VERITAS™

VERITAS NetBackup™ 6.0 for DB2

System Administrator's Guide

for Windows

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Contents

Preface

This guide describes how to install, configure, and use NetBackup for DB2 on a Windows platform. For information about the NetBackup server software, see one of the following platform-specific manuals:

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

Getting Help

You can find answers to questions and get help from the NetBackup documentation and from the VERITAS technical support web site.

Finding NetBackup Documentation

A list of the entire NetBackup documentation set appears as an appendix in the *NetBackup Release Notes*. All NetBackup documents are included in PDF format on the NetBackup Documentation CD.

For definitions of NetBackup terms, consult the online glossary.

▼ **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.

Accessing the VERITAS Technical Support Web Site

The address for the VERITAS Technical Support Web site is http://support.veritas.com.

The VERITAS Support Web site lets you do any of the following:

- 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

From http://support.veritas.com, you can complete various tasks to obtain specific types of support for NetBackup for DB2:

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

   a. From the main http://support.veritas.com page, select a product family and a product.

   b. Under Support Resources, click **Email Notifications**.

      Your customer profile ensures you receive the latest VERITAS technical information pertaining to your specific interests.

2. Locate the telephone support directory at http://support.veritas.com by clicking the **Phone Support** icon. A page appears that contains VERITAS support numbers from around the world.

   Note 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.

3. Contact technical support using e-mail.

a. From the main http://support.veritas.com page, click the **E-mail Support** icon.

A wizard guides you to do the following:

- Select a language of your preference
- Select a product and a platform
- Provide additional contact and product information, and your message
- Associate your message with an existing technical support case

b. After providing the required information, click **Send Message**.

Contacting VERITAS Licensing

For license information, you can contact us as follows:

- Call 1-800-634-4747 and select option 3
- Fax questions to 1-650-527-0952
- In the Americas, send e-mail to amercustomercare@veritas.com.

  In the Asia and Pacific areas, send email to apaccustomercare@veritas.com.

  In all other areas, send email to internationallicense@veritas.com.

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 Installation Guide.*

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Let us know what you like and dislike about the documentation. Were you able to find the information you needed quickly? Was the information clearly presented? You can report errors and omissions or tell us what you would find useful in future versions of our manuals and online help.

Please include the following information with your comment:

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- The topic (if relevant) on which you are commenting
- Your comment
- Your name

Email your comment to NBDocs@veritas.com.

Please only use this address to comment on product documentation. See “Getting Help” in this preface for information on how to contact Technical Support about our software.

We appreciate your feedback.

Introduction 1

NetBackup for DB2 integrates the database backup and recovery capabilities of DB2 with the backup and recovery management capabilities of NetBackup.

This chapter introduces NetBackup for DB2 and how it relates to both DB2 and NetBackup. This chapter includes the following sections:

NetBackup for DB2 Features

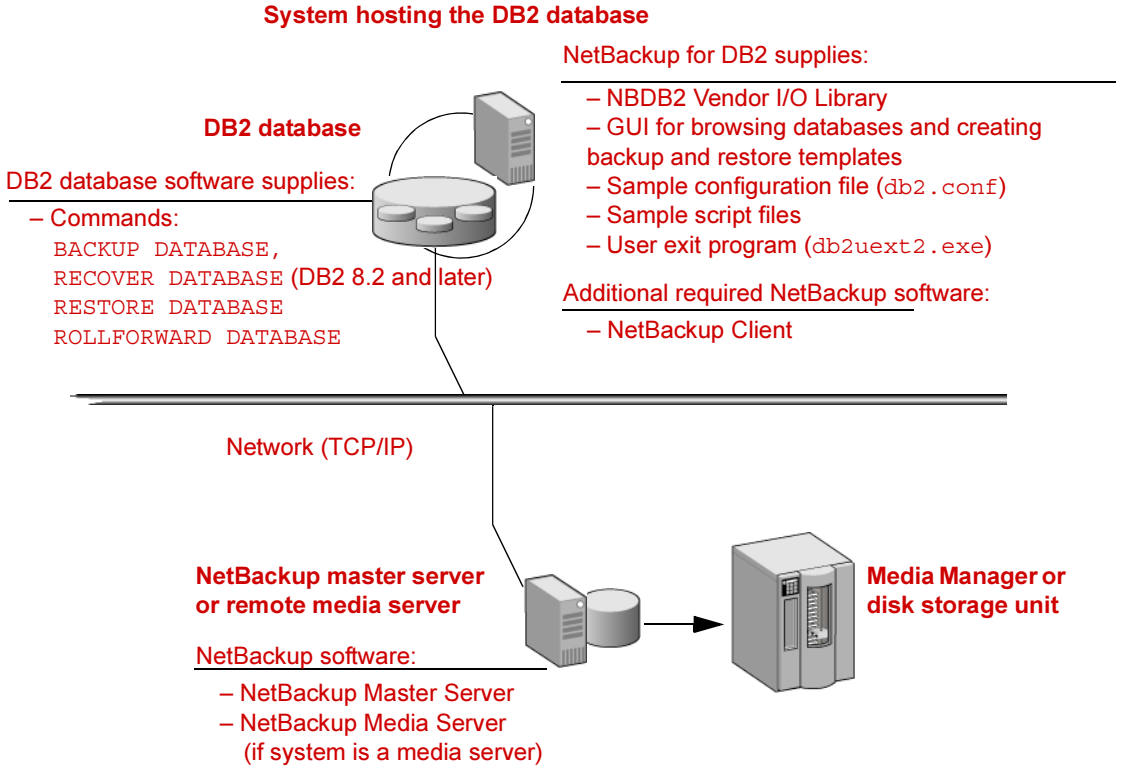
The following list shows NetBackup for DB2's main features and introduces some terms used in the NetBackup for DB2 documentation. For more information on general NetBackup terminology, see the *NetBackup System Administration Guide, Volume I*.

