample Configuration File

A NetBackup for DB2 configuration file is used to store backup and restore preferences. The vendor library and user-exit program use these settings. The location of the file is <*DB2_INSTANCE*>`/db2.conf` (for example, `/home/db2inst1/db2.conf`). This file contains various NetBackup settings, like the policy and schedule.

Sample Script Files

NetBackup invokes a script to perform a scheduled backup or restore of a DB2 database. The user must customize the provided sample script file(s) for their environment. The sample scripts contain DB2 `BACKUP` or `RESTORE` commands for use with NetBackup.

NetBackup for DB2 provides sample scripts in the following location:

install_path/netbackup/ext/db_ext/db2/scripts

Alternatively, users can create templates using the NetBackup for DB2 GUI. The templates can be used in place of scripts.

NetBackup for DB2 Backup Overview

Database Backup

The DB2 user invokes a database backup by using the DB2 Control Center or Command Line Processor. When initiating the backup command, you must specify the location of the NBDB2 library.

A scheduled task within NetBackup can also be used to back up a database. At the scheduled time, the NetBackup task will execute a template or script containing the necessary DB2 commands to perform a backup. Templates are created using the NetBackup for DB2 wizards, while scripts are written by the user to perform the desired operations.

Regardless of the interface used to initiate the backup, DB2 conducts the backup by issuing `start`, `write`, and `end` instructions to the NBDB2 library.

`start`	The `start` instruction causes NBDB2 to verify the backup settings with the master server, such as policy, schedule, and client permissions. Next, start causes NBDB2 to reserve resources like drives and media on the media server.
`write`	The `write` instruction is then repeatedly issued by DB2, each time passing a portion of the backup image. NBDB2 takes the data and directs it to the media server for storage.
`end`	Finally, the `end` instruction is issued when DB2 has successfully written the entire backup image. NBDB2 informs the media server to commit any buffered data, and informs the master server to catalog the operation.

Log File Archiving

DB2 uses log files to preserve database transactions that have not been persistently recorded in the database. Once all transactions in a log file are persistently recorded, that log file can be archived. The DB2 USEREXIT setting enables the use of log files.

DB2 invokes the user-exit program to archive a log file at these times:

- The "user exits" the database using the `DB2 TERMINATE` command.
- The log file is full and transactions are being recorded into another log file.
- The `DB2 BACKUP` command is issued.
- The `DB2 ARCHIVE LOG` command is issued.

NetBackup provides a user-exit program for use with DB2. It supports two modes of operation:

- Saving archived log files directly to NetBackup.
- Copying archived log files to another directory, for later backup by NetBackup.

Saving the log files directly to NetBackup is simply the automatic backup of the log file. DB2 invokes the NetBackup `user-exit` program, which initiates a file backup operation.

Copying the log files to a directory is used in conjunction with a scheduled backup. In this case, the NetBackup `user-exit` program copies the file to an archive directory. Later (for example, nightly), a scheduled NetBackup task runs to backup all files in the archive directory. After backup, the task can optionally delete these files to free disk space.

The save and copy methods require different restore procedures, as explained below.

Incremental Backup of DB2 Databases

NetBackup for DB2 provides true incremental backups. An incremental backup will include only the blocks that have been changed since the most recent backup.

Refer to the *IBM DB2 Universal Database Data Recovery and High Availability Guide and Reference* for more complete details on the backup and recovery process.

NetBackup for DB2 Restore Overview

Database Restore

The DB2 user invokes a database restore by using the DB2 Control Center or Command Line Processor. When initiating the restore command, the vendor library option must specify the location of the `NBDB2` library.

A scheduled task within NetBackup can also be used to restore a database. At the scheduled time, the NetBackup task will execute a template or script containing the necessary DB2 commands to perform a restore. Templates are created by the NetBackup for DB2 wizard. Scripts are written by the user to perform the desired operations.

Regardless of the interface used to initiate the restore, DB2 conducts the restore by issuing `start`, `read`, and `end` instructions to the `NBDB2` library.

`start`	The `start` instruction causes `NBDB2` to verify the restore settings and permissions with the master server, and locates the requested image within the media server.
`read`	The `read` instruction is then repeatedly issued by DB2, each time requesting a portion of the backup image. NBDB2 reads data from the media server and returns it to DB2.
`end`	Finally, the `end` instruction is issued when DB2 has successfully restored the entire image, and NBDB2 informs the media server to release the resources.

Log File Rollforward

Once the database is successfully restored, transactions recorded in the log files need to be re-applied. The DB2 ROLLFORWARD command restores transactions made since the last backup. For example, if the backup image was created 10 days ago and restored today, the log files are used to restore transactions that occurred after the backup.

DB2 assumes the *active* log files are safely preserved on disk. By definition, the active log files have never been archived. However, the *archived* log files need to be restored for the rollforward operation. DB2 invokes the user-exit program to restore archived log files.

If the log files were saved directly to NetBackup, the user-exit program simply initiates a file restore operation. DB2 invokes the user-exit program, providing the filename to restore. The user-exit program searches the NetBackup catalog for that file. When found, it is then restored directly to the DB2 log directory.

If the log files were first copied to an archive directory and later backed up by a scheduled task, the recovery process is a bit different. First, the user must use NetBackup to restore all log files created since the database backup image, e.g. 10 days ago. The files must be restored to the archive directory, not the DB2 log directory. When the rollforward operation is performed, DB2 will instruct the user-exit program to restore a log file. The user-exit program simply searches the archive directory for the file. When found, it is then copied from the archive directory into the DB2 log directory.

Log files saved directly to tape require no user intervention during the recovery. However, their sequential recovery can be slow when dealing with numerous, large log files. Log files that are first copied and later backed up require some user intervention during the recovery. Specifically, you must restore these files prior to the rollforward. Advanced users prefer this approach because of performance and flexibility benefits.

DB2 Commands

This section describes DB2 commands that interact with NetBackup, and options important to proper operation. See the DB2 UDB Command Reference for a complete description of these commands.

Backup

The DB2 `BACKUP DATABASE` command is used to backup a database to NetBackup.

`LOAD` <*NBDB2 Library Path*>	Instructs DB2 to use the NBDB2 vendor library when performing the backup.
`OPEN` (number) `SESSIONS`	Specifies the number of concurrent data streams used for writing data. Use this option if you have multiple backup devices available, or have multiplexing enabled in NetBackup.
`WITH` (number) `BUFFERS`	Use this option when opening multiple sessions (see above). **Note** The number of buffers must be twice the number of sessions.
`BUFFER` size	Use this option to increase or decrease the buffer size if necessary. Increased size can benefit performance, while decreased size may be necessary if using numerous buffers. DB2 recommends the size be a multiple of the extent size. The DB2 DFT_EXTENT_SZ setting defines the default extent size.
`WITHOUT PROMPTING`	This option is required for unattended backups, and must be specified in backup scripts executed by NetBackup.
`INCREMENTAL`	Use this option to perform a cumulative backup.
`INCREMENTAL DELTA`	Use this option to perform a differential backup.
`ONLINE`	Use this option to back up “hot” or active databases. The DB2 USEREXIT setting must be enabled for online backups.

Restore

The DB2 `RESTORE DATABASE` command is used to restore a database from NetBackup.

`LOAD` <*NBDB2 Library Path*>	Instructs DB2 to use the NBDB2 vendor library when performing the restore.
`OPEN` (number) `SESSIONS`	Typically, you should specify the same number of sessions used during the backup. Using fewer sessions is allowed, but may degrade overall restore performance. Specifying more sessions has no benefit.
`WITH` (number) `BUFFERS`	Use this option when opening multiple sessions (see above). **Note** The number of buffers must be twice the number of sessions. Using fewer buffers can degrade performance, or cause the restore to fail when reading multiplexed images.
`BUFFER` size	Use this option to increase or decrease the buffer size if necessary. Increased size can benefit performance, while decreased size may be necessary if using numerous buffers. DB2 will alter the actual size to be a multiple of the size used during the backup.
`WITHOUT PROMPTING`	This option is required for unattended restores, and must be specified in backup scripts executed by NetBackup.
`INCREMENTAL`	When using this option, DB2 may not read the entire image from NetBackup media. Consequently, NetBackup will log an error in the Activity Monitor, which can safely be ignored.
`AUTOMATIC`	Use this option to restore a series of full and incremental images.
`HISTORY FILE`	When using this option, DB2 may not read the entire image from NetBackup media. Consequently, NetBackup will log an error in the Activity Monitor, which can safely be ignored.

ROLLFORWARD

The `DB2 ROLLFORWARD` command is used to recover a database by applying transactions that have been previously logged into a file.

When a database or tablespace recovery is performed, DB2 invokes the user-exit program named `db2uext2` to restore any archived log files. NetBackup for DB2 provides a custom `db2uext` program that restores the files from NetBackup media into the DB2 log directory. Once the log file is restored, DB2 applies the transactions within that file to satisfy the rollforward request.

Load

The `DB2 LOAD` command is used to load data into a database table.

`COPY YES`	Instructs DB2 to copy (back up) the loaded data to NetBackup. The data will not be recorded in the transaction log. If a `ROLLFORWARD` command is performed later, the loaded data will be automatically restored from NetBackup. In other words, the transaction log records that the loaded data resides in a NetBackup backup image.
`LOAD` <*NBDB2 Library Path*>	Instructs DB2 to back up the loaded data using the NBDB2 vendor library.
`OPEN` (number) `SESSIONS`	Specifies the number of concurrent data streams used for writing data. Use this option if you have multiple backup devices available, or have multiplexing enabled in NetBackup.

Installation 2

This chapter describes the NetBackup for DB2 on UNIX installation and setup procedures. It includes a section on installation prerequisites.

▼ 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.

At the time of this release, NetBackup for DB2 supports the following DB2 Universal Database Versions:

- 7.1.x FixPak 10a or later
- 7.2.x FixPak 10a or later
- 8.1.x FixPak 3 or later

NetBackup for DB2 supports all UNIX and Windows Editions of DB2, including EEE/DPF.

Installation Prerequisites

Before installing NetBackup for DB2 on UNIX, be sure you have completed the following procedures:

- Install the DB2 vendor software on the client where you will be backing up the databases.

- 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.

Caution In an DB2 EEE environment, the NetBackup client software must be installed on every node/client used by DB2.

See the following for more details:

- *IBM DB2 Universal Database Quick Beginnings*

Now you are ready to install NetBackup for DB2 on UNIX on the client where you will be backing up the databases. Refer to the next section for detailed instructions on installing NetBackup for DB2 on UNIX.

Guidelines for Installing NetBackup for DB2 on UNIX in a Cluster

- Prior to installing NetBackup for DB2 on UNIX, 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 DB2 on UNIX 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 DB2 on UNIX on a NetBackup server or if you wish to install NetBackup for DB2 on UNIX on a machine on which only the NetBackup client is installed.

Installing NetBackup for DB2 on UNIX

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 DB2 on UNIX" on page 23.

Remote Installation of NetBackup for DB2 on UNIX

During a remote installation, NetBackup for DB2 on UNIX 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 DB2 on UNIX 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 software is installed and operational on each DB2 host.

  This also means that the directory `install_path/netbackup` already exists on each DB2 host.

- DB2 database instances exist on the DB2 host.
- 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 DB2 on UNIX on a clustered NetBackup server, first refer to the "Guidelines for Installing NetBackup for DB2 on UNIX 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 DB2 on UNIX 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 DB2 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 DB2 on UNIX 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 DB2 on UNIX 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 DB2.
- *upgrade install*: Use an upgrade install if all the clients you intend to update already have been added to policies of type DB2.