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 run simultaneously and transparently without any action from the NetBackup administrator. The database administrator can run database backup and restore operations through NetBackup. Alternatively, you can 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 Media Manager and disk storage units used for 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.

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 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. For example, 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.
Templates	The NetBackup for DB2 database wizards can create backup and recovery templates. You can launch the Backup Wizard and the Recovery Wizard from the NetBackup Backup, Archive, and Restore interface. The wizards generate platform-independent templates that contain configuration information that the software uses when performing backups and restores. Because the wizard-generated templates do not support all the features native to DB2, you might want to write a customized backup or restore script in an operating-system defined scripting language. You can use a template as the base for a script.

NetBackup for DB2 Overview

The following example network shows the major components in a NetBackup for DB2 configuration. The server that is hosting the DB2 database must be a NetBackup client, and it must have NetBackup for DB2 licensed.



NetBackup for DB2 Components

The following sections describe the main NetBackup components in a NetBackup for DB2 environment.

NBDB2 Vendor I/O Library

The DB2 `BACKUP` and `RESTORE` commands use the NBDB2 vendor I/O library to send data buffers between a DB2 database and NetBackup.

The vendor library is *`install_path`*`\NetBackup\bin\nbdb2.dll`. For example:

C:\Program Files\Veritas\NetBackup\bin\nbdb2.dll.

You specify the library as the argument to the LOAD parameter of the DB2 BACKUP and RESTORE commands.

User Exit Program

The NetBackup for DB2 user exit program, db2uext2.exe, provides one method for backing up and restoring the DB2 archive log files. This occurs at the following times:

- When the DB2 BACKUP or ROLLFORWARD commands are used to back up or restore databases.
- When the user exits the database by using the DB2 TERMINATE or DISCONNECT command.
- When the log file fills and DB2 starts writing transactions to another log file.
- The DB2 ARCHIVE LOG command is issued.

The user exit program backs up and restores the archive logs as files. The user exit program resides in %DB2_INSTANCE%\bin\db2uext2.exe . If you are using 64-bit DB2, the file is called db2uext2.64. NetBackup for DB2 supports this method for protecting the archive logs in all supported DB2 releases.

There are other methods for backing up archive log files. For more information on these methods, see “Specifying Log Archiving” on page 13.

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, the wizard creates a template that you can run immediately or store on the server (for backup templates). You can use the stored backup templates in scheduled backups through a NetBackup policy, or you can use them to perform manual backups on the NetBackup for DB2 client.

Sample Configuration File (db2.conf) and Script Files

The installation software installs the following sample files:

- A sample configuration file (db2.conf file)

  The db2.conf file includes specifications for backups and restores, and it provides information on policies and schedules. The NetBackup for DB2 library and user exit program use the information in this file.

- Sample backup and restore scripts

  NetBackup can invoke a script to perform a scheduled backup or restore of a DB2 database. The scripts contain DB2 `BACKUP` or `RESTORE` commands for use with NetBackup.

  Alternatively, users can use the NetBackup for DB2 wizards to create backup and restore templates. You can use the templates in place of scripts, and you can convert templates into scripts.

The installation software writes these sample files to the following location:

install_path\NetBackup\dbext\db2\samples

To use the sample files, copy the sample files to working directories and modify them for your own use.

NetBackup for DB2 Terminology Notes

DB2 supports two methods for archiving its log files: through a user exit program and through a vendor library. DB2 supports backing up the archive log files by using a vendor library in its 8.2 and later releases. NetBackup for DB2 supplies a user exit program and a library to support both of these methods.

The DB2 syntax for specifying these archive log methods differs from release to release. This manual uses the terms *user exit* and *VENDOR* to differentiate the methods. The following table shows the DB2 syntax you can use to specify these methods within DB2 and indicates the term this manual uses to describe each method:

DB2 Syntax for Log Archiving and NetBackup for DB2 Terminology

NetBackup for DB2 uses the term *user exit* to describe these DB2 settings:	**NetBackup for DB2 uses the term *VENDOR* to describe this DB2 setting:**
`LOGARCHMETH1=LOGRETAIN`	`LOGARCHMETH1=VENDOR:...\`*`library`*
`LOGARCHMETH1=USEREXIT`	
`USEREXIT=ON`	
`USEREXIT=YES`	
`LOGRETAIN=ON`	
`LOGRETAIN=RECOVERY`	

When `VENDOR` is used, archive logs are backed up by means of the NetBackup for DB2 vendor library. The full specification for this archive log method is as follows:

`LOGARCHMETH1=VENDOR:`*`install_path`*`\NetBackup\bin\nbdb2.dll`.

When a user exit program is used, archive logs are backed up by means of the NetBackup for DB2 user exit program. The DB2 syntax for specifying the user exit program includes the `USEREXIT` and `LOGRETAIN` keywords specified in a configuration parameter.

Verifying Prerequisites and Registering the License Key 2

This chapter describes how to perform the following tasks:

- Verifying the installation prerequisites for NetBackup for DB2. Perform this task before enabling this agent.

  The NetBackup for DB2 software is installed when you install NetBackup, so verify these prerequisites before enabling NetBackup for DB2.
- Registering the license key for NetBackup for DB2.
- Enabling functions specific to NetBackup for DB2.

Verifying the Installation Prerequisites

Before enabling NetBackup for DB2, verify that you are installing the agent on a supported operating system or platform and that requirements are met for the NetBackup software, the database agent, and, if applicable, the cluster software. These requirements apply for remote and local installations.

Operating System and Platform Compatibility

Verify that NetBackup for DB2 will be installed on an operating system or platform supported by NetBackup. A compatibility list for database agents is available on the Technical Support web site.

▼ **To verify compatibility**

1. Go to the Technical Support web page: http://support.veritas.com.
2. From the **Select Product Family** list, click **NetBackup Products**.
3. From the **Select Product** list in the right pane, click **NetBackup Enterprise Server**.
4. Under **Support Resources**, click **Compatibility and Reference**.

5. In the list of documents, click **NetBackup Enterprise Server (tm)/ Server** *x.x* **Database Agent Compatibility (updated** *date***)**.

   For *x.x*, look for the current release. For *date*, look for the most recent date.

   For information on supported cluster environments for NetBackup for DB2, see **NetBackup (tm)** *x.x* **Cluster Compatibility (updated** *date***)**.

6. Click on the link for the PDF document, which is a downloadable file that enables you to view the supported database spreadsheet for this release.

7. Read the document and verify that the software in your environment is compatible with the NetBackup and NetBackup for DB2 software.

NetBackup Software

Verify that the following requirements are met for the NetBackup server and client software:

- ❑ The NetBackup server software is installed and operational on the NetBackup server.

  The NetBackup server platform can be any of those that NetBackup supports. For installation information, see the *NetBackup Installation Guide*.

- ❑ The NetBackup client software is installed on the client where you will be backing up the databases. This step also installs NetBackup for DB2.

  In addition, the *`install_path`*`\NetBackup` directory must exist on the client. On Windows platforms, the NetBackup for DB2 software is installed along with the server and client software. For installation information, see the *NetBackup Installation Guide*.

- ❑ Make sure that you have configured backup media in a Media Manager or disk storage unit. The amount of backup media required depends on the devices used, the sizes of the databases that you are backing up, the amount of data that you are archiving, the size of your backups, and the frequency of backups or archives. For information on using Media Manager, see the *NetBackup Media Manager System Administrator's Guide*.

Database Software

Verify the following regarding the database software on the NetBackup client:

- ❑ DB2 vendor software must be installed and operational.
- ❑ One or more DB2 instances must exist.

Caution In a DB2 EEE environment, install the NetBackup client software on every node and client that DB2 uses.

For information on installing DB2 and creating instances, see your DB2 documentation.

Cluster Software

Verify the following requirements if you are enabling the NetBackup for DB2 software on a NetBackup server configured in a NetBackup cluster:

- ❏ The DB2 vendor software is installed and operational on each node to which NetBackup can failover.
- ❏ The NetBackup server software is installed and configured to work in a NetBackup cluster. Follow the instructions in the *NetBackup Installation Guide*.

  The NetBackup server installation procedure installs the NetBackup for DB2 software along with the server and client software. After all other prerequisites are met, you only need to register the license key for the agent on each NetBackup server in order to enable the agent.

Registering the License Key

NetBackup for DB2 is installed with the server and client software. To use this agent, register a valid license key for it on the master or media server. In a NetBackup cluster, register the key on each node on which the NetBackup server is installed.

▼ To register a license key

1. On the master or media server, open the NetBackup Administration Console.
2. Choose **Help** > **License Keys**.
3. Click the **New** button.
4. Type in the license key and click **Add**.

   For information on adding license keys, see the *NetBackup System Administrator's Guide, Volume I.*

Specifying Log Archiving

DB2 can write database archive logs in several different ways. For a rollforward recovery, you need both the database itself and the archive logs from the backup media. The procedure in this section explains how to specify a method for DB2 to use when backing up the DB2 archive logs.

You can use the procedure in this section to specify an archive method in DB2, or you can use the information in the procedure to determine how your established archive method will interact with NetBackup for DB2.

Note This manual uses the terms *user exit* and *VENDOR* to describe the methods that DB2 supports for log archiving. Read "NetBackup for DB2 Terminology Notes" on page 7 to ensure that you understand how the terms are used in this manual.

▼ To specify an archive method

1. Quiesce the DB2 database.

   This procedure, and the configuration procedures in the next chapter, should be done in sequence at a time when minimal changes are being made to the DB2 database.

2. Decide on a method for specifying the archive logs.

   DB2 provides several methods for backing up its archive log files. The DB2 parameters that specify an archive log method include the `LOGRETAIN`, `USEREXIT`, and `LOGARCHMETH1` keywords. Depending on the DB2 release you are using, there are different methods for specifying these parameters. DB2 supports different syntax for these parameters in different releases. For more information on the effects of these parameters within DB2, or on the specific syntax for specifying these parameters, see your IBM DB2 documentation.

The following list explains the effects of the different log archiving methods on NetBackup for DB2 operations:

Method	Notes and Effects
VENDOR	Only the DB2 8.2 release allows you to specify this log archive method. The syntax is as follows: `LOGARCHMETH1=VENDOR:`*`install_path`*`\NetBackup\bin\nbdb2.dll` If you use this method, note the following: ◆ The archive logs are backed up as part of the database, so you do not need a separate NetBackup policy for them. ◆ NetBackup for DB2 backs up and restores the archive log files as a byte stream. This method uses the DB2 Backup and Restore (BAR) API.
User exit	Any DB2 release allows you to specify this archive method. The syntax for specifying the user exit method differs across DB2 releases. NetBackup for DB2 includes a user exit program that you can use to back up the archive logs. If your DB2 configuration uses the `USEREXIT` or `LOGRETAIN` keywords in its configuration parameters, note the following: ◆ You will need to configure one of the following: (1) a separate NetBackup MS-Windows-NT policy for backing up the archive logs or (2) directories for the user exit program to use when copying the archive logs *and* a separate Netbackup MS-Windows-NT policy for backing up these directories. Another alternative to (1) and (2) would be to modify an existing Netbackup MS-Windows-NT policy with a user backup schedule to include the archive log directories. The configuration procedures in the next chapter explain how to perform these tasks. ◆ NetBackup for DB2 backs up and restores the archive log files as individual files. ◆ Supported only for backward compatibility.