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 DB2 on UNIX 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
```

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 DB2 on UNIX 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 DB2 -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, AIX4.3.3, or AIX5 machine, both the 32-bit and 64-bit versions of NetBackup for DB2 on UNIX 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 DB2 ALL ALL`

This command looks at all possible clients and updates only the clients currently in the DB2 policy type.

Instead of `ALL ALL`, you may use `-ClientList` *filename* as explained in "Initial Installation on Clients" on page 20.

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, AIX4.3.3, or AIX5 machine, both the 32-bit and 64-bit versions of NetBackup for DB2 on UNIX 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 DB2 on UNIX does not support that client's platform type
- the NetBackup for DB2 on UNIX software for that client type was not loaded onto the server in step 6 of the "Remote Installation Instructions" on page 19
- (if using the `ALL ALL` method) the client does not belong to the DB2 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 DB2 on UNIX 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 DB2 on UNIX

During a local installation, the NetBackup for DB2 on UNIX 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 DB2 on UNIX 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.
- DB2 database instances exist on the DB2 host.
- 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 DB2 on UNIX 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 DB2 on UNIX 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 DB2 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, AIX4.3.3, or AIX5 machine, both the 32-bit and 64-bit versions of NetBackup for DB2 on UNIX 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 DB2 on UNIX that was installed and an installation timestamp.

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

Specifying the DB2 Home Path

The `db2uext` user-exit program is installed into *`install_path`*`/netbackup/bin/db2uext2`. DB2 expects the `db2uext2` executable to reside with the `DB2 UNIX $PATH`. This can be accomplished by running the `db2_config` tool provided with NetBackup for DB2. This must be performed after installing NetBackup for DB2, and whenever a new DB2 instance is created.

▼ To specify the DB2 Home Path

1. Change to the following directory:

   ```
   /usr/openv/netbackup/bin
   ```

2. Run the setup command:

   ```
   ./db2_config
   ```

   The following appears:

   ```
   Please specify the DB2 instance home path name:
   ```

3. Supply the appropriate home path name, and press Enter.

   The following appears:

   ```
   Do you have other DB2 instances? (y/n) [n]
   ```

4. Add other DB2 instances as appropriate, or enter **n** if you are finished.

   The setup step is complete.

Adding New DB2 Instances

If you add a new DB2 instance after NetBackup for DB2 on UNIX has been installed, follow the procedure described in "Specifying the DB2 Home Path" on page 26. This ensures that all new database instances will be included in the NetBackup for DB2 backup operations.

Configuration 3

Before attempting to configure NetBackup for DB2, complete the installation procedure as described in "Installation" on page 15.

The following steps outline 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 DB2 Configuration Settings

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

To configure NetBackup for DB2 from a Windows NetBackup server, see "Configuration Using the NetBackup Administration Console for Windows" on page 28.

To configure NetBackup for DB2 from a UNIX NetBackup server, see "Configuration Using the NetBackup Administration Console for UNIX" on page 46.

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:

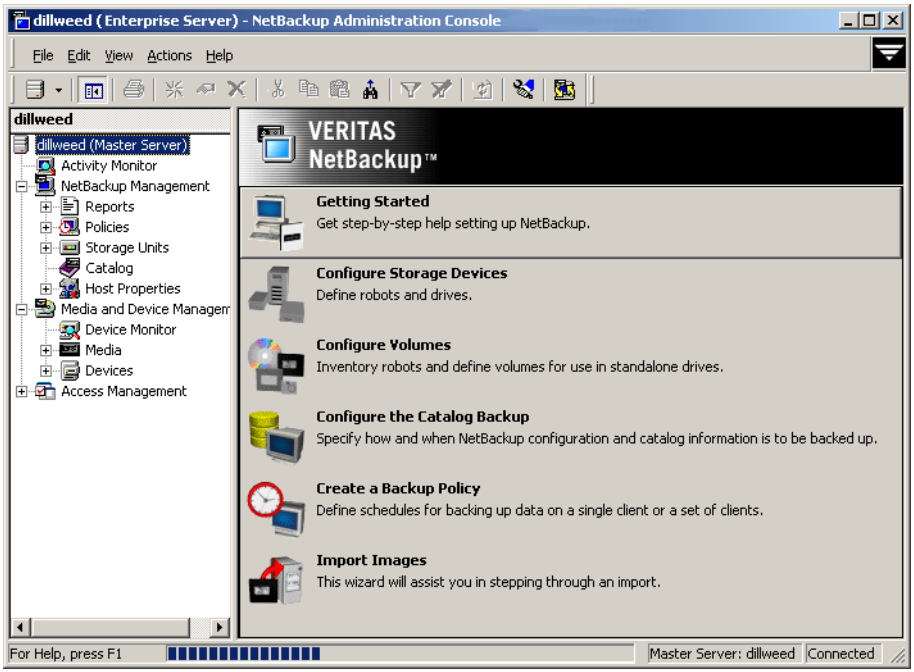
- Configuring media using Media and Device Management
- Setting the **Maximum Jobs per Client** property
- Configuring a NetBackup policy
- Testing NetBackup for DB2 configuration settings

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 DB2 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 DB2 databases that you are backing up, and the frequency of backups.

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 Sessions* x *Number of Policies*

Where:

- *Number of Session* is the number of backup sessions between the backup server and NetBackup on the client. Each separate session starts a new backup job on the client.

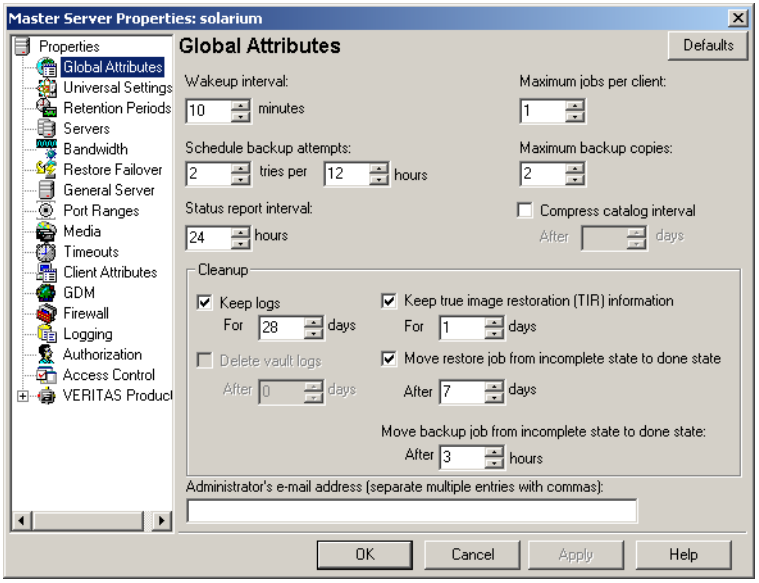
- *Number of Policies* is the number of policies that may back up this client at the same time. This number can be greater than one. For example, a client may be in two policies in order to back up two different databases. These backup windows may overlap.

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 DB2.

▼ 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
- script files to be executed on the clients

To use NetBackup for DB2, at least one DB2 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 DB2 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.

DB2 Environments

In general, the following NetBackup configuration is required to use NetBackup for DB2:

- To back up the DB2 Database:

  Create a DB2 database policy with an Application Backup schedule.

- To schedule a DB2 Backup using NetBackup:

  Create a DB2 database policy with an Automatic Full, Automatic Differential Incremental, or Automatic Cumulative Incremental Backup schedule.

- To back up the DB2 Archive Log files:

  Create a Standard file policy with a User Backup schedule.

In most DB2 environments, a single DB2 policy can be used. However, in a DB2 EEE environment, a minimum of two (2) DB2 policies are needed: one for the DB2 catalog node(s), and another for the non-catalog nodes. In any DB2 environment where USEREXIT is enabled, a Standard file policy is required.

The following sections describe how to create the NetBackup policies and schedules for these environments. For DB2 EEE users, see "Configuration for a DB2 EEE (DPF) Environment" on page 143.

Note The Media Manager must be configured and a Storage Unit defined before a policy can be added.

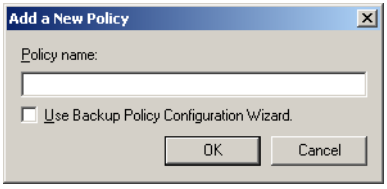
Adding New Policies

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.

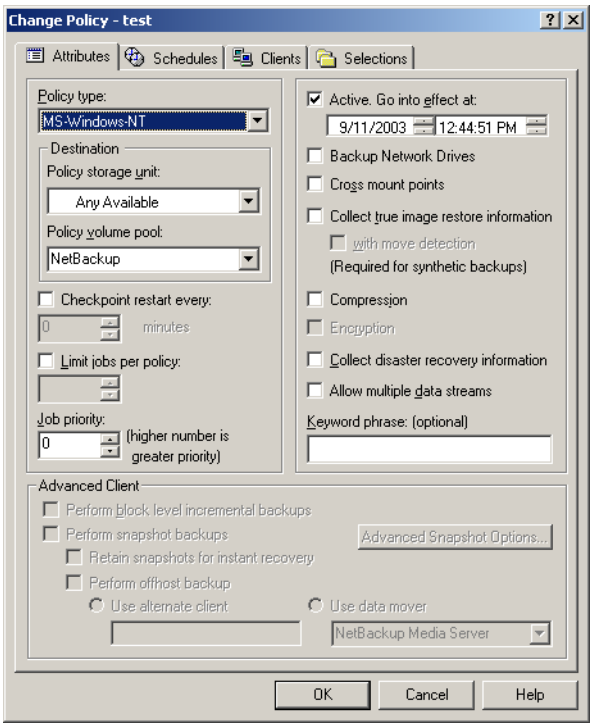
      - To use the wizard, select the **Use Backup Policy Configuration Wizard** box and click **OK**. The wizard starts and you create the policy by following the prompts. When prompted, select the DB2 policy type.

Note The DB2 policy type will not appear in the drop-down list unless your server has a license key for NetBackup for DB2.

- 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 DB2 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 DB2 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 DB2, you must have defined at least one DB2 policy.
Keyword phrase to associate with the backup	For NetBackup for DB2, the keyword phrase entry is ignored.
Advanced Client	See the "Using NetBackup for DB2 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.

A DB2 backup requires an Application Backup schedule, which is created automatically when you create a DB2 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 DB2 database operations are performed through NetBackup for DB2 using an Application Backup schedule. This includes those backups started automatically.

   You must configure an Application Backup schedule for each DB2 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 DB2 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 DB2 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

Note The Application Backup schedule name must be specified in the $*DB2_Instance_Home*/db2.conf file on the client.

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 DB2 operations are never locked out due to the Application Backup schedule.

▼ 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."

Refer to the following table 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 months
	Frequency	Frequency determines how often a backup should be performed	every month
	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.	Monday 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 month
	Frequency	Frequency determines how often a backup should be performed	every week

Type of Backup	Schedule settings	Description	Settings
	Backup Window	The time during which a NetBackup operation can be performed.	Sunday 18:00:00 - 22:00:00

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

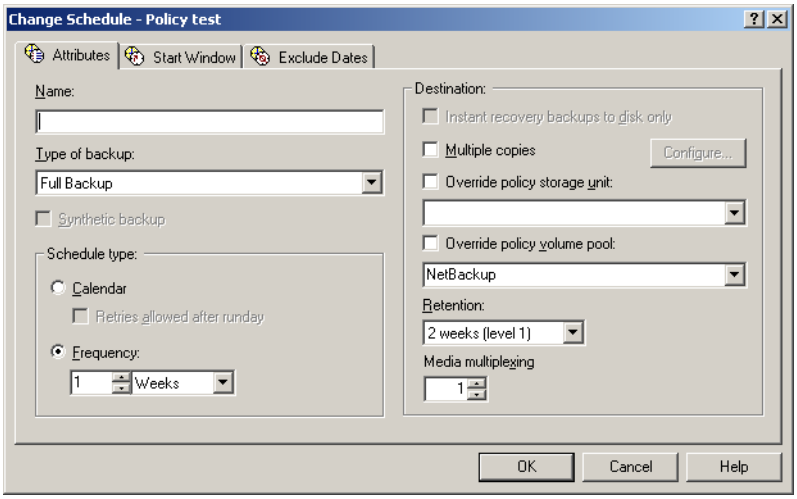
6. Click **OK**.

▼ To add other schedules

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

2. Click **New**.

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



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."

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

6. Click **OK**.

To add more schedules, repeat this procedure. Click **Cancel** to cancel changes that you have not yet added and close the dialog.

Types of Backups

Caution When an automatic schedule is used to invoke a script authored by the user, NetBackup cannot provide safeguards preventing unusual behavior, including:
- a full schedule executing an incremental backup script
- an incremental schedule executing a full backup script
- an automatic schedule executing a restore/recovery script

Whenever possible, using a template instead of a script is recommended, because template execution can detect the backup type on the schedule. However, the user is still responsible for specifying a template with the correct operation type (backup) in the policy.

Description of Backup Types for DB2

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 DB2 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.
Automatic Differential Incremental Backup	In a differential incremental datafile backup, you back up all blocks that have changed since the most recent full or incremental backup.
Automatic Cumulative Incremental Backup	In a cumulative incremental backup, you back up all blocks that have changed since the most recent full backup. Cumulative incremental backups reduce the work needed for a restore by ensuring that you only need one cumulative incremental backup at restore time. Cumulative backups typically require more space and time than Differential Incremental Backups, however, because they contain all modifications since the last full backup.

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 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 longer than the frequency setting for the schedule.* For example, if the frequency setting is set to one week, set the retention period to be more than one week. **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 DB2 policy, configure **Multiple copies** on the Application Backup schedule.

Adding Clients to a Policy

The client list is the list of clients on which your DB2 template or scripts are run during an automatic backup. A NetBackup client must be in at least one policy but can be in more than one.

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:

- DB2
- NetBackup client or server
- NetBackup for DB2
- the backup or restore 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 DB2 is installed in a cluster, specify the virtual DB2 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 DB2 templates and shell scripts, see "Creating Templates and Shell Scripts" on page 71.

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

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

2. Click **New**.

3. Enter the name of the selection.

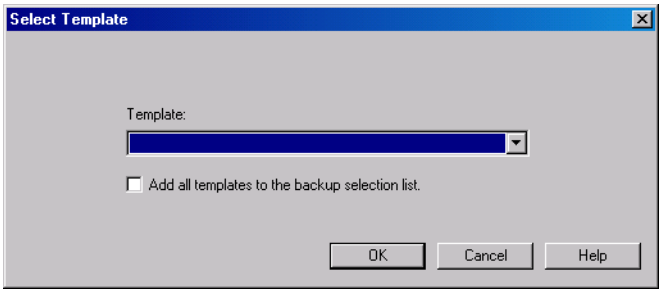
   Templates:

   - 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** 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 DB2 scripts. For example:

   `/myscripts/db2_backup.sh`

Note For clustered environments, the scripts must be stored in a location that is available after a failover.

OR

   - Click the **Remote Folder** button.

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

Refer to "Creating Templates and Shell Scripts" on page 71 for details on creating scripts.

Be sure that the DB2 scripts listed here are installed on each client in the Client list.

4. Click **OK**.

Configuring a Standard Policy

In addition to the DB2 policy, you must also configure a Standard type policy. A Standard policy will enable the backup of database log files.

A Standard type policy must be added when:

- `userexit` for logging is turned on in DB2 UDB.
- Client is a UNIX machine.

Note The name of the policy must be specified in the *$DB2_Instance_Home*/db2.conf file on the client.

▼ To create a Standard policy

1. Add a new policy, as specified in "Configuring a NetBackup Policy" on page 31.
2. Specify the general attributes for the policy:
   a. Select Standard for the policy type.
   b. Specify other attributes as desired.
3. Add a schedule:
   a. Type the name of your schedule.

Note The name of the policy must be specified in the *$DB2_Instance_Home*/db2.conf file on the client.

   b. In the **Type of Backup** box, select User Backup.

      This is a user backup that is started by the NetBackup for DB2 user-exit program on the client. This schedule specifies the criteria for DB2 archive logs file backups. A User Backup schedule enables user controlled NetBackup operations performed on the client.

c. In the **Retention** box, set the time period needed to retain two full backups of your database.

   For example, if your database is backed up once every Sunday morning, select a retention period of at least two weeks.

d. In the **Start Window** section of the Schedules dialog, set the time of day when you want backups to occur.

   This schedule must encompass *all of the time periods* during which DB2 UDB can call the user-exit programs.

Note No Backup Selections list is necessary for this policy because it will be a User Backup type schedule.

4. Specify the clients that you will be backing up. The client must have:
   - DB2 UDB installed
   - NetBackup for DB2 installed

Note If the client is installed in a cluster, add the virtual host name to the policy.

5. Click **OK**.

   The Add New Policy dialog box closes. The policy you just configured appears in the policy list.

Specifying the Master Server for a NetBackup for DB2 Client

After you have added your NetBackup for DB2 client to a policy, you must specify the master server for the client in the NetBackup Administration Console.

▼ To specify the master server in the NetBackup Administration Console

1. In the left pane, expand **Host Properties**.
2. Click **Clients**.
3. Double click the NetBackup for DB2 client name in the **Clients** list.
4. The Client Properties dialog opens.
5. In the **Properties** pane, click **Servers**.

6. Verify that the correct server is displayed in the **Master Server** field.

7. If not, click the server name in the Additional Servers list, and click **Make Master**. You can also click **Add** to add a new server name to the list.

8. Click **OK** to save your change.

Do not specify the master server in the Backup, Archive, and Restore interface for the DB2 client. This can cause backups and restores to fail. To specify the master server for your NetBackup for DB2 client, you must set this value in the Client Properties for the DB2 client on the master server.

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 DB2 configuration settings

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

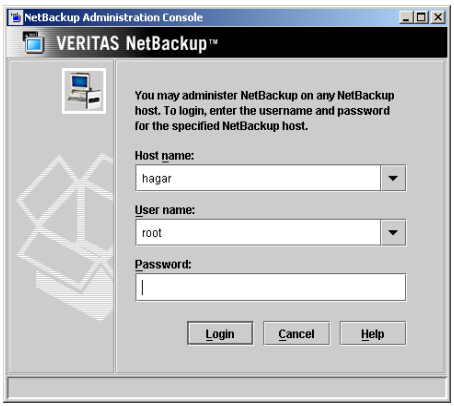
▼ To launch the NetBackup Administration Console for UNIX

1. Log onto the UNIX server as root.

2. Start the NetBackup Administration Console by executing:

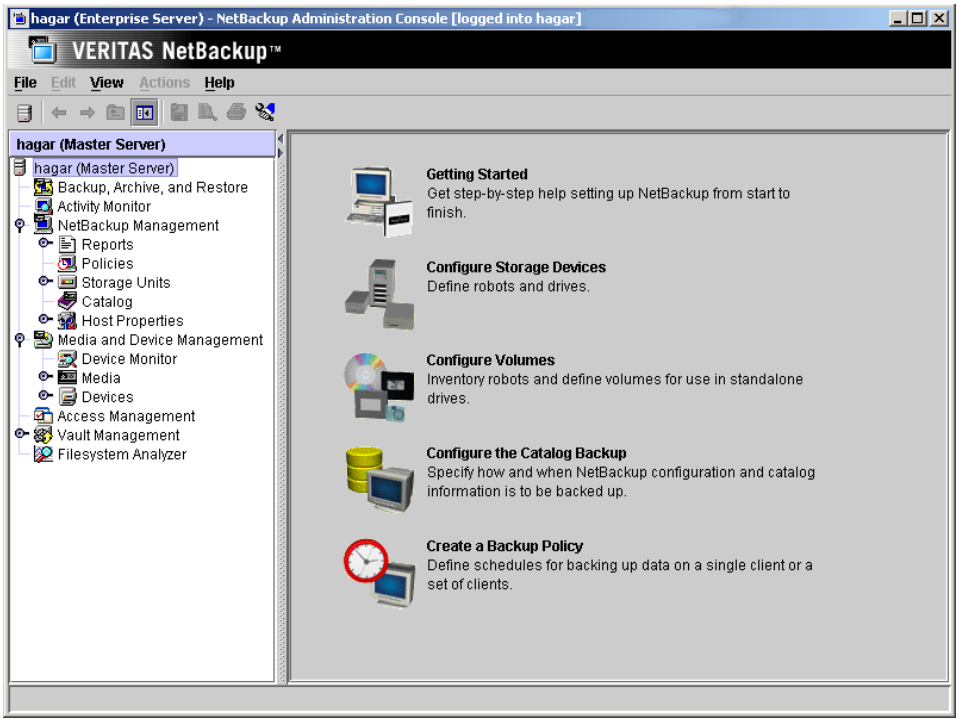
   install_path/**netbackup/bin/jnbSA &**

   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 DB2 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 DB2 databases that you are backing up, and the frequency of backups.

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 Sessions* x *Number of Policies*

Where:

- *Number of Session* is the number of backup sessions between the backup server and NetBackup on the client. Each separate session 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.

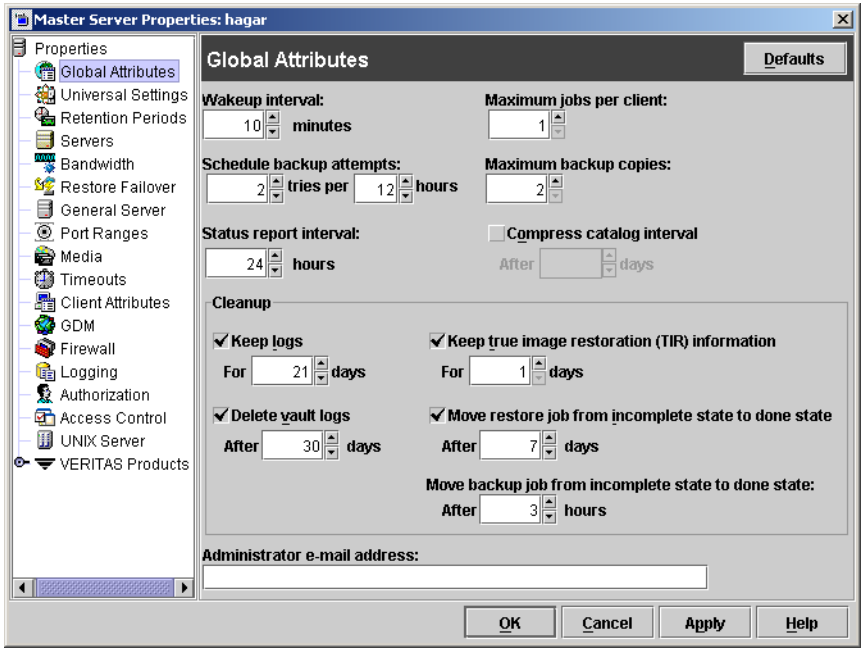
Tip To avoid any problems, we recommend that you enter a high enough value for the **Maximum jobs per client** property to meet the number of jobs executed by DB2.

▼ 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
- script files to be executed on the clients

To use NetBackup for DB2, at least one DB2 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 DB2 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.

DB2 Environments

In general, the following NetBackup configuration is required to use NetBackup for DB2 on UNIX:

- To backup the DB2 Database:

  Create a DB2 database policy with an Application Backup schedule.

- To schedule a DB2 Backup using NetBackup:

  Create a DB2 database policy with an Automatic Full, Automatic Differential Incremental, or Automatic Cumulative Incremental Backup schedule.

- To backup the DB2 Archive Log files:

  Create a Standard file policy with a User Backup schedule.

In most DB2 environments, a single DB2 policy can be used. However, in a DB2 EEE environment, a minimum of two (2) DB2 policies are needed: one for the DB2 catalog node(s), and another for the non-catalog nodes. In any DB2 environment where USEREXIT is enabled, a Standard file policy is required.

The following sections describe how to create the NetBackup policies and schedules for these environments. For DB2 EEE users, see "Configuration for a DB2 EEE (DPF) Environment" on page 143.

Note The Media Manager must be configured and a Storage Unit defined before a policy can be added.

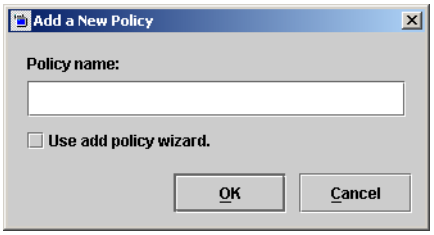
Adding New Policies

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.

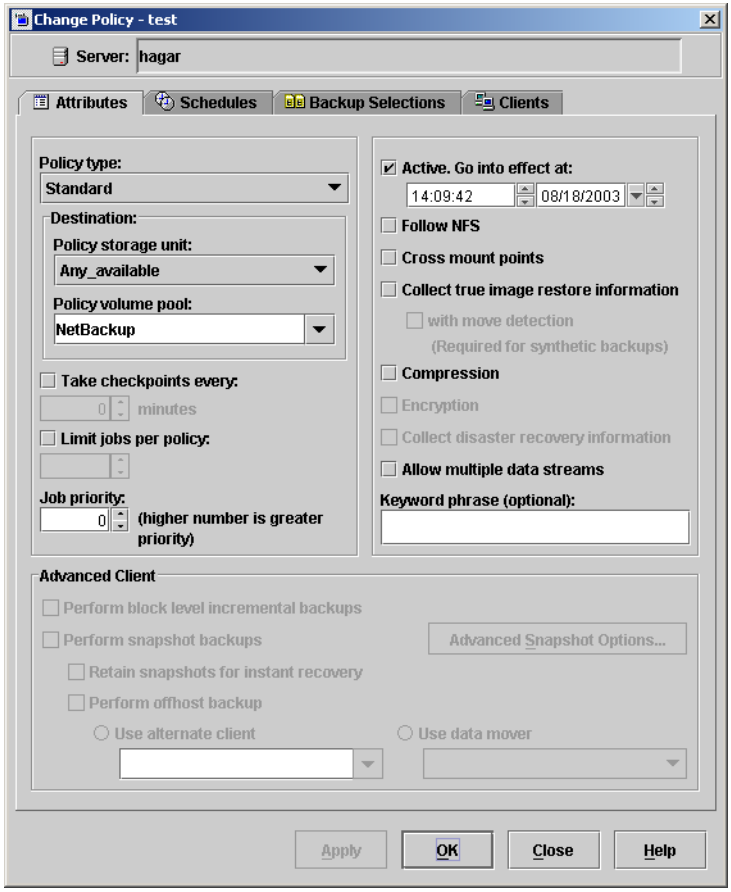
- To use the wizard, select the **Use add policy wizard** box and click **OK**. The wizard starts and you create the policy by following the prompts. When prompted, select the DB2 policy type.

Note The DB2 policy type will not appear in the drop-down list unless your server has a license key for NetBackup for DB2.

- 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 DB2 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 DB2 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 DB2, you must have defined at least one DB2 policy.
Keyword phrase to associate with the backup	For NetBackup for DB2, the keyword phrase entry is ignored.
Advanced Client	See the "Using NetBackup for DB2 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.

A DB2 backup 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 DB2 database operations are performed through NetBackup for DB2 using an Application Backup schedule. This includes those backups started automatically.

   You must configure an Application Backup schedule for each DB2 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 DB2 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 DB2 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 DB2 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 weeks
	Backup Window	The time during which a NetBackup operation can be performed.	Sunday through Saturday 00:00:01 - 23:59:59

Note The Application Backup schedule name must be specified in the *$DB2_Instance_Home*/`db2.conf` file on the client.

▼ 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 months
	Frequency	Frequency determines how often a backup should be performed	every month
	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 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.	Monday 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 month
	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

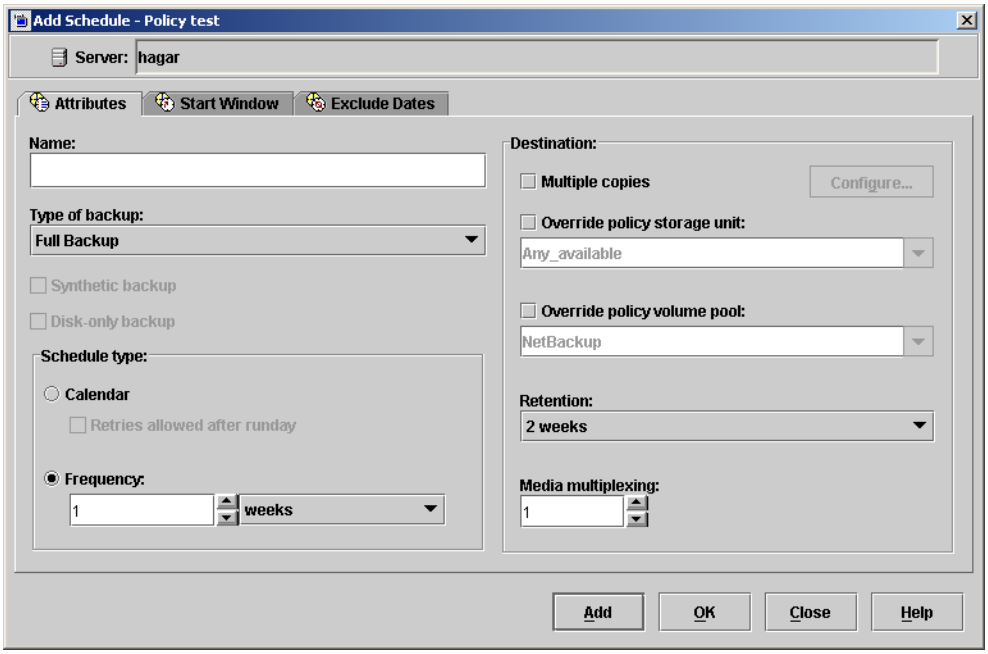
5. Specify the other properties for the schedule as explained in "Schedule Properties."

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

▼ To add other schedules

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

   The Add Schedule dialog is displayed. The title bar shows the name of the policy to which you are adding the schedules.



2. Specify a unique name for the schedule.

3. Select the **Type of Backup**.

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

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

5. If this is the last schedule, click **OK**. To add more schedules, click **Add** and repeat step 2 through step 4. Click **Close** to cancel changes that you have not yet added and close the dialog.

Types of Backups

Caution When an automatic schedule is used to invoke a script authored by the user, NetBackup cannot provide safeguards preventing unusual behavior, including:
- a full schedule executing an incremental backup script
- an incremental schedule executing a full backup script
- an automatic schedule executing a restore / recovery script

Whenever possible, using a template instead of a script is recommended, because template execution can detect the backup type on the schedule. However, the user is still responsible for specifying a template with the correct operation type (backup) in the policy.

Description of Backup Types for DB2

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 DB2 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.
Automatic Differential Incremental Backup	In a differential incremental datafile backup, you back up all blocks that have changed since the most recent full or incremental backup.
Automatic Cumulative Incremental Backup	In a cumulative incremental backup, you back up all blocks that have changed since the most recent full backup. Cumulative incremental backups reduce the work needed for a restore by ensuring that you only need one cumulative incremental backup at restore time. Cumulative backups typically require more space and time than Differential Incremental Backups, however, because they contain all modifications since the last full backup.

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 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 longer than the frequency setting for the schedule.* For example, if the frequency setting is set to one week, set the retention period to be more than one week. **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 DB2 policy, configure **Multiple copies** on the Application Backup schedule.

Adding Clients to a Policy

The client list is the list of clients on which your NetBackup for DB2 backups will be performed. A NetBackup client must be in at least one policy but can be in more than one.

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:

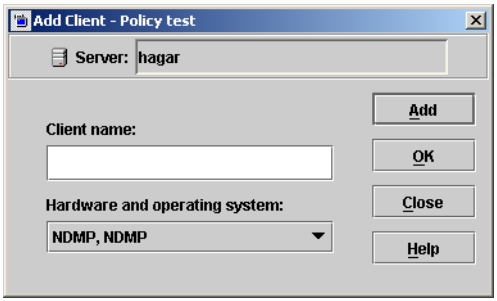
- DB2

- NetBackup client or server
- NetBackup for DB2
- the backup or restore script(s)

▼ 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 DB2 is installed in a cluster, specify the virtual DB2 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 DB2 templates and shell scripts, see "Creating Templates and Shell Scripts" on page 71.

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.

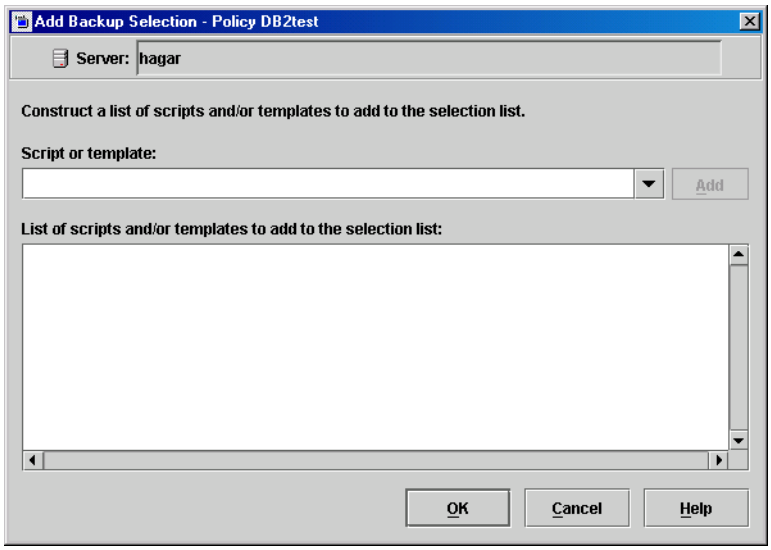
The following procedure starts from the Policy dialog. To see the Policy dialog, double-click the policy in the **Policies** list in the NetBackup Administration Console.

▼ To add templates or scripts to the Backup Selections List

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 DB2 template or shell script.

   Templates:

   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 DB2 scripts. For example:

   `/myscripts/db2_backup.sh`

Be sure that the DB2 scripts listed here are installed on each client in the Client list.

Note For clustered environments, the scripts must be stored in a location that is available after a failover.

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 a Standard Policy

In addition to the DB2 policy, you must also configure a Standard type policy. A Standard policy will enable the backup of database log files.

A Standard type policy must be added when:

- `userexit` for logging is turned on in DB2 UDB.
- Client is a UNIX machine.

Note The name of the policy must be specified in the *$DB2_Instance_Home*/db2.conf file on the client.

▼ To create a Standard policy

1. Add a new policy, as specified in "Configuring a NetBackup Policy" on page 31.

2. Specify the general attributes for the policy:

   a. Select Standard for the policy type.

   b. Specify other attributes as desired.

3. Add a schedule:

   a. Type the name of your schedule.

Note The name of the policy must be specified in the *$DB2_Instance_Home*/db2.conf file on the client.

   b. In the **Type of Backup** box, select User Backup.

This is a user backup that is started by the NetBackup for DB2 user-exit program on the client. This schedule specifies the criteria for DB2 archive logs file backups. A User Backup schedule enables user controlled NetBackup operations performed on the client.

c. In the **Retention** box, set the time period needed to retain two full backups of your database.

For example, if your database is backed up once every Sunday morning, select a retention period of at least two weeks.

d. In the **Start Window** section of the Schedules dialog, set the time of day when you want backups to occur.

This schedule must encompass *all of the time periods* during which DB2 UDB can call the user-exit programs.

Note No Backup Selections list is necessary for this policy because it will be a User Backup type schedule.

4. Specify the clients that you will be backing up. The client must have:
   - DB2 UDB installed
   - NetBackup for DB2 installed

Note If the client is installed in a cluster, add the virtual host name to the policy.

5. Click **OK**.

   The Add New Policy dialog box closes. The policy you just configured appears in the policy list.

Specifying the Master Server for a NetBackup for DB2 Client

After you have added your NetBackup for DB2 client to a policy, you must specify the master server for the client in the NetBackup Administration Console.

▼ To specify the master server in the NetBackup Administration Console

1. In the left pane, expand **Host Properties**.
2. Click **Clients**.
3. Double click the NetBackup for DB2 client name in the **Clients** list.

4. The Client Properties dialog opens.

5. In the **Properties** pane, click **Servers**.

6. Verify that the correct server is displayed in the **Master Server** field.

7. If not, click the server name in the Additional Servers list, and click **Make Master**. You can also click **Add** to add a new server name to the list.

8. Click **OK** to save your change.

Do not specify the master server in the Backup, Archive, and Restore interface for the DB2 client. This can cause backups and restores to fail. To specify the master server for your NetBackup for DB2 client, you must set this value in the Client Properties for the DB2 client on the master server.

Configuring the Run-Time Environment

Environment Variables

It is important to note that these environmental variables are created by the NetBackup automatic scheduler when it executes a script.

Note The environmental variables below are only used in the executing script. They are unknown to the DB2 UDB backup/restore. For example, the `DB2_POLICY` variable will not be processed by the DB2 UDB backup or DB2 UDB restore. Instead it uses the `POLICY` name defined in the *$DB2_Instance_Home*/`db2.conf` file.

When the NetBackup automatic scheduler calls a DB2 template or script, the following environmental variables are created.

`DB2_POLICY`	Name of the NetBackup for DB2 policy from which the Automatic Backup backup type was started. This policy name is not necessarily the same policy name that is in the `db2.conf` file. This variable is set only if the backup is initiated from the server (either automatically by the NetBackup scheduler or manually through the administrator interface).
`DB2_SERVER`	Name of the NetBackup server.
`DB2_SCHED`	Name of the NetBackup schedule. This variable is set up only if the backup is initiated from the server (either automatically by the NetBackup scheduler or manually through the administrator interface).
`DB2_SCHEDULED`	Set to 1 if this is a scheduled backup type (Automatic Backup).
`DB2_USER_INITIATED`	Set to 1 if this is a user-initiated backup type (Application Backup backup).

Note The variables below can be tested within the script to determine which type of backup has been requested.

`DB2_FULL`	Set to 1 for an Automatic Full Backup.
`DB2_INCR`	Set to 1 for an Automatic Differential Incremental Backup
`DB2_CINC`	Set to 1 for an Automatic Cumulative Incremental Backup.

Creating a db2.conf File

A `db2.conf` file is a control file that indicates what policy, schedule, and database to use. You must place this file in the *$DB2_Instance_Home*/ directory on all the NetBackup for DB2 clients. A sample copy is provided in the sample directory.

Example

Assume we are backing up a database named *SAMPLE* and its archive logs. We have already configured two policies that have the required schedules for our backups.

One of the policies is for backing up the database. This policy is named *DB2_DB_Policy* and has both an Application Backup schedule and an Automatic Backup schedule. The first entry in the example file below specifies this policy and its Application Backup schedule, which is named *Default-Application-Backup*. The Automatic Backup schedule is not specified in `db2.conf`.

The other policy is for backing up the archive logs. This policy is named *DB2_Log_Policy* and has a User Backup type schedule named *User*. The second entry in the example file below specifies this policy and its User Backup schedule.