3. Verify your DB2 configuration to ensure that the appropriate log archiving method for your site is enabled.

   If necessary, edit your DB2 configuration specifications to specify the log archiving method.

Adding New DB2 Instances

At installation, the NetBackup for DB2 installation software writes the user exit program to the following location:

`install_path``\NetBackup\dbext\DB2\db2uext2.exe`

For example:

```
C:\Program Files\IBM\SQLLIB\bin\db2uext2.exe
```

DB2 expects the `db2uext2` executable to reside in the DB2 installation location.

If you reinstall or move the DB2 installation, manually copy `db2uext2.exe` from the NetBackup location into the DB2 location.

Configuration 3

Before attempting to configure NetBackup for DB2, complete the installation procedure as described in the Installation chapter.

The following is the configuration procedure.

1. Configuring the Maximum Jobs Per Client
2. Configuring Backup Policies
3. Configuring Policies for Archive Logs and Configuration Files
4. Configuring the Runtime Environment
5. Enabling Database User Authentication
6. Creating Templates and Shell Scripts
7. Testing Configuration Settings

The following subsections describe these steps.

User Interface Terminology Notes

You can perform many of the configuration steps in this chapter from the NetBackup Administration Console on the master server. Depending on your master server's platform, the console is available in one or two forms. NetBackup supports a Java interface for both Windows and UNIX master servers. In addition, NetBackup supports a Windows interface for Windows master servers.

The Java and Windows interfaces are nearly identical, but when there are interface differences in the configuration procedures, this manual uses the following headings to identify the interface being described:

From the Windows interface:

From the Java interface:

Configuring the Maximum Jobs Per Client

▼ To configure the Maximum jobs per client

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 box displays.
4. In the Master Server Properties dialog box, click **Global Attributes**.
5. Change the **Maximum jobs per client** value to 99.

   The **Maximum jobs per client** specifies the maximum number of concurrent backups allowed per client. The default is 1. You can use the following formula to calculate a smaller value:

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

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

Tip Enter a large enough value for the **Maximum jobs per client** attribute to meet the number of jobs executed by DB2. You might need to experiment with different values at your site.

Configuring Backup Policies

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
- Policy attributes
- Backup schedules
- Clients to be backed up
- Backup templates or script files to be run on the clients

To use NetBackup for DB2, you need to define at least one DB2 policy with the appropriate schedules. A configuration can have a single policy that includes all clients, or there can be many policies, some of which include only one client.

Most requirements for 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. For configuration instructions and information on all the attributes available, see the *NetBackup System Administrator's Guide, Volume I*.

Planning NetBackup for DB2 Policies and Schedules

The following table summarizes the types of NetBackup policies and schedules to create:

For this type of data:	Specify this type of policy:	Specify this type of schedule:
DB2 database	DB2	Required schedule: • Application Backup (Default-Application-Backup) Optional schedules (Note: the following schedules are required if you are using the Advanced Client or if you want to perform scheduled backups): • Automatic Full Backup • Automatic Differential Incremental Backup • Automatic Cumulative Incremental Backup
DB2 transaction logs (if using VENDOR)	DB2	Required schedule: • Application Backup (Default-Application-Backup)

For this type of data:	Specify this type of policy:	Specify this type of schedule:
DB2 transaction logs (if using user exit)	MS-Windows-NT	Required Schedule: ◆ User Backup
DB2 configuration files	MS-Windows-NT	Optional schedules: ◆ Full Backup ◆ User Backup These schedules are recommended for backing up your configuration files in case of a disaster. For information on files to include in this policy, see your database documentation.

At a minimum, specify one DB2 policy with an Application Backup schedule.

If you are using DB2 EEE, see "Configuration for a DB2 EEE (DPF) Environment" on page 123 for information on creating policies for the catalog nodes and the noncatalog nodes.

Adding a New Policy

▼ To add a new policy

1. Log on to the master server as administrator (Windows) or root (UNIX).
2. Start the NetBackup Administration Console.
3. If your site has more than one master server, choose the one on which you want to add the policy.
4. *From the Windows interface*: In the left pane, right-click **Policies** and choose **New Policy**.

   From the Java interface: In the left pane, click **Policies**. In the **All Policies** pane, right-click the master server, and click **New**.

   The **Add a New Policy** dialog box displays.
5. In the **Policy name** field, type a unique name for the new policy.
6. Click **OK**.

A dialog box displays in which you can specify the general attributes for the policy.

7. From the **Policy Type** box, select the DB2 policy type.

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

8. Complete the entries on the **Attributes** tab. For more information, see "Description of Attributes", which follows this procedure.

9. Add other policy information.
   - To add schedules, see "Adding Schedules" on page 22.
   - To add clients, see "Adding Clients" on page 28.
   - To add templates or scripts to the Backup Selections list, see "Adding Backup Selections" on page 29.

10. When you have added all the schedules, clients, and Backup Selections you need, click **OK**. The new policy is created.

Description of Attributes

With a few exceptions, NetBackup manages a database backup like a file system backup. The following table shows the policy attributes that are different for DB2 backups. This information is used when you are adding a new policy.

Other policy attributes vary according to your specific backup strategy and system configuration. For more information on policy attributes, see the *NetBackup System Administrator's Guide, Volume I*.

Description of Policy Attributes

Attribute	Description
Policy type	Determines the types of clients that can be in the policy and, in some cases, the types of backups that NetBackup can perform on those clients. To use NetBackup for DB2, you must define at least one policy of type DB2.
Keyword phrase	For NetBackup for DB2, the **Keyword phrase** entry is ignored.
Advanced Client	See "Using NetBackup for DB2 with Advanced Client" for information on configuring policies for advanced backup methods.

Adding Schedules

Each policy has its own set of schedules. These schedules initiate automatic backups and specify when a user can initate operations.

A DB2 backup requires an Application Backup schedule, which is created automatically when you create a DB2 policy. The Application Backup schedule manages the backup operation. You also need one or more automatic backup schedules if you plan to have NetBackup perform automatic scheduled backups or if you are using Advanced Client features.

▼ To configure an Application Backup schedule

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

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

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

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

   All DB2 backup operations are performed through NetBackup for DB2 using an Application Backup schedule. This includes backups that start automatically.

   Configure an Application Backup schedule for each DB2 policy you create. If you do not do this, you cannot 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" on page 26.

   The backup window for an Application Backup schedule must encompass the time period during which all NetBackup for DB2 jobs, scheduled and unscheduled, can 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 the following:

   - Users perform DB2 backup operations during business hours, 0800 to 1300.
   - Automatic backups that use this policy commence 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 the backup images are retained in the NetBackup catalog for restore.	2 weeks
	Backup Window	The time during which a NetBackup operation can be initiated.	Sunday through Saturday 00:00:00 - 24:00:00

Note Specify the Application Backup schedule name in the *install_path*\NetBackup\dbext\db2\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 box displays. 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 Backup Schedules" on page 25.

5. Specify the other properties for the schedule as explained in Schedule Properties, which follows this procedure.

The following table shows 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, which NetBackup uses to determine if the schedule needs to be run.	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 initiated.	Sunday, 18:00:00 - 22:00:00
Automatic Differential Incremental Backup	Retention	The length of time to store the record of a backup, which NetBackup uses to determine if the schedule needs to be run.	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 initiated.	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, which NetBackup uses to determine if the schedule needs to be run.	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 initiated.	Sunday 18:00:00 - 22:00:00

6. If this is the last schedule, click **OK**. To add other schedules, repeat step 1 through step 6.

Types of Backup Schedules

You can perform backups with the following types of schedules:

DB2 Backup Types

Application Backup	The Application Backup schedule enables user-controlled NetBackup operations from the client, both those initiated from the client and those initiated by an automatic schedule on the master server. NetBackup uses the Application Backup schedule when the DB2 user starts a backup manually. Configure at least one Application Backup schedule for each DB2 policy. The Default-Application-Backup schedule is configured automatically as an Application Backup schedule.
Automatic Full Backup	An Automatic Full Backup contains a copy of all the data. Note that a full backup is not the same as a whole database backup; *full* is an indicator that the backup is not one of the incremental backup types. If you are performing a stream-based Automatic Full Backup, also specify an Automatic Full Backup schedule for scheduled NetBackup operations. If you are using the Advanced Client, other than the Block-Level Incremental (BLI) backup, this is the only type of backup supported.
Automatic Differential Incremental Backup	An Automatic Differential Incremental backup is an incremental backup that is not cumulative. The backup contains a copy of the database data that has changed since the most recent successful backup, full or otherwise. This corresponds to the `INCREMENTAL DELTA` option of the DB2 `BACKUP` command. This type of backup takes less space and time than a cumulative incremental backup because the backup includes only the data changed since the last successful backup operation of any type. This type of backup is supported only for stream-based backups and for Block-Level Incremental (BLI) backups.
Automatic Cumulative Incremental Backup	An Automatic Cumulative Incremental backup is an incremental backup that is cumulative. The backup contains a copy of the database data that has changed since the most recent successful full backup. This corresponds to the `INCREMENTAL` option of the DB2 `BACKUP` command. This type of backup is supported only for stream-based backups and Block-Level Incremental (BLI) backups. This type of backup takes less time and space than a full backup because the backup contains only the data that changed since the last full backup.

Using Backup Schedules, Templates, and Scripts

Later in this chapter you configure templates or scripts to use when performing backups and restores. Be aware that when an automatic schedule invokes a script authored by a user, NetBackup does not provide safeguards to prevent unusual behavior, such as an automatic backup schedule running a restore or recovery script.

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

Backup Schedules and Advanced Client Features

The information in "Types of Backup Schedules" on page 25 pertains to stream-based backups. If you are using the NetBackup Advanced Client, be aware that some of the information in that table might differ depending on the Advanced Client features that you are using. For more information about backup schedules and Advanced Client features, see "NetBackup for DB2 with Advanced Client" on page 85.

Schedule Properties

Some of the schedule properties have a different meaning for database backups than for a regular file system backup. The following table explains the schedule properties:

Description of Schedule Properties

Property	Description
Type of backup	Specifies the type of backup that this schedule controls. The selection list shows only the backup types that apply to the policy you are configuring. For more information, see "Types of Backup Schedules" on page 25.
Frequency	This setting is used only for scheduled backups and not for user-directed backups. **Frequency** specifies the period of time that can elapse until the next backup or archive operation begins on this schedule. For example, if the frequency is seven days and a successful backup occurs on Wednesday, the next full backup does not occur until the following Wednesday. Typically, incremental backups have a shorter frequency than full backups.
Calendar	This setting is used only for scheduled backups. It is not used for user-directed backups. The **Calendar** option allows you to schedule backup operations 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. Set a retention period that is longer than the frequency setting for the schedule. For example, if the frequency setting is set to one week, set the retention period to be more than one week. The NetBackup scheduler compares the latest record of the Automatic Backup schedule to the frequency of that Automatic Backup schedule to determine whether a backup is due. This means that if you set the retention period to expire the record too early, the scheduled backup frequency is unpredictable. However, if you set the retention period to be longer than necessary, the NetBackup catalog accumulates unnecessary records. **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 want to specify multiple copies for your DB2 policy, configure **Multiple copies** on the Application Backup schedule.