```
#
# The following settings are used by NetBackup to backup/restore a DB2 database.
#
# Reminders:
# 1) The specified policy must have a type of "DB2".
# 2) The specified schedule must be defined for this policy.
# 3) The DB2 database host must be entered as a client for this policy.
#

OBJECTTYPE DATABASE
DATABASE SAMPLE
POLICY DB2_DB_Policy
SCHEDULE Default-Application-Backup
ENDOPER

#
# The following settings are used by NetBackup to backup/restore DB2 log files.
#
# Reminders:
# 1) The specified policy must have a type of "Standard" (for UNIX DB2 host) or
#    "MS-Windows-NT" (for Windows DB2 host).
# 2) The specified schedule must be defined for this policy.
# 3) The DB2 database host must be entered as a client for this policy.
#
# If DB2 log file archiving is enabled (DB2 USEREXIT ON), DB2 will invoke
# the NetBackup user-exit program to backup & restore DB2 archive log files.
# Using ARCFUNC SAVE causes log files to be archived to NetBackup storage,
# as specified by the policy.
# Using ARCFUNC COPY causes log files to be archived to a disk directory.
# Use ARCDIR to specify the destination directory for log file backup.
# Use RETDIR to specify the source directory for log file restore.
#

OBJECTTYPE ARCHIVE
DATABASE SAMPLE
POLICY DB2_Log_Policy
SCHEDULE User
ARCFUNC SAVE
```

```
#ARCFUNC COPY
#ARCDIR /home/db2inst1/arcdir
#RETDIR /home/db2inst1/arcdir
ENDOPER
```

Using ARCFUNC to Back up Archive Logs

ARCFUNC can be used with two options: SAVE and COPY. The default option is SAVE.

When using ARCFUNC SAVE, the name of the Standard policy configured earlier (see "Configuring a Standard Policy" on page 43) must be recorded in the db2.conf file.

The following is an example of a db2.conf file for backing up archive log files for the database SAMPLE using ARCFUNC SAVE. The policy name is db2_archive and the schedule name is db2_archive_sched

```
DATABASE SAMPLE
OBJECTTYPE ARCHIVE
POLICY db2_archive
SCHEDULE db2_archive_sched
ARCFUNC SAVE
ENDOPER
```

The ARCFUNC COPY function is different. It copies the archive log(s) to the ARCDIR. There is no NetBackup policy or schedule involved or needed. The user exit program (`db2uext2`) does the copy operation when called by DB2. However, you must setup ARCDIR and the RETDIR in the `db2.conf` file for the operation to function properly. The following example shows contents of a `db2.conf` file for the database SAMPLE.

```
DATABASE SAMPLE
OBJECTTYPE ARCHIVE
ARCFUNC COPY
ARCDIR /mylogs/arcdir/
RETDIR /mylogs/arcdir/
ENDOPER
```

At some point, the disk will become full with archived log files. To manage this, you need to configure a separate Standard policy to archive the entire ARCDIR directory to NetBackup storage. To reclaim the disk space, the policy must use a "User Archive" schedule type. This instructs NetBackup to delete the files after they have been successfully backed up. Refer to the NetBackup System Adminstrator's Guide for more information about User Archive schedules.

Note This policy is managed by NetBackup only and has nothing to do with `the db2.conf` file.

Using ARCFUNC During Restore of Archive Log Files

If your database is restored to a rollforward pending state, execute a `ROLLFORWARD DATABASE` command. DB2 will request the archive log files it needs to do the rollforward. DB2 will perform the rollforward through the user exit program.

When a restore request comes in from DB2 and the ARCFUNC option is SAVE, the user exit program will look for the file from tape or other device you setup for backup. When using this option, you will not need to worry about the ARCDIR or RETDIR options.

When the option for ARCFUNC is COPY, the user exit program will look for the file to restore from the RETDIR you specified in the `db2.conf` file. If some or all of the files have been archived to NetBackup storage, you must restore them to the RETDIR directory before performing a `ROLLFORWARD DATABASE` command. See the "Performing Restores" section in the NetBackup User's Guide for detailed instructions regarding how to restore a file to disk. The `ROLLFORWARD DATABASE` command will request the log files that DB2 needs from the user exit program. The user exit program will look in the `RETDIR` to find the file since the option for `ARCFUNC` is `COPY`. The user exit program will then copy the files to the DB2 primary log directory.

Important Points

Remember the following about the `db2.conf` file.

- A different `POLICY` name needs to be specified for `DATABASE` and `ARCHIVE` objects.
- A `db2.conf` consists of a series of entries that define the policy and schedule based upon the `OBJECTTYPE`.
- `OBJECTTYPE` and `POLICY` are required fields and all other fields are optional.
- Each operation consists of a series of *keyword, value* pairs, which completely define the total action.
- The keyword is not case sensitive, but the value is.
- Entries are not nested.
- Within an entry, the *keyword, value* pairs can appear in any order. Each entry must be terminated by `ENDOPER`.
- Any line with a # in the first column is treated as a comment line.

Keywords

The following table describes the keywords and values used in `db2.conf` file.

Keyword	Value	Required	Default	Description
ARCDIR	*directory path*	yes, if the value for ARCFUNC is COPY no, if the value for ARCFUNC is SAVE	none	directory path name where archive logs are moved to.
ARCFUNC	SAVE | COPY	no	SAVE	Only for OBJECTTYPE is ARCHIVE. SAVE saves a backup / restore archive log to / from NetBackup. COPY copies an archive to / from ARCDIR / RETDIR directories.
POLICY	*NB policyname*	yes	none	NetBackup policy name.
DATABASE	*database_name*	no	none	DB2 database name. If OBJECTTYPE is ARCHIVE, then a Standard policy must be specified. If OBJECTTYPE is DATABASE or TABLESPACE, then a DB2 policy must be specified.
ENDOPER	none	yes	none	Terminates each entry.
OBJECTTYPE	DATABASE TABLESPACE ARCHIVE	yes	none	Type of backup / restore being performed. DATABASE and TABLESPACE are for DB2 policy types. ARCHIVE is for the Standard policy type.
RETDIR	*directory path*	yes if the value for ARCFUNC is COPY no if the value for ARCFUNC is SAVE	none	The directory path name where archive logs are retrieved from.
SCHEDULE	*nb schedname*	no	first Application Backup in policy	NetBackup schedule name in policy.

Configuring the bp.conf File for a Cluster Environment

When using DB2 in a cluster environment, you must create a `bp.conf` file in the home directory of the DB2 instance owner. In this file, set the CLIENT_NAME entry to the virtual name of the DB2 instance.

In the `bp.conf` file located in the `usr/openv/netbackup` directory, set the CLIENT_NAME entry to the actual host name of the NetBackup for DB2 client. This will allow other backups to be performed on the host.

Creating Templates and Shell Scripts

To perform a scheduled NetBackup for DB2 backup, you must create a template or shell script. The template or shell script will direct the backup job on the NetBackup for DB2 client. You will add this template or shell script to the Backup selections list in the NetBackup for DB2 policy on the master server. You can also use the template or shell script to manually start a backup on the client.

Understanding Templates and Shell Scripts

Templates

The NetBackup for DB2 Backup Wizard is used to create backup templates. This wizard is initiated from the NetBackup Backup, Archive, and Restore interface. See "Creating a Backup Template Using the NetBackup for DB2 Backup Wizard" on page 72.

The NetBackup for DB2 Backup Wizard does not support all of the commands and options provided by DB2. A 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 DB2 and UNIX shell syntax. Sample backup and recovery shell scripts are installed on the client with the NetBackup for DB2 agent. Modify these scripts to meet your individual requirements. See "Creating DB2 Scripts Manually" on page 77 for more information on sample scripts.

NetBackup for DB2 also provides a utility, `bpdbsbdb2`, 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 Shell Scripts Using bpdbsbdb2" on page 76.

Specifying the NetBackup Master Server from the Client

To ensure that the templates you create are saved to and run from the correct master server, specify the master server from the client.

Setting the Master Server in Backup, Archive, and Restore

Use the Backup, Archive, and Restore GUI to specify the NetBackup master server from the client. Setting the master server in the client GUI ensures that the templates you create will be saved to the same master server where you created the NetBackup for DB2 policies.

▼ **To specify the master server**

1. In the Backup, Archive and Restore, click **Actions** > **Specify NetBackup Machines and Policy Type**.
2. In the dialog, click the **NetBackup server** tab.
3. If the master server is not in the **Server List**, enter the server name in the **New Server Name** field. Click **Add**.
4. Select the master server in the **Server List**, and click **Make Current**.
5. Click **OK**.

Setting the Master Server in the User bp.conf

To ensure that the templates you create are run from the master server where you created the NetBackup for DB2 policies, specify the master server in the user bp.conf file in one of the following locations:

`$DB2_HOME/bp.conf`

or

`$NBU_HOME/bp.conf`

Creating a Backup Template Using the NetBackup for DB2 Backup Wizard

Create the backup template using the NetBackup for DB2 Backup Wizard, available in the NetBackup Backup, Archive, and Restore interface.

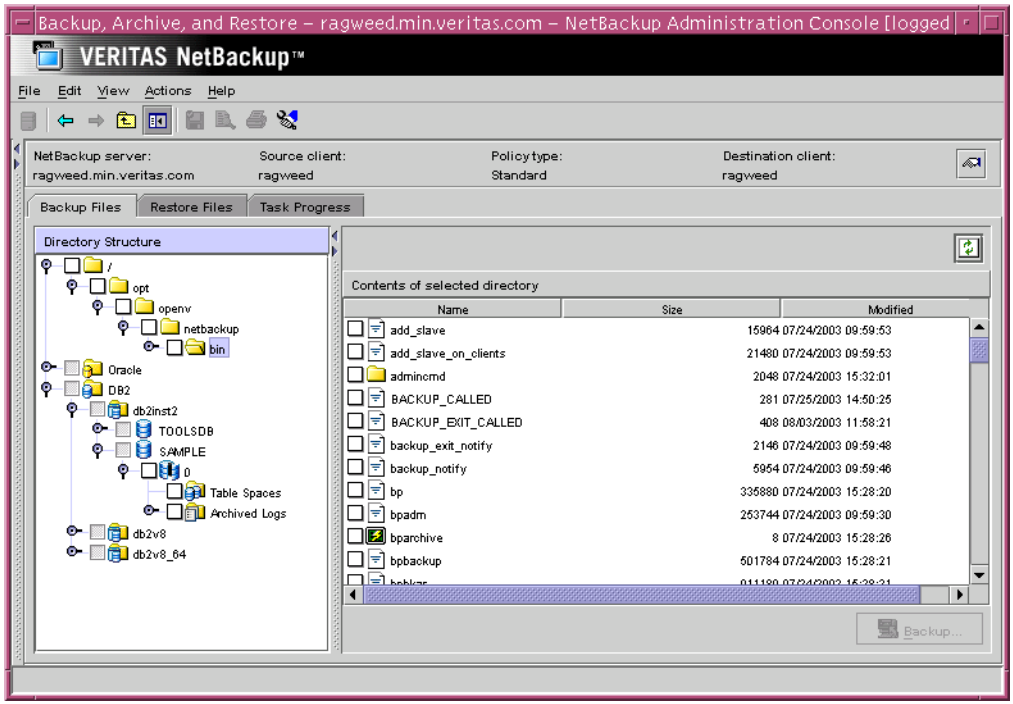
Browsing for the DB2 Instance to Back Up

You can browse the DB2 environment in the Backup, Archive, and Restore interface on the NetBackup for DB2 client.

❖ To start the NetBackup Backup, Archive, and Restore interface, execute:

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

If DB2 is installed, the Backup, Archive, and Restore interface for your DB2 client displays a DB2 resource node in the left pane. Click the **Backup Files** tab, and expand the DB2 resource in the left pane to view a DB2 instance hierarchy. Select a node in the left pane to view details in the right pane.



Selecting any parent database object automatically selects all the children objects beneath it. The following table provides an explanation of the DB2 object types displayed.

DB2 Database Objects in the Backup Window

DB2 resource	If NetBackup for DB2 is detected on the client, the browser window displays the DB2 resource. This is the top level DB2 object in the browser.

DB2 Database Objects in the Backup Window	
instance	The second level object is a DB2 instance. An instance represents a collection of DB2 databases.
database	While you cannot directly select a whole database for backup, you can select a database for backup by selecting all partitions that belong to it. If you select the database for backup in this way, you will not be able to select other databases. If you select objects within the database, you will not be able to select objects within other databases at the same time.
partition	The partition represents a collection of storage with a database. Partitions contain table spaces and log folders. Within a database, you can select a partition or more than one partition. DB2 EEE / DPF environments generally consist of multiple partitions. Other DB2 UDB environments consist of a single partition, which is usually represented as partition zero (0). **Note** Only partitions that reside on the same NetBackup client are displayed. Other partitions on remote hosts are not displayed. See the Caution below for more information.
table space	A table space is a logical entity representing a collection of physical storage containers. Table spaces are comprised of containers, which represent database storage units. A table space is the lowest level DB2 object you can select in the browser.

Caution Because the GUI only displays local or resident partitions, templates created on the local client will not back up partitions on remote hosts. You must create additional templates for the other remote partitions by running the wizard on those clients. To back up the entire EEE / DPF configuration, specify multiple templates in the policy Backup Selections list.

Using the NetBackup for DB2 Backup Wizard

When you have selected the DB2 database, partition(s), or table space(s) that you want to back up, you can use the NetBackup for DB2 Backup Wizard to create a backup template for that DB2 element. The following procedure takes place in the Backup, Archive, and Restore interface on the NetBackup for DB2 client.

▼ To create a backup template using the NetBackup for DB2 Backup Wizard

1. In the Backup, Archive and Restore interface, select the DB2 object(s) you want to back up.

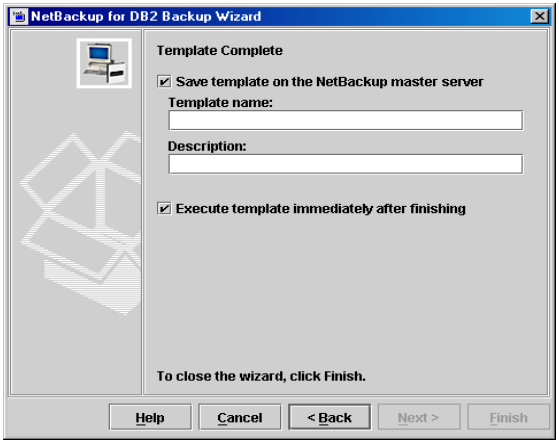
2. Click **Backup**.

   The NetBackup for DB2 Backup Wizard displays several screens where you will enter information about the backup operation you want to perform:

   - Welcome
   - Database Login
   - Initial Settings
   - Backup Options
   - Template Summary

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

3. When you have completed the wizard, the Template Complete screen displays. You can choose to save the template for later use, run the template immediately, or both.



   Click **Help** for details about saving and running the template you created.

   When you are satisfied with the template, click **Finish** to save, run, or save *and* run the template you created.

   When a backup template is run from the wizard, a full backup is performed.

Creating Shell Scripts Using bpdbsbdb2

bpdbsbdb2 is a NetBackup for DB2 command line utility used to initiate template based user-directed backup and recovery. This utility is also used to generate DB2 shell scripts from templates created by the Backup Wizard.

At the command prompt, type:

```
bpdbsbdb2 -backup -g <script file name> -t <template 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 bpdbsbdb2" on page 100.
-t *template name*	Identifies the template. bpdbsbdb2 will retrieve backup templates from a known location on the master server. Therefore, specify only the file name.

Caution It is the user's responsibility to review and customize any / all scripts generated from templates. Generated scripts are intended to be modified for the user's environment and preferences. For example, settings such as passwords or catalog partition numbers are not generated in the template to script conversion, and require manual intervention. In addition, generated scripts do not handle all possible error and failure cases, and should be used *at your own risk*.

Scripts generated for UNIX are intended to be executed by an authorized DB2 user or by root.

Script execution permissions should be reviewed and modified as desired by the user.

For security purposes, usernames and passwords are not included in generated scripts, and must be added if needed.

The DB2 QUIESCE command is generated when the **Disconnect users and prohibit access** template option is specified. However, this command will fail if your version is prior to DB2 V8.1.

When attempting a point-in-time restore, the time value must be customized. The command DB2 RESTORE ... TAKEN AT strictly interprets the specified time, and will succeed only if a backup image with the same time exists. See the DB2 Command Reference for details. (This limitation does not exist for templates, which search for an appropriate image.)

If a template enables roll-forward recovery, then roll-forward commands are generated for all partitions specified in the template, whether or not that partition is configured for roll-forward recovery.

If a script performs a roll-forward recovery, the `DB2NODE` variable must be customized. In single partition environments, this variable can typically be empty, for example, "`DB2NODE=`". In a multiple partition environment, this variable must be set to the catalog partition number.

Creating DB2 Scripts Manually

Note For more information on scripts, see the *DB2 Commands User's Guide*.

The following example scripts were included with the NetBackup for DB2 installation:

```
db2_backup
db2_restore
db2_all_backup_mpp
db2_all_restore_mpp
```

These scripts were provided as examples. They are installed in the following directory:

install_path`/netbackup/ext/db_ext/db2/scripts`

where *install_path* is `/usr/openv` by default.

Note Be sure to modify these scripts for your environment. Do not store your scripts in the sample directory, as they will be lost when upgrading or re-installing. Always relocate your scripts to a safe location. For clustered environments, this location must be available after a failover.

Although each script can have multiple DB2 commands operations, a separate script is required for each type of operation. For example, you need separate scripts for backups and restores.

Caution Always specify the correct script when configuring automatic backups or when starting operations through NetBackup. NetBackup for DB2 will not generate an error if a restore script is used for a backup operation or a backup script is used for a restore operation.

Instructions for Modifying Scripts

Note If you do not include an su - user (user is the DB2 instance account) in your scripts, they will not run with the proper permissions and environmental variables.

Note If you are using DB2 EEE, see "Creating DB2 Templates or Scripts for a DB2 EEE Environment" on page 148.

1. Copy the example scripts to a different directory on your client. This should be a safe location. In clustered environments, this location should be available after a failover.

2. Set the access permissions of these scripts to 775.

   `chmod 775` *script_name*

3. Modify the script

   a. Use a text editor such as vi to open the script.

   b. Follow the instructions in the script.

Note Test the scripts you just created by starting a manual backup of this policy as explained in "Testing NetBackup for DB2 Configuration Settings" on page 80.

Script Parameters

Parameters are necessary in DB2 template or scripts to enable the DB2 commands to perform backup and restore operations. The parameters can come from one of these sources:

- Environmental Variables
- NetBackup `bp.conf`
- NetBackup `db2.conf`

Parameters from these sources can be evaluated within the scripts. For example, the DB2_POLICY value is the name of the policy used to perform the backup.

For details, please see "Configuring the Run-Time Environment" on page 65.

Storing Templates and Scripts

Templates

The NetBackup for DB2 Backup Wizard saves a backup template to a NetBackup specific location on the current NetBackup master server. A backup template is retrieved from the master server as part of a backup (server-directed, scheduled, or user-directed) and is run on the client. A backup template is associated with a policy by specifying its name in the policy file or script list. Because backup templates are stored on the server in a known location, server directed and scheduled backups will use the same copy of the template for each client in the policy client list.

The NetBackup for DB2 Recovery Wizard saves a restore 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 DB2 Recovery Wizard" on page 96.

Templates store encrypted passwords that are decrypted at runtime.

Shell Scripts

DB2 scripts must reside on the NetBackup client. Backup scripts are associated with a policy by specifying the file name (including path) in the policy file or script list. This means that for server-directed or scheduled backups, 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 41.

The backup and recovery processes sometimes require passwords for DB2 database access and / or system user accounts.

Testing NetBackup for DB2 Configuration Settings

After configuring the master server for NetBackup for DB2, test the configuration settings. For a description of status codes, refer to the *NetBackup Troubleshooting Guide for UNIX and Windows*.

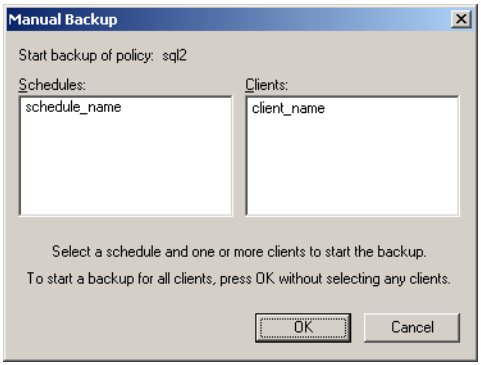
NetBackup Administration Console for Windows

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**.

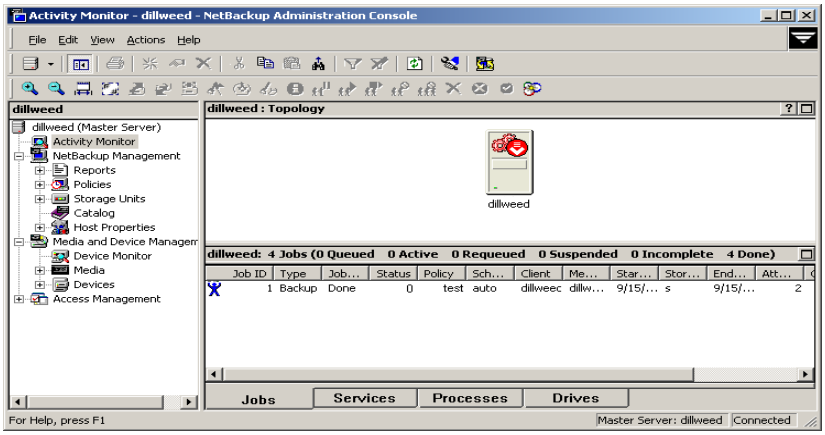
   The Manual Backup dialog is displayed.



   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.



If the manual backup does not exit with a successful status, refer to the Troubleshooting chapter.

NetBackup Administration Console for UNIX

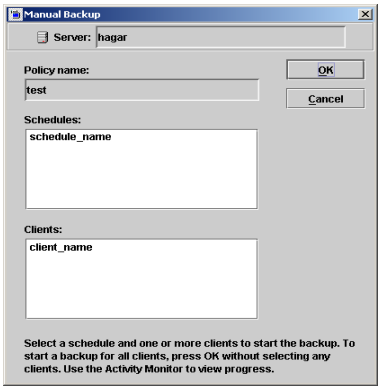
Use this procedure to test a policy configuration on the NetBackup Administration Console for UNIX.

▼ 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**.