Other schedule properties vary according to your specific backup strategy and system configuration. For more information on schedule properties, consult the *NetBackup System Administrator's Guide, Volume I.*

Adding Clients

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

The following software must be installed on the client:

- DB2
- NetBackup client or server
- 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.

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

2. Click **New**.

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

   If DB2 is installed in a NetBackup cluster, specify the virtual DB2 name as the client name.

   From the Windows interface:

   - Type the name into the client list and press Enter.

     If NetBackup cannot detect the hardware and operating system, a dialog box displays so you can specify this information.

     OR

   - Click the **Browse for Computer** button to choose the client from the network.

   From the Java interface:

   a. The Add Client dialog box displays. In the **Client name** field, type the name of the client you are adding.

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

4. To add another client, repeat step 2 and step 3.

5. If this is the last client, click **OK**.

Adding Backup Selections

The backup selections list in a database policy has a different meaning than for non-database policies. For example, in an MS-Windows-NT policy, the list contains files and folders to be backed up. In a NetBackup for DB2 database policy, you specify templates or scripts to be run.

Observe the following when using templates or scripts:

- Make sure the scripts reside on each client in the client list. Scripts can reside in any location. Make sure that NetBackup can access the location you choose and that NetBackup can run the scripts.

  Note that templates do not reside on the clients. Templates reside on the NetBackup master server.

- NetBackup installs sample scripts when you install the software, and you can modify these scripts for your own use. As part of the modification process, write the scripts to a location outside of the original installation location so future NetBackup installations do not overwrite your site's scripts.

- If you are using NetBackup for DB2 in a NetBackup server cluster, make sure that the scripts reside in a location that is available after a failover.

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 are run for manual backups and for Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup schedules as specified under the **Schedules** tab. NetBackup runs the templates or scripts in the order that the templates or scripts appear in the Backup Selections list.

For more information on backup templates and scripts, see "Creating Templates and Shell Scripts" on page 48.

▼ To add templates or scripts to the backup selections list

The following steps show how to perform this procedure from both the Java interface and from the Windows interface.

Caution Be sure to specify the correct template and script names in the Backup Selections list to prevent an error or possibly a wrong operation. Make sure that the template or script resides on the client before you try to add it to the Backup Selections list.

From the Java interface:

1. Open the Policy dialog.

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

2. Click the **Backup Selections** tab.

3. Click **New**.

   A dialog box displays.

4. Specify the names of templates that you want NetBackup to use.

   a. Specify a specific template by choosing the template from the drop-down **Script or Template** list or by typing the correct template file name.

      Include the `.tpl` extension. Do not include the full path.

      For example:

      ```
      weekly_full_backup.tpl
      ```

   b. Click **Add** to add the template to the list.

   c. Repeat step a and step b until all templates are added.

5. Specify the names of the scripts that you want NetBackup to use.

   a. In the **Script**: box, type the full path name of a script on the client.

      For example:

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

   b. Click **Add** to add the script to the list.

   c. Repeat step a and step b until all scripts are added.

6. Click **OK**.

From the Windows interface:

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

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

2. Click **New**.

3. Specify the names of the templates you want NetBackup to use.

   Use one of the following methods:

   - Type the name of the template with the `.tpl` extension. Do not include the full path.

     For example:

     ```
     weekly_full_backup.tpl
     ```

   - 
     Click the **Template** button. The **Select Template** dialog displays. From the **Template** list, choose the correct template. Click **OK**.

4. Specify the names of the scripts you want NetBackup to use.

   Use one of the following methods:

   - Type the full path name of the script on the client.

     For example:

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

   - 
     Click the **Remote Folder** button.

     The Browse window displays the hosts in the client list. Navigate to and select the script file. Click **OK**.

5. Click **OK**.

Configuring Policies for Archive Logs and Configuration Files

The procedures in this section show you how to configure one or more MS-Windows-NT policies for backing up archive log files and configuration files

If you are using the VENDOR method for backing up your archive log files, perform only the procedure for backing up your configuration files.

Backing up the Archive Logs

Use the procedure in this section to create a policy to back up your archive log files if you are using the user exit program. You do not need to perform this procedure if you are using the VENDOR method to back up your archive log files.

▼ To configure a policy to back up the archive logs

1. Create an MS-Windows-NT policy, as specified in "Configuring Backup Policies" on page 19.

   Alternatively, you can select an existing MS-Windows-NT policy and follow this procedure for adding a schedule to back up the configuration files. If you want to use an existing policy, double click the policy name in the **All Policies** pane and proceed to step 3.

2. Specify the general attributes for the policy.

   a. Select MS-Windows-NT for the policy type.

   b. Specify other attributes as desired.

3. Click the **Schedules** tab.

4. Click **New**.

5. Add a **User Backup** or **User Archive** schedule.

   a. Type the name of your schedule.

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

      You will specify either `ARCFUNC SAVE` or `ARCFUNC COPY` in the NetBackup for DB2 configuration file, `db2.conf`, later on in this configuration procedure in "Creating a db2.conf File" on page 37.

      - If you plan to specify `ARCFUNC SAVE`, select a **User Backup** schedule for the archive log files.
      - If you plan to specify `ARCFUNC COPY` and you plan to archive these files, select a **User Archive** schedule for archiving the archive log files.

   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. Click the **Start Window** tab.

   e. 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 can call the user exit program.

f. Click **OK**.

Note No Backup Selections list is necessary for this policy because it has a User Backup or User Archive schedule. It is not an automatic schedule.

6. Specify the clients to be backed up.

The clients must have the following installed:

- DB2
- NetBackup for DB2

a. Click the **Clients** tab.

b. Click **New**.

c. Type the name of the client.

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

d. Click **OK**.