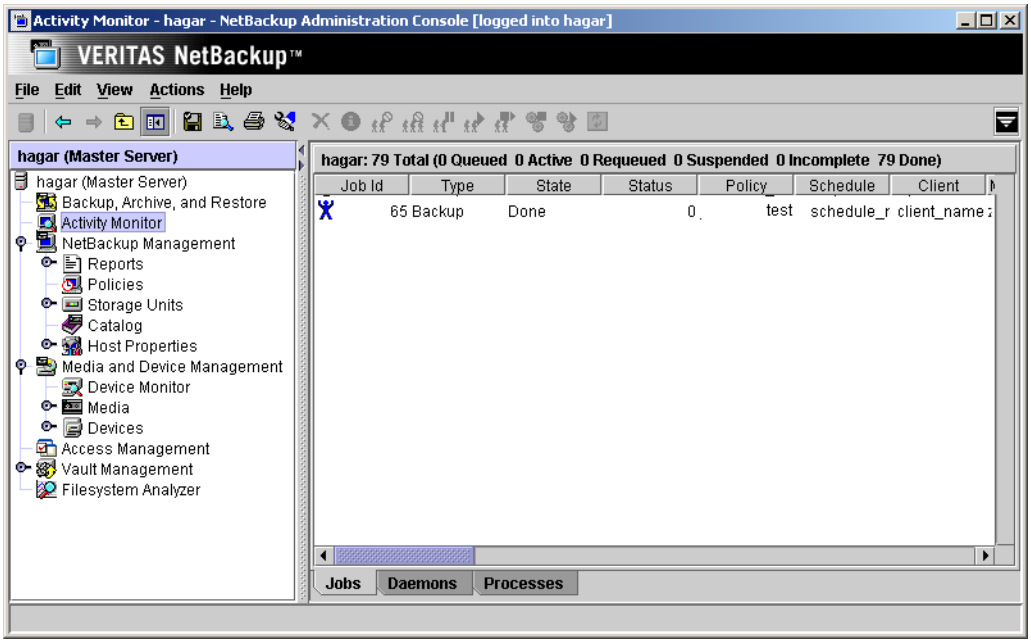
The Manual Backup dialog is displayed.



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.



If the manual backup does not exit with a successful status, refer to the Troubleshooting chapter.

Using NetBackup for DB2 4

When all installation and configuration is complete, you can start DB2 backups and restores through NetBackup or execute DB2 UDB commands directly.

This chapter contains the following sections:

- Performing a Backup
- Browsing Back Ups
- Performing a Restore

Caution Always specify the correct DB2 script or template when configuring automatic backups or when starting operations through NetBackup (see the Configuration chapter). NetBackup for DB2 will not generate an error if a restore DB2 script file is used for a backup operation or a backup DB2 template or script is used for a restore operation.

Performing a Backup

There are two types of DB2 backups: database and archive logs.

- A database backup is a copy of the entire database or tablespaces. This backup is accomplished by executing a DB2 `BACKUP DATABASE` command. A database backup can be initiated through NetBackup by an automatic backup of a DB2 policy, a manual backup of a DB2 policy, or a user-directed backup.
- An archive log backup is a backup of an archive log file for DB2. These backups are initiated by DB2 through a user exit program.

Performing a Backup from the NetBackup Master Server

Automatic Backup of a DB2 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 DB2 scripts run:

- In the same order as they appear in the file list
- On all clients listed in the client list

The DB2 scripts will start the database backup.

To add a new schedule or change an existing schedule for automatic backups, follow the guidelines given in the Configuration chapter.

When a backup template is run from a NetBackup schedule, the schedule determines the backup type (full, cumulative, or differential).

If an online backup of a partition is requested, the DB2 LOGRETAIN or USEREXIT setting must be enabled. If not, an offline partition backup will be attempted. An offline backup is also attempted if the database is in backup-pending mode.

If a table space backup is requested, the DB2 LOGRETAIN or USEREXIT setting must be enabled. If not, DB2 does not support offline tablespace backup, so template execution will fail.

For more information about templates, see “Running a NetBackup for DB2 Backup Template” on page 87.

Manual Backup of a DB2 Policy

The administrator on the master server can use the NetBackup administrator's interface to manually execute an Automatic Backup schedule for a DB2 policy. The instructions for doing this are the same as given in "Testing NetBackup for DB2 Configuration Settings" on page 80.

Refer to "Testing NetBackup for DB2 Configuration Settings" on page 80 for instructions on initiating a backup of a DB2 policy.

Performing a User-Directed Backup from the NetBackup for DB2 Client

Running a NetBackup for DB2 Backup Template

When executing a template, database partitions are processed sequentially, in the order listed in the template summary. All table spaces residing with the same partition are processed together. For example, if table space `T1` resides in partition `P1`, and table spaces `T2` and `T3` reside in partition `P2`, the processing order is:

1. Process table space `T1` in partition `P1`.
2. Process table spaces `T2` and `T3` in partition `P2`.

A failure in processing a request immediately stops the template execution. The error condition must be resolved before the template can be re-executed.

Except where noted, all DB2 warnings are treated as DB2 errors; they cause template execution to fail.

If the **Disconnect users and prohibit access** template option is selected, the DB2 `QUIESCE` command is attempted before performing the backup or restore. In versions prior to DB2 V8.1, this feature is not available and instead the **Abort if users are connected** option is enforced .

Users must have sufficient DB2 permissions to browse DB2 databases and perform backup, restore, and rollforward operations. Refer to the following DB2 database manager configuration settings: SYSADM, SYSCTRL, and SYSMAINT.

Using DB2 Template Administration

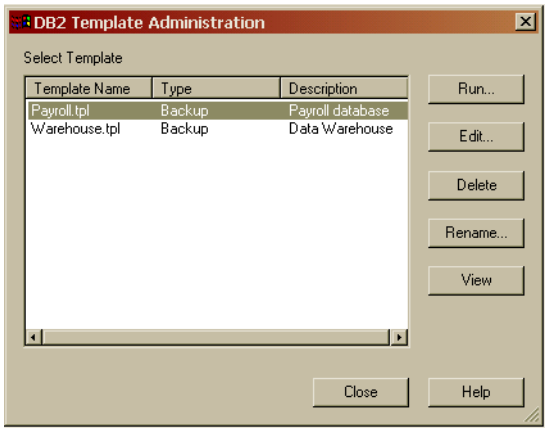
The DB2 Template Administration dialog is available in the NetBackup Backup, Archive, and Restore interface.

Use this dialog to run, edit, delete, rename, and view existing backup templates. These are the templates created by the NetBackup for DB2 Template Generation Wizard and stored in a pre-determined location on the master server. See "Creating a Backup Template Using the NetBackup for DB2 Backup Wizard" on page 72.

▼ To use DB2 Template Administration

1. In the Backup, Archive, and Restore interface, choose **Actions** > **Administer Templates** > **DB2**.

   The DB2 Template Administration window appears:

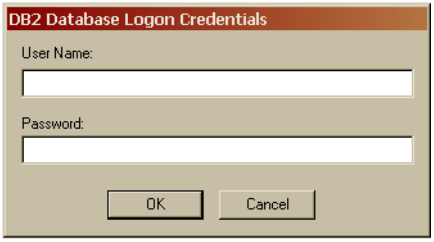


   The Select Template list shows the names and descriptions of the DB2 backup templates stored on the current master server.

2. Select the name of the backup template you wish to run.

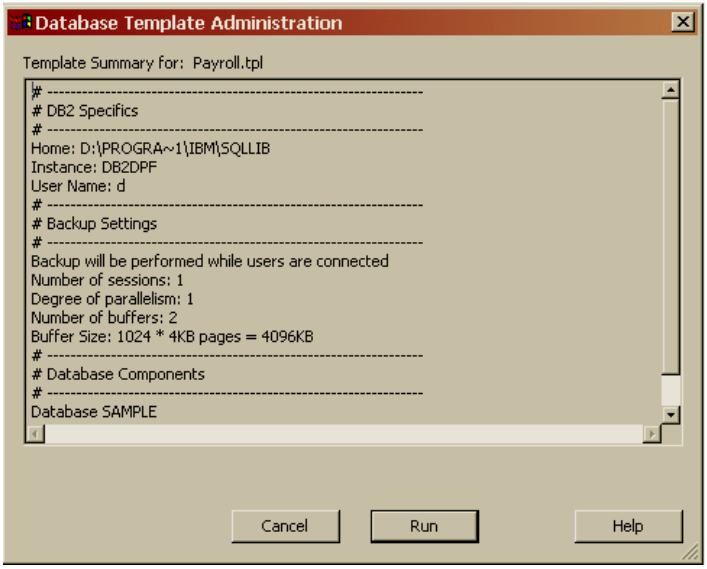
3. Click **Run**.

   The Run dialog displays:



4. Supply a **User name** and **Password**. Click **OK**.

A Template Summary window displays:



5. Click **Run**. The template will run a full backup. Incremental backups are only available through the NetBackup scheduler.

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

The DB2 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 template is loaded into the *NetBackup for DB2 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 bpdbsbdb2

The bpdbsbdb2 command allows you to run a backup template created by the NetBackup for DB2 Backup Wizard.

At the command prompt, type:

```
bpdbsbdb2 -backup -r -t <template name>
```

where -r runs a template and -t identifies the template.

For example:

```
bpdbsbdb2 -backup -r -t DB2_Mon_full.tpl
```

bpdbsbdb2 will retrieve backup templates from a pre-determined location on the master server. Therefore, specify only the file name.

Using DB2 to Perform a Backup

You can start a backup by executing the DB2 BACKUP DATABASE command from the command line on the client. For example:

For a Solaris or Linux client you would enter:

db2 backup database sample load /*install_path*/netbackup/bin/nbdb2.so

For an AIX or HP-UX client you would enter:

db2 backup database sample load /*install_path*/netbackup/bin/nbdb2.sl

Note that for a 64-bit DB2 instance, specify the pathname for the 64-bit library as follows.

For Solaris: nbdb2.so64

For AIX or HP-UX: nbdb2.sl64

Refer to the *IBM DB2 Universal Database Command Reference* for details on using the DB2 BACKUP DATABASE command.

Using xbp to Perform a Backup

Note xbp is not supported on AIX platforms.

The following describes how to use xbp to back up your database. Refer to the xbp man page and the online help in the interface for detailed instructions on using xbp to back up the database.

▼ To perform a backup using xbp

1. Log in as the DB2 administrator or as root.

   If you are already logged in under a different user account, use the `su -` command to change to the DB2 administrator.

2. Execute `xbp` on the client to which you want to backup a database.

   ***install_path*/netbackup/bin/xbp**

3. In the Directory to Search Box, type the path name of the location of the DB2 scripts. For example:

   ***install_path*/netbackup/ext/db_ext/*db2*/scripts/**

4. Choose **File** > **Browse File System for Backup Scripts**.

5. Select the backup script from the Files pane.

6. Choose **Backup** > **Backup Database Using Selected Scripts**. The xbp_confirm dialog displays.

7. Click **OK**.

   A NetBackup process called `bphdb` starts the DB2 script on the client.

8. View the status of the script execution.

   a. Choose **Backup** > **Report Progress Of Backup...**.

      The xbp_progress dialog displays.

   b. Select the log file for your backup.

      The Contents of Selected Log File pane displays only the status of the script execution. A status `=0` message indicates that the script was successfully completed. Go to Step 9 for a detailed status report. For a status other than 0, refer to the Troubleshooting section of this manual. For additional information, check the output of the script.

9. View the log file for the NetBackup operation.

   a. Change directories to the `bphdb` log directory.

      cd *install_path*/netbackup/logs/bphdb

   b. Open the log file with the tail option.

```
tail -f log.mmddyy
```

A `Backup completed SUCCESSFULLY` message indicates a successfully completed NetBackup operation.

Browsing Back Ups

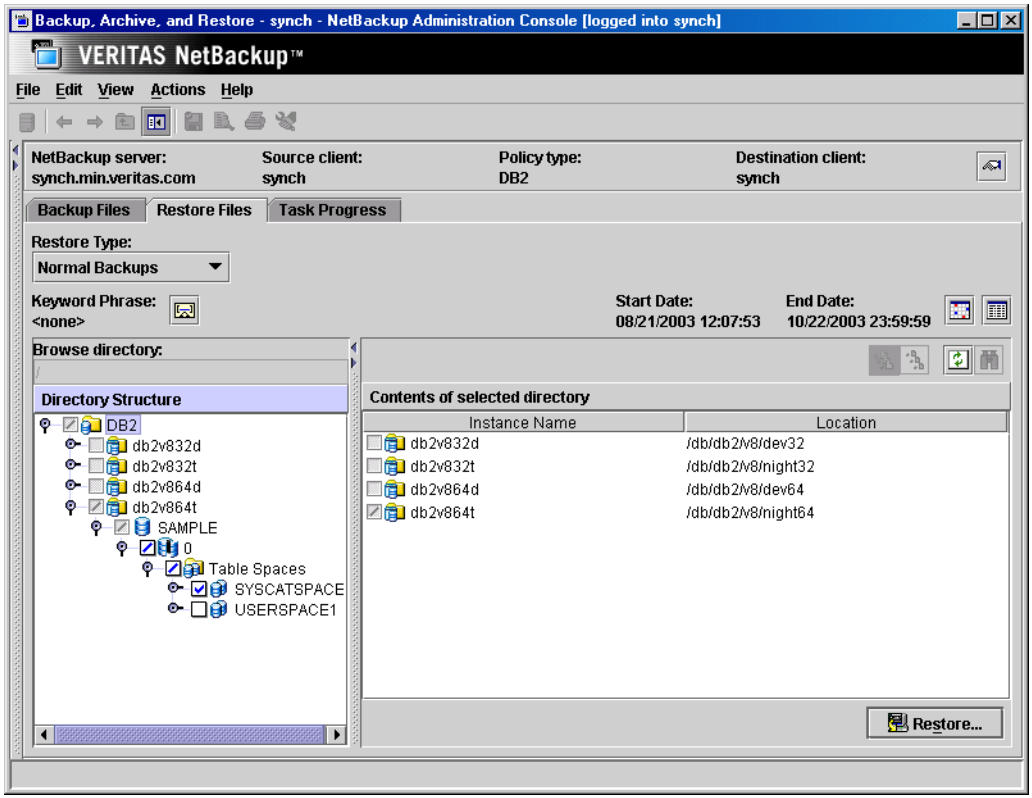
This section describes how to browse backup images. You can also use the `DB2 LIST HISTORY` command. For instructions on using this command, see the *IBM DB2 Universal Database Command Reference* manual.

Using Backup, Archive, and Restore to Browse

The Backup, Archive, and Restore interface displays the DB2 resource. You can browse the DB2 resource through four levels: instance, database, partition, and tablespace. You can view the containers in a tablespace, but you can only select for restore at the tablespace level or the partition level.

This interface does not currently allow browsing of previous backups. Instead, it browses the existing DB2 instances and databases. You can select these DB2 objects and use the NetBackup for DB2 Recovery Wizard to prepare recovery templates for the objects. See "Using the NetBackup for DB2 Recovery Wizard" on page 96. See "Using the NetBackup for DB2 Recovery Wizard" on page 85.

The following shows a sample restore window in the Backup, Archive, and Restore interface. In this example, the DB2 resource is expanded down to the table space level. You can select a tablespace or table spaces, a partition or partitions, or one entire database (by selecting all of its partitions) for the restore.



Using bplist to Browse

The following example uses `bplist` to search all DB2 backups (images) for the client named camel, which is also the master server. The information comes from the NetBackup catalog on the master server. The `-t 18` on this command specifies DB2 backup types. The `bplist` output shows the list of DB2 database backup images that are stored in the NetBackup database. See the NetBackup online help for more information on the `bplist` command.

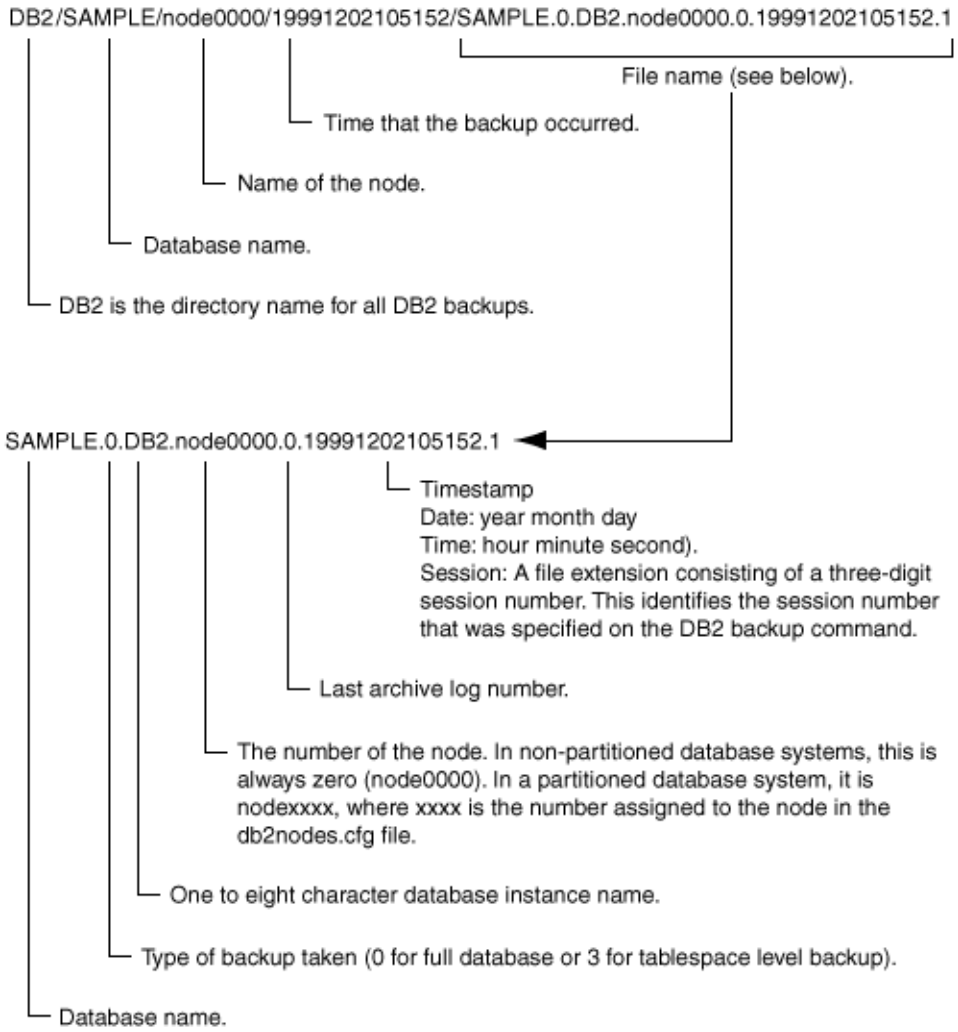
```
install_path/netbackup/bin/bplist -C camel -S camel -t 18 -R /
/DB2/SAMPLE/node0000/19991202105152/SAMPLE.0.DB2.node0000.0.19991202105152.1
/DB2/SAMPLE/node0000/19991202104734/SAMPLE.0.DB2.node0000.0.19991202104734.1
/DB2/SAMPLE/node0000/19991201171209/SAMPLE.0.DB2.node0000.0.19991201171209.1
/DB2/SAMPLE/node0000/19991129154117/SAMPLE.3.DB2.node0000.4.19991129154117.1
```

```
/DB2/SAMPLE/node0000/19991129142046/SAMPLE.0.DB2.node0000.0.19991129142046.1
```

The next example uses bplist to search for all DB2 archive log file backups. The -k DB2_Log_Policy specifies files backed up using this policy. The policy name originates from the settings in the db2.conf file for archive log files. The `bplist` output shows the list of DB2 archive log files stored in NetBackup.

```
install_path/NetBackup/bin/bplist -k DB2_Log_Policy -C camel -S camel -R /
/home/db2inst/NODE0000/SQL00001/SQLOGDIR/S0000026.LOG
/home/db2inst/NODE0000/SQL00001/SQLOGDIR/S0000025.LOG
/home/db2inst/NODE0000/SQL00001/SQLOGDIR/S0000024.LOG
```

The following diagram explains how to interpret one of the lines from the listing.



Using xbp to Browse

Note `xbp` is not supported on AIX platforms.

The following describes how to use `xbp` to browse your database backups. Refer to the xbp man page and the online help in the interface for detailed instructions on using `xbp` to browse database backups.

1. Log in as the DB2 administrator or as root.

   If a different user account is used, use the `su` command to change to the DB2 administrator.

2. Execute `xbp` on the client.

   ***install_path*/netbackup/bin/xbp**

   The xbp dialog is displayed.

3. From the **File** menu, click **Configuration**.

   The xbp_config dialog displays.

   a. In the Policy type of image to browse, specify the DB2 policy.

   b. Click **OK** to close the dialog.

   c. In the **Directory To Search Box**, enter / as the directory to search.

   d. Set the **Range of Dates** to include the date of your backup.

   e. Enter `9` in the **Directory Depth Box**.

   f. From the **File** menu, select **Browse Backups (Restore)**. A list of backup images appears in the dialog.

Performing a Restore

Executing the NetBackup for DB2 Template on the Client

Using the NetBackup for DB2 Recovery Wizard

NetBackup for DB2 includes a Recovery Wizard that solicits information from the user about the desired DB2 restore and recover operations. The wizard uses the information to create a template that can be used immediately or saved for later use.

The NetBackup for DB2 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 DB2 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 DB2 Backup and Recovery Guide for more information.

Starting the NetBackup Backup, Archive, and Restore Interface

The NetBackup for DB2 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 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 DB2 resource in the left pane to view a DB2 instance hierarchy. Select a node in the left pane to view details in the right pane.

DB2 Policy Type

Note that if the DB2 node is not visible, it's possible that your NetBackup for DB2 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 and Policy Type**.
2. On the Specify NetBackup Machines dialog, click the **Source client/Policy type** tab.
3. In the **Policy type** drop down list, select **DB2**.
4. Click **OK**.

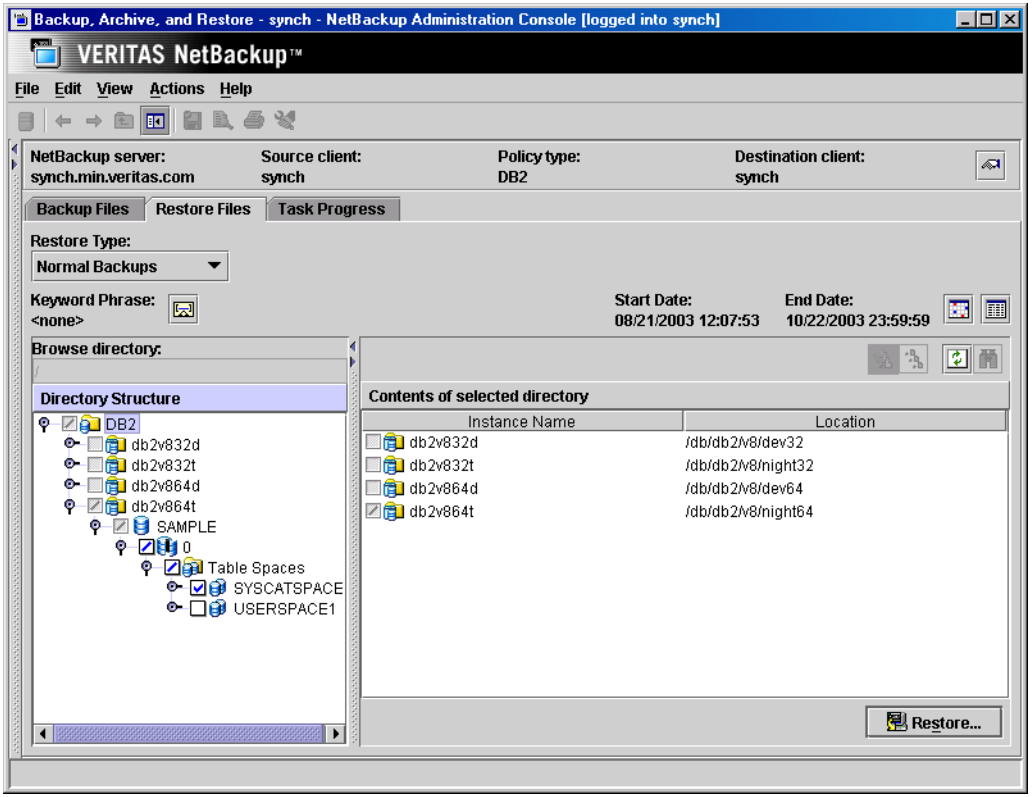
Using the Recovery Wizard

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, expand a DB2 instance and select the database object(s) you wish to restore.

2. Click **Restore**.

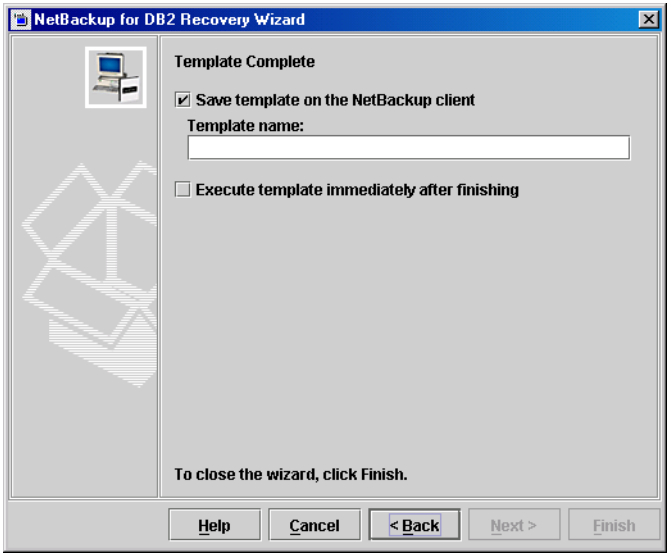


The NetBackup for DB2 Recovery Wizard displays several screens where you will enter information about the backup operation you want to perform:

- Welcome
- Database Login
- Time Periods
- Restore Options
- Recovery Options

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 Complete screen displays:



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**.

When executing a template, all restore operations are performed before any/all roll-forward operations.

Note When performing a DB2 restore, false alarms are reported in the NetBackup Activity Monitor. DB2 accesses the NetBackup image twice when performing a restore. The first access reads a partial image, which is reported as "The restore failed to recover the requested files" (status 5) in the Activity Monitor. The next access reads the entire image, which should result in a successful restore (status 0). The template execution status is the best indication of overall success, and not the activity monitor.

Caution The DB2 warning SQL2539W indicates that the requested restore operation will replace the existing database (existing database files will be deleted). When executing a template to perform a restore, this warning is logged and the restore proceeds without interruption.

The DB2 warning SQL2523W indicates that the backup image originates from a

different database of the same name. This is handled as an error, to prevent DB2 from deleting log files.

The DB2 error SQL1260N indicates that the restored partition is not configured for roll-forward recovery. If the template is configured to perform a roll-forward, this step is skipped.

Template execution does not currently support the use of local time when performing a rollforward. The roll-forward time specified in the template is passed to DB2, and is interpreted as GMT by DB2. See the `DB2 ROLLFORWARD` command reference for details.

Using `bpdbsbdb2`

The `bpdbsbdb2` command allows you to run a recovery template created by the NetBackup Recovery Wizard.

At the command line, type:

/*install_path*`/netbackup/bin/bpdbsbdb2 -restore -r -t <template name>`

where -r runs a template and -t identifies the template

For example:

bpdbsbdb2 -restore -r -t `/db2/restore_templates/full_restore.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.

For details about creating a script from a template using bpdbsbdb2, see "Creating Shell Scripts Using bpdbsbdb2" on page 76.

Using DB2 to Perform a Restore

The procedure for restoring a DB2 database depends on the database involved and the problems that you have on your system. See the *DB2 UDB Administration Guide Data Recovery and High Availability Guide* for a complete description of how to recover a DB2 database.

The following procedure shows how to restore our example database, SAMPLE, to the level of a recent database backup plus archive logs.

▼ To restore a database using DB2

1. Perform a user-directed restore by executing the DB2 `RESTORE DATABASE` command from the command line on the client:

   ```
   For a Solaris or Linux client you would enter:
   db2 restore database sample load /install_path/netbackup/bin/nbdb2.so

   For an AIX or HP-UX client you would enter:
   db2 restore database sample load /install_path/netbackup/bin/nbdb2.sl
   ```

   Refer to the *IBM DB2 Universal Database Command Reference* manual for details on using the DB2 `RESTORE DATABASE` command.

2. Browse and restore archive log.

   See "Using bplist to Browse" on page 91 in the previous section. Also follow the instructions in "Using ARCFUNC During Restore of Archive Log Files" on page 68.

3. Run the DB2 `ROLLFORWARD DATABASE` command. This brings the database back on-line. For example:

   ```
   db2 rollforward database sample to end of logs and stop
   ```

   For more information on this command, refer to the *IBM DB2 Universal Database Command Reference* manual.

Using xbp to Perform a Restore

The following describes how to use `xbp` to restore your database. Refer to the `xbp` man page and the online help in the interface for detailed instructions on using `xbp` to restore database backups.

▼ To use xbp to perform a restore

1. Log in as the DB2 administrator or as root.

   If a different user account is used, change the `su-` command to the DB2 administrator.

2. Execute `xbp` on the client to which you want to restore a database.

   ***install_path*/netbackup/bin/xbp**

3. In the Directory to Search Box, type in the path name of the location of the DB2 scripts. For example:

***install_path*/netbackup/ext/db_ext/*db2*/scripts/**

4. Choose **File** > **Browse File System for Restore Scripts**. The xbp dialog is displayed.

5. Select the restore script from the Files pane.

6. Choose **Restore** > **Restore Database Using Selected Scripts**. The xbp_confirm dialog is displayed.

7. Click **OK**.

   A NetBackup process called bphdb starts the DB2 script on the client.

8. View the status of the script execution.

   a. Choose **Restore** > **Report Progress Of Restore...**.

      The xbp_progress dialog is displayed.

   b. Select the log file for your restore.

      The Contents of Selected Log File pane displays only the status of the script execution. A status =0 message indicates that the script was successfully completed. Go to Step 9 for a detailed status report. For a status other than 0, refer to the Troubleshooting section of this manual.

9. View the log file for the NetBackup operation.

   a. Change directories to the bphdb log directory.

      cd /usr/openv/netbackup/logs/bphdb

   b. Open the log file with the tail option.

      tail -f log.*mmddyy*

A Restore completed SUCCESSFULLY message indicates a successfully completed NetBackup operation.

Using NetBackup for DB2 with SAP® 5

When a DB2 database is used by SAP software, NetBackup for DB2 can be used within that environment for backup and restore of SAP data. This chapter provides guidelines for using SAP, DB2, and NetBackup together.

This chapter contains the following sections:

- Installation of the DB2 User-Exit Program
- Backup and Restore of DB2 Databases
- Archive and Restore of DB2 Log Files
- Backup of SAP Files

Installation of the DB2 User-Exit Program

DB2 allows for the presence of a single user-exit program to manage archiving of database log files. Both SAP and NetBackup deliver user-exit programs for exclusive use by DB2. The user-exit program resides in the DB2 database directory as db2uext2.

Note The use of the NetBackup user-exit program is required, because it provides for automatic archiving of log files to tape and on-demand recovery of log files by DB2.

Take precautions when installing SAP to prevent overwriting the NetBackup user-exit program. Always preserve the NetBackup db2uext2 file before installing SAP, and restore afterwards.

Backup and Restore of DB2 Databases

Follow the standard NetBackup instructions in this document for backup and restore of the DB2 database(s) used by SAP. You may use either DB2 or NetBackup to initiate database backups and restores.

Caution *Do not* use `SAP CCMS`, `sapdba`, `brbackup`, or `brrestore` commands to initiate backups or restores. They will not invoke NetBackup.

Caution Also, SAP must not be running when attempting to restore the database.

Archive and Restore of DB2 Log Files

Follow the standard NetBackup instructions in this document for configuring the user-exit program. DB2 will automatically invoke the user-exit program to archive and recover the necessary log files.

Caution DO NOT use `SAP CCMS`, `sapdba`, `brarchive` commands, or the SAP Logfile Management window in the DB2 Control Center for log file archival. They are dependent upon the SAP `user-exit` program for proper operation.

Backup of SAP Files

Be certain to include any / all SAP files when planning for SAP recovery, not just the DB2 database. For instance, any regular files used by SAP can be backed up using standard NetBackup file backup procedures. For file backup instructions, consult the “Performing Backups” section in the NetBackup Backup, Archive, and Restore online help.

NetBackup for DB2 with Advanced Client 6

This chapter explains how to use NetBackup for DB2 with NetBackup Advanced Client to perform snapshot backups backups of your DB2 database.

To use NetBackup for DB2 with Advanced Client, you must have both NetBackup Advanced Client and NetBackup for DB2 licensed and installed.

The chapter provides information on the following topics:

- Installation and Licensing Requirements
- NetBackup for DB2 with Advanced Client Overview
- How Does NetBackup for DB2 with Advanced Client Work?
- Configuring a Snapshot Backup
- Using NetBackup for DB2 with Advanced Client

Installation and Licensing Requirements

To use NetBackup for DB2 with Advanced Client, you must have the following licensed and installed:

- NetBackup for DB2 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 DB2 with Advanced Client Overview

NetBackup for DB2, when used in conjunction with NetBackup Advanced Client, can back up and restore DB2 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.

Advanced Client Features

The following NetBackup Advanced Client features are available for use with NetBackup for DB2:

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 processingonto 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.

Proxy Method

Proxy method describes a special type of backup in which DB2 turns over control of the data transfer to the NetBackup for DB2 Agent. During DB2 backup and restore operations, a proxy method enables NetBackup for DB2 to manage the entire data movement between the disks containing DB2 datafiles and the storage devices managed by NetBackup.

With a proxy method, NetBackup for DB2 obtains a list of files to back up through a DB2 API. NetBackup for DB2 Agent makes all decisions regarding how the data is moved and when to move the data.

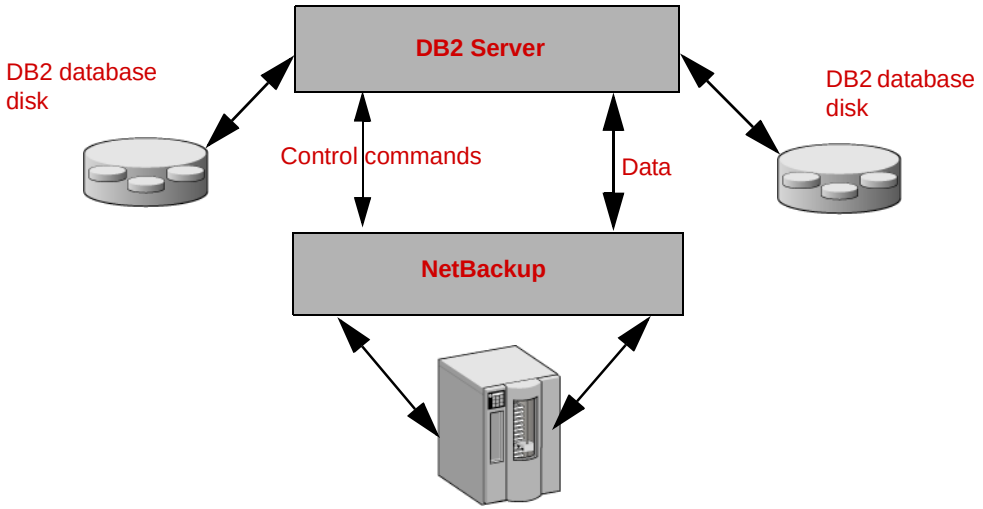
Stream-Based Operations vs. File-Based Operations

Standard NetBackup for DB2 backups and restores are stream-based. NetBackup for DB2 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 backups and restores where NetBackup moves the data provided by the DB2 server process. NetBackup simply captures the data stream content provided by DB2 commands. If the user has specified multiple streams, then DB2 commands opens multiple streams that NetBackup catalogs as separate images.

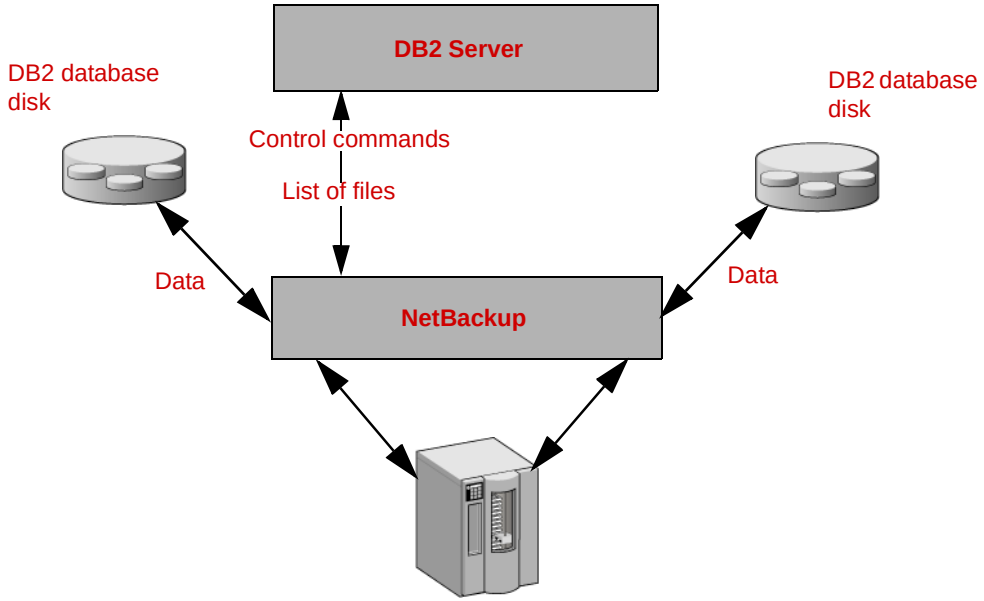
NetBackup for DB2 stream-based backup or restore



File-Based Operations

In a file-based operation, NetBackup obtains a list of files requiring backup or restore through a DB2 API. NetBackup for DB2 with Advanced Client performs the actual data movement.