7. Click **Close**.

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

8. Note the name of the policy you just configured.

Later in the configuration process, you configure the *install_path*\NetBackup\dbext\db2\db2.conf file. If you specify ARCFUNC SAVE or ARCFUNC COPY in the db2.conf file, you also need to specify the name of the policy you created in this procedure in the db2.conf file. For more information about the db2.conf file, see "Creating a db2.conf File" on page 37.

Backing up the Configuration Files

The following procedure shows how to create two schedules, a User Backup schedule and a Full Backup schedule, for backing up the configuration files.

1. Create an MS-Windows-NT policy, as specified in "Configuring Backup Policies" on page 19.

   Alternatively, you can select an existing MS-Windows-NT policy and follow this procedure for adding a schedule to back up the configuration files. If you want to use an existing policy, double click the policy name in the **All Policies** pane and proceed to step 3.

2. Specify the general attributes for the policy.

   a. Select MS-Windows-NT for the policy type.

   b. (Optional) Specify other attributes.

3. Add a User Backup schedule.

   a. Click the **Schedules** tab.

   b. Click **New**.

   c. Type the name of your schedule.

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

   e. 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.

   f. 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 can call the user exit program.

   g. Click **Add**.

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

4. Add a Full Backup schedule.

   a. Type the name of your schedule.

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

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.

e. Click **OK**.

5. Specify a backup selections list for this policy.

a. Click the **Backup Selections** tab.

b. Click **New**.

c. Type the full path name of the directory that contains the configuration files.

d. Click **Add**.

e. Click **OK**.

6. Specify the clients to be backed up.

The clients must have the following installed:

- DB2
- NetBackup for DB2

a. Click the **Clients** tab.

b. Click **New**.

c. Type the name of the client.

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

d. Click **OK**.

7. Click **Close**.

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 add your NetBackup for DB2 client to a policy, 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.

   If the correct server is not displayed, click the server name in the Additional Servers list, and click **Make Master**. Alternatively, click **Add** to add a new server name to the list.
7. Click **OK** to save your change.

Note *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 Runtime Environment

Creating a db2.conf File

The NetBackup for DB2 configuration file, `db2.conf`, consists of a series of keywords and values that define how to back up the database and the archive logs. This file defines the database, the policy, and the schedule to use.

Create a `db2.conf` file on each NetBackup for DB2 client. The installation package installed a `db2.conf` file that you can customize. The procedure that follows shows you how to customize this file using the sample as a template.

▼ To create a db2.conf file

1. Log into a client machine.

2. Copy the sample `db2.conf` file from its location in the sample folder to its active location.

   Its location in the sample folder is as follows:

   install_path\NetBackup\dbext\db2\samples

   The active location for the `db2.conf` file is as follows:

   install_path\NetBackup\dbext\db2\db2.conf

3. Edit the `db2.conf` file.

   The `db2.conf` file consists of keyword lines that form object identifiers. The lines in each object identifier specify the database, the policy, and other information.

   a. Create an object identifier for backing up the database. In the sample file, this object identifier starts with the following keyword lines:

   ```
   DATABASE SAMPLE
   OBJECTTYPE DATABASE
   . . .
   ```

   b. Create an object identifier for backing up the archive logs.

   The form to use depends on how the archive logs are being backed up. Use one of the following forms for the object identifier:

   - If you are using the user exit program and `ARCFUNC SAVE`, use the following form:

```
DATABASE SAMPLE
OBJECTTYPE ARCHIVE
POLICY WIN_TYPE_POL_LOGPOL (an MS-Windows-NT type policy)
SCHEDULE USER_BACKUP_SCHED_LOGSCHED
```

In the POLICY line, specify the name of the MS-Windows-NT policy for backing up the archive logs.

In the SCHEDULE line, specify the User Backup schedule that you created earlier for backing up the archive logs.

- If you are using the user exit program and ARCFUNC COPY, use the following form:

```
DATABASE SAMPLE
OBJECTTYPE ARCHIVE
POLICY WIN_TYPE_POL_LOGPOL (an MS-Windows-NT type policy)
SCHEDULE USER_ARCHIVE_SCHED_LOGSCHED
```

In the POLICY line, specify the name of the MS-Windows-NT policy for backing up the archive logs.

In the SCHEDULE line, specify the User Archive schedule that you created earlier to archive the entire ARCDIR directory to NetBackup storage.

- If you are using the user exit program and the logs reside on a raw partition (PARTITIONTYPE RAW,) use the following form:

```
DATABASE SAMPLE
OBJECTTYPE ARCHIVE
POLICY DB2_TYPE_POL_LOGPOL (a DB2 type policy)
SCHEDULE DEFAULT-APPLICATION-BACKUP
```

In the POLICY line, specify the name of a DB2 policy. This can be the same policy that you use to back up the database.

In the SCHEDULE line, specify a Default-Application-Backup schedule.

- If you are using VENDOR, use the following form:

```
DATABASE SAMPLE
OBJECTTYPE ARCHIVE
POLICY DB2_TYPE_POL_LOGPOL (a DB2 type policy)
SCHEDULE DEFAULT-APPLICATION-BACKUP
```

In the POLICY line, specify the name of a DB2 policy. This can be the same policy that you use to back up the database.

In the SCHEDULE line, specify a Default-Application-Backup schedule.

For information about creating an MS-Windows-NT policy, see “Configuring Policies for Archive Logs and Configuration Files” on page 31.

The subsections that follow show an example file and contain information on how to edit this file.

4. Save and close the db2.conf file.

5. Repeat this procedure on each client machine.

Example db2.conf File

Assume that you need to back up a database named SAMPLE and its archive logs. USEREXIT is enabled for database SAMPLE. The policies for database SAMPLE specify the required schedules for the backups. The policies are as follows:

- The DB2_DB_Policy backs up the database. This policy has an application backup schedule and an automatic backup schedule. The first definition in the example db2.conf file 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 DB2_Log_Policy backs up the archive logs. This policy has a user backup schedule named User. The second entry in the example file specifies this policy and its User backup schedule.