NetBackup for DB2 with Advanced Client file-based backup or restore



How Does NetBackup for DB2 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 DB2 policy. The template or shell script specifies objects or commands that will be used to perform the backup or restore on the client. And Advanced Client backup of DB2 can also be initiated with the `bpdb2proxy` command.

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 DB2 files and uses the NetBackup Advanced Client interface to perform the actual data movement.

The NetBackup for DB2 agent uses DB2 APIs to put the data files into quiesce / write suspend mode. NetBackup then creates a snapshot of the files. Once the snapshot has been created, NetBackup for DB2 uses the DB2 APIs to take the data files out of quiesce / write suspend mode. The data files being backed up are quiesce / write suspend mode only for the period of time it takes to create a snapshot of the data.

Sequence of Operation: Backup

For a backup operation, the NetBackup for DB2 agent performs the following steps:

1. Maps the DB2 logical identifiers into physical file locations.
2. Suspends write activity to the data files (quiesces the database).
3. Uses the Advanced Client method to create a snapshot image of the mapped files.
4. Enables DB2 write activity (unquiesces the database).
5. Backs up the snapshot image of the data files.

Sequence of Operation: Restore

For a restore operation, the NetBackup for DB2 agent performs the following steps:

1. Using the DB2 database and a point in time, locates the correct physical backup images.
2. Disconnects all users from the database (brings the database offline).
3. Restores the images to the original database.

4. Reruns the transactions from the log files.

5. Enables user connections to the database (brings the database online).

Database Objects Supported by Advanced Backup Methods

Currently, DB2 allows proxy method backups of databases, tablespaces, and datafiles at the node level. As a result, NetBackup can use file-based Advanced Client backup methods to back up these objects.

For archived redo logs, DB2 performs only conventional stream-based backups. This means that NetBackup for DB2 must use stream-based backups for 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 NetBackup for DB2 with Advanced Client backups, be sure to configure policies that will allow both kinds of backups. See "Types of Backups" on page 122 and "Schedule Properties" on page 122 for details.

Multistreaming

The number of proxy copy backup streams to be started is controlled by the `-s` option on the `bpdb2proxy` command or the sessions parameter in the Backup Options screen of the Backup Wizard. NetBackup for DB2 splits the files into a number of groups as specified by either of these parameters, based on file size. NetBackup for DB2 attempts to create streams of equal size.

Symbolic Links

NetBackup for DB2 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.

Example: Using Multiple Channels for a DB2 Command with Proxy Method

This NetBackup for DB2 sample command initiates a database backup on a per-node basis, which includes the archived logs. The agent splits the files into 3 streams and initiates a file-based backup for each stream. After the proxy backup is done, DB2 starts a non-proxy conventional backup of the archived logs.

```
bpdb2proxy -backup -d sample -s 3 -n 0
```

Note This command must be performed for each node of the database.

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.*

Before configuring a policy for alternate client backups, make sure the following have been done:

- For the FlashSnap and VVR snapshot methods, VxVM 3.2 or later (for UNIX) or VxVM 3.1 or later (Windows) must be installed and volumes configured over the primary host's disks. The VxVM FlashSnap or VVR license must also be installed.
- The user and group identification numbers (UIDs and GIDs) associated with the files to be backed up must be available to both hosts (the primary client and the alternate backup client).
- The primary and alternate clients must be running the same operating system, volume manager, and file system. For each of these I/O system components, the alternate client must be at the same level as the primary client, or higher level. For supported configurations, see the *NetBackup Advanced Client System Administrator's Guide.*

For a description of snapshot methods available for use with NetBackup for DB2, 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 archived 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 DB2 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 for alternate client backups and notes on the NetBackup Media Server and Third Party Copy Device backup methods.

Configuring a DB2 Policy with Advanced Client Backup Methods

This section explains what is necessary to configure snapshot and instant recovery backups for a DB2 policy. For detailed instructions on configuring a DB2 policy refer to "Configuring a NetBackup Policy" on page 31.

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 policy types to perform file-based and stream-based backups in order to ensure that the entire database can be successfully restored.

To configure DB2 snapshot or instant recovery backups a user needs to configure:

- A DB2-type policy with the following attributes:
  - Snapshot methods for file systems 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
- A Standard type policy to perform a stream-based backup of archived logs. Note that DB2 does not support proxy backups of database archived logs. These files are backed up using standard user-exit operations.

For details on policy attributes that differ for a NetBackup for DB2 with Advanced Client policy, see the following sections:

- "Types of Backups" on page 122
- "Schedule Properties" on page 122
- "Templates and Scripts" on page 123

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

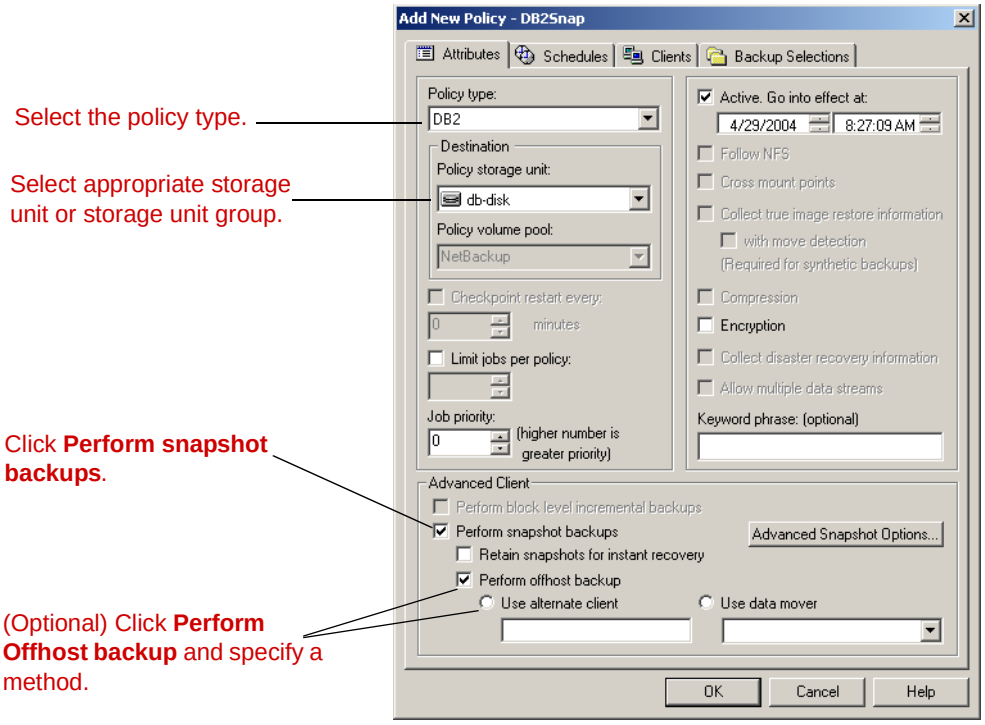
The following type of offhost backup method can be configured:

- alternate client

▼ 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 DB2 policy type.

4. Select a **Policy storage unit**.



Any_available is not supported for 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 120.

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.

   See "Types of Backups" on page 122 for information on how these schedules differ for an DB2 policy that supports Advanced Client methods. See "Schedule Properties" on page 122 for an explanation on how the properties differ for a schedule that supports Advanced Client methods.

8. Optional: If you wish to reduce the processing load on the client, perform the following steps:

   a. The alternate client must be the client that shares the disk array. This option may require additional configuration. Refer to the *NetBackup Advanced Client System Administrator's Guide*.

   b. Select **Perform offhost backup**.

   c. Click **Use alternate client** and enter the name of the alternate client.

Note **Use data mover** is not a supported option for NetBackup for DB2.

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 27 for details on adding clients to a policy.

   Note that for NetBackup 5.1, it is no longer possible to configure a snapshot method on a per-policy, per client basis. Snapshot options are applied to all clients controlled by that policy.

10. Use the **Backup Selections** tab to enter the template or script.

See "Templates and Scripts" on page 123 for information about using templates and scripts with a NetBackup for DB2 with Advanced Client policy.

11. Configure other attributes and add any further desired schedules. Refer to "Configuration" on page 27 for more information.

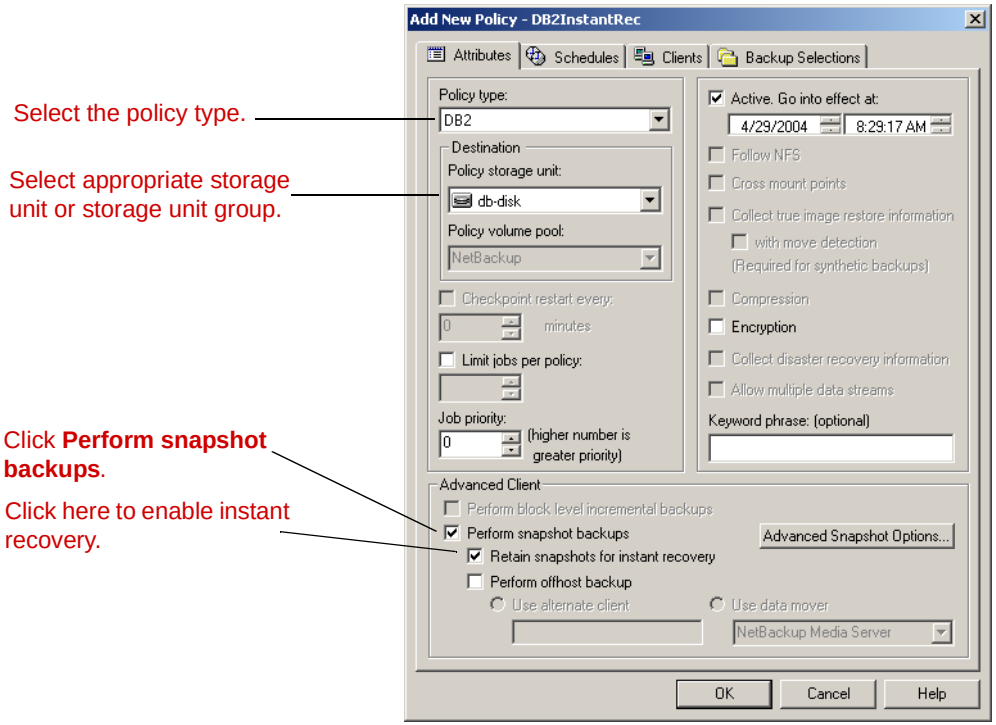
For instant recovery, configure an DB2 policy for snapshot backup as described in the above procedure. Additional configuration for instant recovery is described in the following procedure.

▼ To configure a policy for instant recovery

1. Open the policy you wish to configure.

2. Click on the **Attributes** tab.

3. Select the DB2 policy type.



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 122 for information on how these schedules differ for an DB2 policy that supports Advanced Client methods. See "Schedule Properties" on page 122 for an explanation on how the properties differ for a schedule that supports Advanced Client methods.

   b. Optional: 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.

Types of Backups

The Backup Types available on the **Schedules** tab of the policy play a different role for NetBackup for DB2 with Advanced Client backups.

Description of Backup Types for DB2

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 as your offhost backup method, you must override the policy storage unit by specifying a locally attached storage unit for the Application Backup schedule.
Automatic Full Backup, Automatic Differential Incremental Backup, Automatic Cumulative Incremental Backup	For file-based proxy method backups, the Automatic backup schedule types serve two purposes: ◆ Automatic backup schedules automatically start the backups by running the NetBackup for DB2 scripts or templates. ◆ Automatic backup schedules perform the actual file-based snapshot backups of the database objects. **Note** Selecting any of the Automatic backup schedule 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 DB2 backups are described in "Schedule Properties" on page 39.

Description of Schedule Properties

Property	Description
Retention	**Frequency based scheduling** For proxy backups, NetBackup for DB2 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** For proxy backups, NetBackup for DB2 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	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 DB2 Template Generation wizard to perform NetBackup for DB2 with Advanced Client backups. Once created, templates are stored on the NetBackup master server and are available for use by other NetBackup for DB2 clients. See "Creating Templates and Shell Scripts" on page 71 for details on creating a backup template.

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 DB2 `bpdb2proxy` command in the script to enable the advanced backup method.

Using NetBackup for DB2 with Advanced Client

Once configuration is complete, performing NetBackup for DB2 with Advanced Client backups and restores is similar to regular NetBackup for DB2 operations. Differences are highlighted in the following sections.

Performing Backups

There are three ways to perform NetBackup for DB2 backups with Advanced Client:

- server-directed, automatic and scheduled from the master server
- user-directed, via template creation and execution on the client
- user-directed, from the command line as a DB2 user (with the `bpdb2proxy` command)

Note All three of these methods require a DB2 policy with Advanced Client configuration.

Server-Directed Backups

The configuration procedures in this chapter describe the process for configuring policies for DB2 backups with Advanced Client. See "Configuring a DB2 Policy with Advanced Client Backup Methods" on page 116. These policies will result in Advanced Client backups for the DB2 database.

User-Directed Backups Using Templates

To perform a backup from the Backup, Archive, and Restore interface, you can run a template through DB2 Template Administration (by clicking **Actions**>**Administer Templates**>**DB2**). You can also create a new template using the DB2 Backup Wizard, and run the template from the Template Complete screen.

The backup that results from the template will be an Advanced Client backup if the policy for the client is configured for Advanced Client methods. The policy can be specified in the `DB2.conf` file on the client. You can also specify the policy by adding the client to that policy on the master server.

User-Directed Backups Using bpdb2proxy

Use the `bpdb2proxy` command to perform an Advanced Client backup of your DB2 database from the command line. You must be the DB2 user to use the `bpdb2proxy` command. For backups, specify the `-backup` option with `bpdb2proxy`.

The following is the syntax for using `bpdb2proxy` to back up a DB2 database with an Advanced Client method:

```
bpdb2proxy -backup -d<DBALIAS> -u<USER> -p<PASSWORD>
```

For UNIX, -u and -p are optional.

The following options are also available:

-s	specifies session
-n	specifies node (default is 0)

Performing Restores

Perform NetBackup for DB2 Advanced Client restores from the DB2 client. There are two methods available for restoring an Advanced Client backup of a DB2 database:

- user-directed, via template creation and execution on the client
- user-directed, from the command line as a DB2 user (with the `bpdb2proxy` command)

User-Directed Restores Using Templates

To perform a restore from the Backup, Archive, and Restore interface, use the NetBackup for DB2 Restore Wizard to select the files you want to restore and the parameters for the restore. If the backup image in the catalog was created with Advanced Client methods, the restore will use Advanced Client methods.

User-Directed Restores Using bpdb2proxy

Use the `bpdb2proxy` command to perform an Advanced Client restore of your DB2 database from the command line. You must be the DB2 user to use the `bpdb2proxy` command. For restores, specify the `-restore` option with `bpdb2proxy`.

Note The backup image you restore with `bpdb2proxy` must be from an Advanced Client method backup, otherwise, the restore will fail.

The following is the syntax for using `bpdb2proxy` to restore a DB2 database with an Advanced Client method:

```
bpdb2proxy -restore -d<DBALIAS> -u<USER> -p<PASSWORD>
```

For UNIX, -u and -p are optional.

The following options are also available:

-s	specifies session
-n	specifies node (default is 0)
-t	specifies time of backup (mm/dd/yyyy[HH:MM:SS])

Troubleshooting 7

NetBackup, NetBackup for DB2 on UNIX, and the DB2 commands all provide reports on database operations. These reports are useful for finding errors associated with those applications.

This chapter presents the following topics:

- NetBackup Reports
- Setting the Debug Level
- Preventing Timeout Failures on Large Database Restores
- Using NET_BUFFER_SZ to Speed Up a Slow Restore
- False Restore Failures Reported in the Activity Monitor
- Reason Code

NetBackup Reports

The NetBackup server and client software allow you to set up detailed debug logs for troubleshooting problems that occur outside of either NetBackup for DB2 on UNIX or the DB2 commands. 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 DB2 commands, unless those errors also affect NetBackup for DB2. DB2 may (or may not) use the NetBackup for DB2 logs for errors in the application. Your best sources for DB2 error information are the logs provided by DB2.

Note In general, each debug log corresponds to a NetBackup process and executable.

▼ To enable the NetBackup for DB2 on UNIX logs

1. Create the following directories on the client:

   install_path/netbackup/logs/bphdb
   install_path/netbackup/logs/bpdb2

   ```
   % cd install_path/netbackup/logs/
   % mkdir bphdb
   % mkdir bpdb2
   ```

   For 64-bit, create:

   install_path/netbackup/logs/bpdb264

   ```
   % cd install_path/netbackup/logs
   % mkdir bphdb
   % mkdir bpdb264
   ```

2. Set the access permissions to 777 on these log directories.

   ```
   % chmod 777 bphdb
   % chmod 777 bpdb2
   ```

   For 64-bit:

   ```
   % chmod 777 bpdb264
   ```

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.

db2_stdout.*mmddyy*

Unless redirected elsewhere, NetBackup places DB2 script output in this file.

db2_stderr.*mmddyy*

Unless redirected elsewhere, NetBackup places DB2 script errors in this file.

log.*mmddyy*

bphdb is the NetBackup Database Backup binary. This log contains debugging information for the bphdb process. NetBackup for DB2 on UNIX uses this client process for DB2 script execution. It is invoked when an automatic backup schedule is executed.

bpdb2 Directory on the Client

The *install_path*/netbackup/logs/bpdb2 directory contains the following execution log.

log.*mmddyy*

This log contains debugging information and execution status for the DB2 NetBackup client processes linked to the library program provided with NetBackup for DB2 on UNIX.

install_path/netbackup/logs/

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.

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
```

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.

Using NET_BUFFER_SZ to Speed Up a Slow Restore

When the restore is slow you can speed it up by creating a file in the NetBackup install , /NET_BUFFER_SZ, on the NetBackup master server. In the file, add the size of the socket you want to set in number of bytes. For example, 32768 bytes = 32K.

Note This only applies when the NetBackup master server is a UNIX machine.

False Restore Failures Reported in the Activity Monitor

In some restore scenarios reports a successful restore status while the NetBackup Activity Monitor reports failures. When performing a restore, DB2 may read a portion of a backup image and not the entire image. For example, an incremental image is read once to obtain information for performing an automatic restore, and read again to actually restore data.

The first access is discontinued by DB2 before reading the entire image, which is reported as an error in the NetBackup Activity Monitor. Later, DB2 reads the entire image for restoring. An error reported in the Activity Monitor does not necessarily indicate a failed restore. Users should consult the status reported by DB2, and respond accordingly.

Reason Code

The following reason code can occur while accessing the NetBackup shared library during the processing of a DB2 database utility `BACKUP` or `RESTORE`. Refer to the log files for more detail information about an error message.

1

Message (from DB2):

SQL2071N An error occurred while accessing the shared library "`/incorrect/path/nbdb2.so`". Reason code: "1".

Cause:

The vendor library cannot be found or accessed.

Action:

Verify that the correct path is specified, and that the vendor library exists and has the correct file access permissions.

2

Message (from DB2):

SQL2071N An error occurred while accessing the shared library "`/usr/openv/netbackup/bin/nbdb2.s0`". Reason code: "2".

Cause:

Specified the 32-bit vendor library for a 64-bit instance, or vice versa.

Action:

Use the 32-bit vendor library on 32-bit instances, and the 64-bit library on 64-bit instances.

300

Message:

```
ERR - No match for a database image file was found based on
the following criteria.
```

Cause:

The restore criteria of database name, instance, type, and backup time object can not be found in the NetBackup database.

Action:

Make sure the image you are trying to restore exist by using `bplist` to list it.

Make sure the correct instance is being used.

Make sure the correct values are set in `db2.conf` and `bp.conf`.

If logging is turned on, check the current log file in *`install_path`*`/netbackup/logs/bpdb2` directory for more information.

305

Message:

```
ERR - found more than one object.
```

Cause:

More than one DB2 backup images were found in the NetBackup database that matched the restore criteria of database name, instance, type and backup time.

Action:

This should not happen under normal operation.

If logging is turned on, check the current log file in *`install_path`*`/netbackup/logs/bpdb2` directory for more information.

310

Message:

```
ERR - bp.config failed with <%d> status.
```

Cause:

Unable to read configuration file *`install_path`*`/NetBackup/bp.conf`.

Action:

Make sure this file exists and is properly configured.

If logging is turned on, check the current log file in *`install_path`*`/netbackup/logs/bpdb2` directory for more information.

330

Message:

```
ERR - Invalid options encountered for action %s.
```

Cause:

Invalid option(s) encountered for the action. The %s is for a string that will be inserted according to the error condition.

Action:

Make sure the action parameters are used properly.

335

Message:

```
ERR - in get DB2 UDB level.
```

Cause:

NetBackup server and NetBackup DB2 shared library are not the same level.

Action:

Make sure NetBackup and DB2 shared library are the same level. Check the log file in *install_path*/netbackup/logs/bpdb2 directory for the version number of the shared library and the version number for NetBackup. If they are not the same, you will need to install the same level.

380

Message:

```
ERR - db2.conf read status error <%d>.
```

Cause:

db2.conf read status error.

Action:

Make sure the directory is accessible with read and write permissions. Also make sure the file exists and has read permission.

385

Message:

```
ERR - Found multiple <DATABASE> entries before an <ENDOPER>
entries was encountered.
```

Cause:

Found multiple DATABASE entries before an ENDOPER entries was encountered in the *$DB2_Instance_Home*/db2.conf file.

Action:

Remove the extra DATABASE entry.

390

Message:

```
ERR - Found multiple <OBJECTTYPE> entries before an
<ENDOPER> entries was encountered.
```

Cause:

Found multiple OBJECTTYPE entries before an ENDOPER entries was encountered in the *$DB2_Instance_Home*/db2.conf file.

Action:

Remove the extra OBJECTTYPE entry.

395

Message:

```
ERR - Found multiple <POLICY> entries before an <ENDOPER>
entries was encountered.
```

Cause:

Found multiple POLICY entries before an ENDOPER entries was encountered in the *$DB2_Instance_Home*/db2.conf file.

Action:

Remove the extra POLICY entry.

400

Message:

```
ERR - Found multiple <SCHEDULE> entries before an <ENDOPER>
entries was encountered.
```

Cause:

Found multiple SCHEDULE entries before an ENDOPER entries was encountered in the *$DB2_Instance_Home*/db2.conf file.

Action:

Remove the extra SCHEDULE entry.

405

Message:

```
ERR - Found multiple <ARCFUNC>entries before an <ENDOPER>
entries was encountered.
```

Cause:

Found multiple ARCFUNC entries before an ENDOPER entries was encountered in the *$DB2_Instance_Home*/`db2.conf` file.

Action:

Remove the extra ARCFUNC entry.

410

Message:

```
ERR - Found multiple <ARCDIR> entries before an <ENDOPER>
entries was encountered.
```

Cause:

Found multiple ARCDIR entries before an ENDOPER entries was encountered in the *$DB2_Instance_Home*/`db2.conf` file.

Action:

Remove the extra ARCDIR entry.

415

Message:

```
ERR - Found multiple <RETDIR> entries before an <ENDOPER>
entries was encountered.
```

Cause:

Found multiple RETDIR entries before an ENDOPER entries was encountered in the *$DB2_Instance_Home*/`db2.conf` file.

Action:

Remove the extra RETDIR entry.

420

Message:

```
ERR - need to specify a valid POLICY or SCHEDULE in db2.conf
for <DATABASE %s> and <OBJECTTYPE %s>.
```

Cause:

Policy name or schedule name is not specified in the POLICY SHEDULE entry in the *$DB2_Instance_Home*/`db2.conf` file.

Action:

Add an appropriate policy name or schedule name to the POLICY or SCHEDULE entry.

425

Message:

```
ERR - need to specify a valid ARCDIR in db2.conf: Errno = %d
: %s.
```

Cause:

Invalid ARCDIR is specified in `db2.conf`.

Action:

Add an appropriate directory name to the ARCDIR entry.

430

Message:

```
ERR - ARCDIR field needs to be specified in the db2.conf
file.
```

Cause:

No ARCDIR entry found in the *$DB2_Instance_Home*/`db2.conf` file.

Action:

Add ARCDIR field to the *$DB2_Instance_Home*/`db2.conf` file with an appropriate directory name as a parameter.

435

Message:

```
ERR - RETDIR field needs to contain a valid file when
OBJECTTYPE is equal to ARCHIVE: %s.
```

Cause:

RETDIR field does not contain a valid file.

Action:

RETDIR field needs to contain a valid file when OBJECTTYPE is equal to ARCHIVE in the *$DB2_Instance_Home*/`db2.conf` file.

440

Message:

```
ERR - COPY or SAVE needs to be specified for ARCFUNC when
OBJECTTYPE is equal to ARCHIVE.
```

Cause:

Found OBJECTTYPE equal to ARCHIVE but no ARCFUNC is found in the `db2.conf` file.

Action:

Need to specify a copy or save parameter for ARCFUNC when OBJECTYPE is equal to ARCHIVE.

445

Message:

```
ERR - Invalid <OBJECTTYPE> entries: <%s>.
```

Cause:

Invalid OBJECTTYPE entry in the *$DB2_Instance_Home*/`db2.conf` file.

Action:

Add the appropriate object type to the *$DB2_Instance_Home*/`db2.conf` file.

450

Message:

```
ERR - OBJECTTYPE entry needs to be specified.
```

Cause:

OBJECTTYPE entry is not specified in the *$DB2_Instance_Home*/`db2.conf` file.

Action:

Add the appropriate object type to the *$DB2_Instance_Home*/`db2.conf` file.

455

Message:

`ERR - POLICY entry needs to be specified.`

Cause:

POLICY entry is not specified in the *$DB2_Instance_Home*/`db2.conf` file.

Action:

Add the appropriate policy name to the POLICY entry in the *$DB2_Instance_Home*/`db2.conf` file.

502

Message:

NetBackup DB2 Handle Invalid

Cause:

Internal communication between DB2 and NetBackup has failed.

505

Message:

The input parameters supplied by DB2 are not valid.

Cause:

This may result from using an unsupported version of DB2

507

Message:

NetBackup Initialize Failed

Cause:

NetBackup encountered errors in preparing for the requested operation. This may result from improper configuration.

510

Message:

NetBackup Read Config Failed

Cause:

NetBackup encountered errors in reading configuration settings.

Action:

Check that the NetBackup client & server settings have been configured, and that the `db2.conf` file exists and has been configured.

511

Message:

NetBackup Write Config Failed

Cause:

NetBackup encountered errors in preparing for the requested operation. This may result from improper configuration.

513

Message:

NetBackup Begin Action Failed

Cause:

NetBackup encountered errors when attempting to start the requested operation. This may indicate a problem in obtaining necessary resources.

514

Message:

NetBackup Create Image Failed

Cause:

NetBackup encountered errors when attempting to create a backup image.

515

Message:

NetBackup Get Image Failed

Cause:

NetBackup encountered errors when attempting to access a backup image.

516

Message:

NetBackup Find Image Failed

Cause:

NetBackup encountered errors when attempting to locate a backup image.

518

Message:

NetBackup Write Failed

Cause:

NetBackup encountered errors when writing a backup image.

520

Message:

NetBackup Read Failed

Cause:

NetBackup encountered errors when reading a backup image

523

Message:

NetBackup Commit Data Failed

Cause:

NetBackup encountered errors when attempting to close the backup image.

524

Message:

NetBackup Commit Action Failed

Cause:

NetBackup encountered errors when attempting to complete the requested operation.

526

Message:

NetBackup Abort Action Failed

Cause:

NetBackup encountered errors when attempting to abort the previously requested operation.

528

Message:

NetBackup Delete Image Failed

Cause:

NetBackup encountered errors when attempting to expire an incomplete backup image. This typically indicates the previous operation has failed, and DB2 is attempting to delete any incomplete image.

Configuration for a DB2 EEE (DPF) Environment

A

This appendix contains instructions for configuring NetBackup for DB2 in an Extended-Enterprise Edition (EEE) or Database Partitioning Feature (DPF) environment. In this appendix, all instructions that refer to an EEE environment are also applicable for a DPF environment.

The following is the configuration procedure.

1. Configure media.

   The instructions for configuring the Media Manager for DB2 EEE are the same as those for DB2. Refer to "Configuring Media Using Media and Device Management" on page 29.

2. Set the **Maximum Jobs per Client** property.

   The instructions for setting the **Maximum Jobs per Client** property for DB2 EEE are the same as those for DB2. Refer to "Setting the Maximum Jobs Per Client Property" on page 29 .

3. Add NetBackup policies for the DB2 EEE environment.

   The instructions for adding policies to NetBackup are different for DB2 EEE. Refer to "Adding NetBackup Policies for DB2 EEE Environment" on page 144.

4. Create DB2 Scripts for the DB2 EEE environment.

   The instructions for creating scripts for DB2 EEE are the same as those for DB2. Refer to "Creating Templates and Shell Scripts" on page 71.

   Also refer to "Creating DB2 Templates or Scripts for a DB2 EEE Environment" on page 148 to view a DB2 EEE script.

5. Create a *$DB2_Instance_Home*/`db2.conf` file.

   The instructions for configuring the `db2.conf` files for DB2 EEE are the same as those for DB2. Refer to "Configuring the Run-Time Environment" on page 65.

6. Test NetBackup for DB2 EEE configuration settings.

The instructions for testing DB2 EEE configuration settings are the same as those for DB2. Refer to "Testing NetBackup for DB2 Configuration Settings" on page 80.

Adding NetBackup Policies for DB2 EEE Environment

A DB2 EEE environment requires two separate DB2 policies: one for an Application Backup schedule type of backup and another for an Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup schedule type of backup.

To back up archive logs it will be necessary to add a separate Standard-type policy.

The following policies must be configured for a DB2 EEE environment.

- A DB2 type policy that has an Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup backup type schedule.

  This policy should contain only one Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup backup schedule type. It includes only the clients that:

  - contain the system catalog
  - run a DB2 script.

  The script uses the `IBM db2_all` command to archive the catalog nodes before any other node is backed up. For configuration instructions, see the next topic "To Create a DB2 policy with Automatic Backup schedule type" on page 144.

- A DB2 type policy with an Application Backup schedule type.

  This policy should contain only one Application backup schedule type . This policy includes *all* clients to be backed up in the client list, including the catalog node. For configuration instructions, see the "To create a DB2 policy with Application Backup schedule type" on page 146."

- Standard type policy with a User Backup type schedule.

  For configuration instruction, see "To Create a Standard Policy" on page 146.

▼ To Create a DB2 policy with Automatic Backup schedule type

Note Do not specify this policy or schedule name in the *$DB2_Instance_Home*/`db2.conf` file.

1. Add a new policy, as specified in "Configuring a NetBackup Policy" on page 31.

2. Specify the general attributes for the policy:

   a. Select DB2 for the policy type.

   b. Specify other attributes as desired.

3. Delete the schedule called Default-Application-Backup.

4. Configure a schedule for an Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup type of backup.

   When the NetBackup scheduler invokes an Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup type of backup, NetBackup for DB2 on UNIX will execute the DB2 scripts listed in the Backup Selections list, on each client listed in the Client list.

   Since all the DB2 scripts execute during automatic backups, you may need a separate DB2 policy for each type of backup you want to execute automatically on the same database. For example, to perform both full and tablespace backups of the same database, two different DB2 scripts are required. If you put both DB2 scripts in the same DB2 policy, NetBackup for DB2 on UNIX executes both of them during each Automatic Backup session for that DB2 policy. This means that you will be performing both full and tablespace backups during the same backup type, which is normally undesirable.

5. Configure the Backup Selections list.

Note Specify a Backup Selections list if unattended scheduled backups are going to be performed.

List the DB2 scripts that you want to execute on the client. Always specify the full path name for a DB2 script in the Backup Selections list. For example:

```
/myscripts/db2_backup.sh
```

Note The scripts provided are not intended for production. Modify these scripts to suit your needs.

See "Creating DB2 Templates or Scripts for a DB2 EEE Environment" on page 148 for information on creating a DB2 script.

Caution NetBackup does not interpret a DB2 script. Be sure to use the correct DB2 script name in the file list to prevent an error or possibly a wrong operation.

6. Specify all DB2 clients that will run the DB2 script. These must be the clients that contain the system catalog.

7. Click **OK**.

   The Add New Policy dialog box closes. The policy you just configured appear in the policy list.

▼ To create a DB2 policy with Application Backup schedule type

Note The name of the policy must be specified in the *$DB2_Instance_Home*/`db2.conf` file on the client.

1. Add a new policy, as specified in "Configuring a NetBackup Policy" on page 31.

2. Specify the general attributes for the policy:

   a. Select DB2 for the policy type.

   b. Specify other attributes as desired.

3. Double-click the schedule called Default-Application-Backup. Configure the schedule properties for an Application Backup schedule type.

4. Specify the clients that you want to back up. The client must:

   - Have DB2 UDB installed
   - Have NetBackup for DB2 on UNIX installed

Note No Backup Selections list is required for a User Backup policy.

5. Click OK.

   The Add New Policy dialog box closes. The policy you just configured appear in the policy list.

▼ To Create a Standard Policy

A Standard type policy must be added when:

- `userexit` for logging is turned on in DB2 UDB.
- Client is a UNIX machine.

Note The name of the policy must be specified in the *$DB2_Instance_Home*/`db2.conf` file on the client.

1. Add a new policy, as specified in "Configuring a NetBackup Policy" on page 31.

2. Specify the general attributes for the policy:

   a. Select Standard for the policy type.

   b. Specify other attributes as desired.

3. Add a schedule:

   a. Type the name of your schedule.

   b. In the **Type of Backup** box, select **User Backup**.

      This is a user backup that is started by the NetBackup for DB2 on UNIX user-exit program on the client. This schedule specifies the criteria for DB2 archive logs file backups. A User Backup schedule enables user controlled NetBackup operations performed on the client.

   c. In the **Retention** box, set the time period needed to retain two full backups of your database.

      For example, if your database is backed up once every Sunday morning, select a retention period of at least two weeks.

   d. In the **Start Window** section of the **Schedules** dialog, set the time of day when you want backups to occur.

      This schedule must encompass *all of the time periods* during which DB2 UDB can call the user-exit program.

Note No Backup Selections list is required for a User Backup policy.

4. Specify the clients that you will be backing up. The client must have:

   - DB2 UDB installed
   - NetBackup for DB2 on UNIX installed

5. Click **OK**.

   The Add New Policy dialog box closes. The policy you just configured appears in the policy list.

Creating DB2 Templates or Scripts for a DB2 EEE Environment

Templates

Templates are currently limited to operating on a single NetBackup client. If your EEE/DPF environment spans multiple machines, you must create at least one template for each machine. For example, assume your database spans two hosts, and host `H1` contains partition `P1`, and host `H2` contains partitions `P2` and `P3`. You will need at least 2 templates:

- One template for partition `P1` on host `H1`
- One template for partitions `P2` and `P3` on host `H2`.

Caution Proper backup and restore of the catalog partition is the user's responsibility. Generally, it is recommended that the catalog partition is the first node backed up, and also the first partition restored. Refer to the *DB2 Data Recovery Guide* for details.

For information on creating Backup templates, see "Using the NetBackup for DB2 Backup Wizard" on page 74. For information on creating recovery templates, see "Using the NetBackup for DB2 Recovery Wizard" on page 96.

Roll-forward recovery to a point-in-time is not currently supported. DB2 requires that PIT recovery is executed via the same operation for all partitions and tablespaces on all machines. Templates do not currently support spanning machines.

Scripts

▼ To create scripts for a DB2 EEE Environment

1. Copy the example scripts to a different directory on your client. DB2 scripts must be in a safe location. For clustered environments, this location should be available after a failover.
2. Modify the script
   a. Use a text editor to open the script.
   b. Follow the instructions in the script.

Note Test the scripts you just created by backing up the policy as explained in "Testing NetBackup for DB2 Configuration Settings" on page 80.

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