The sample db2.conf file is as follows:

```
#
# 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.
#

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

#
# The following settings are used by NetBackup to backup/restore DB2 log files.
#
 Reminders:
# 1) DB2 transcation logs can be backed up/restored using  either
#   (a) DB2 User Exit Program
#        The specified policy must have a type of "Standard" (for UNIX DB2
#        host) or "MS-Windows-NT" (for Windows DB2 host).
#
#   (b) LOGARCHMETH1 can be configured to use NetBackup.
#       (When LOGARCHMETH1 = "VENDOR:NetBackup for DB2 agent")
```


```
#       This option is possible only for versions 8.2 and above.
#       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.
#

# ---------------------
# DB2 User Exit Program
# ---------------------
# 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 storage-unit setting.
# 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.
#
DATABASE SAMPLE
OBJECTTYPE ARCHIVE
POLICY DB2_Log_Policy
SCHEDULE User
ARCFUNC SAVE
#ARCFUNC COPY
#ARCDIR /home/db2inst1/arcdir
#RETDIR /home/db2inst1/arcdir
ENDOPER


# ------------------------------------------------------------
# LOGARCHMETH1 = "VENDOR.." parameter for versions 8.2 and above
# Policy is of type DB2.
# ------------------------------------------------------------
#
# Comment the above DB2 User Exit section when using LOGARCHMETH1 = "VENDOR.."
#
DATABASE SAMPLE
OBJECTTYPE ARCHIVE
POLICY DB2_ARCH_Policy
SCHEDULE Default-Application-Backup
ENDOPER
```

Archiving Log Files with the User Exit Program

You can configure the NetBackup for DB2 user exit program to back up the archive logs in one of the following ways:

- By saving archived log files directly to NetBackup. You do this by specifying the `ARCFUNC SAVE` keywords in the NetBackup for DB2 configuration file, `db2.conf`. You must also configure an MS-Windows-NT policy with a User Backup schedule.

- Copying archived log files to another directory for later backup by NetBackup. You do this by specifying the ARCFUNC COPY keywords in the db2.conf file. You must also configure an MS-Windows-NT policy with a User Archive schedule.

  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 back up all files in the archive directory. After backup, the task can optionally delete these files to free disk space.

Note Do not specify ARCFUNC SAVE or ARCFUNC COPY if the VENDOR DB2 configuration parameter is in effect. In environments with VENDOR in effect, NetBackup ignores information pertaining to ARCFUNC SAVE or ARCFUNC COPY.

Whether to specify ARCFUNC SAVE or ARCFUNC COPY depends on the amount of user intervention you intend to provide, as follows:

- If you specify ARCFUNC SAVE, NetBackup backs up the archive logs according to the policy and schedule you specified earlier in the configuration process.

  If DB2 later issues a ROLLFORWARD request, the user exit program (db2uext2.exe) looks for the archive logs on a backup volume. At restoration time, no user intervention is required.

- If you specify ARCFUNC COPY, NetBackup copies the archive logs to the location specified on the ARCDIR statement.

  If DB2 later issues a ROLLFORWARD request and the archive logs no longer reside on the system, you might have to manually restore the archive logs to the RETDIR directory.

Using ARCFUNC SAVE

If you specify ARCFUNC SAVE, use the POLICY and SCHEDULE keywords to specifiy the name of the MS-Windows-NT policy configured earlier. For more information on configuring a MS-Windows-NT policy, see “Configuring Policies for Archive Logs and Configuration Files” on page 19.

The following example object identifier backs up the archive log files for database SAMPLE using policy db2_archive and schedule db2_archive_sched:

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


Using ARCFUNC COPY

If you specify ARCFUNC COPY, the disk to which the archive logs are copied eventually fills with archived log files. To manage this, configure an additional MS-Windows-NT policy that archives the entire ARCDIR directory to NetBackup volumes. Specify a User Archive schedule for this policy. Such a schedule instructs NetBackup to delete the online files after they have been successfully backed up. For more information on user archive schedules, see the *NetBackup System Adminstrator's Guide, Volume 1*.

If ARCFUNC COPY is specified, also specify the ARCDIR and RETDIR keywords. Typically, db2.conf files specify the same location for these files. The syntax for these keywords is as follows:

- For ARCDIR, specify the folder to which the archive logs are written. DB2 calls the user exit program (db2uext2.exe) to copy the archive logs to this folder.
- For RETDIR, specify the folder from which the user exit program can obtain the log files needed for a DB2 database restore. Typically, the RETDIR location is the same as the ARCDIR location.

The following example object identifier specifies archive log file locations for database SAMPLE:

```
DATABASE SAMPLE
OBJECTTYPE ARCHIVE
ARCFUNC COPY
ARCDIR C:\MyLogs\arcdir\
RETDIR C:\MyLogs\arcdir\
ENDOPER
```

Using ROLLFORWARD DATABASE With ARCFUNC SAVE or ARCFUNC COPY

When your DB2 database is in a rollforward pending state and you issue the ROLLFORWARD DATABASE command, DB2 requests the archive log files it needs to do the rollforward and performs the rollforward. Depending on whether ARCFUNC SAVE or ARCFUNC COPY are in effect, user intervention might be needed, as follows:

- If you specified ARCFUNC SAVE, the user exit program looks for the archive logs on the NetBackup backup media. No user intervention is needed, but their sequential recovery can be slow when dealing with numerous, large log files.
- If you specified ARCFUNC COPY, the user exit program looks for the archive logs in the RETDIR you specified in the db2.conf file. If some or all of the files have been archived to NetBackup storage, use NetBackup to restore them to the RETDIR directory before executing the ROLLFORWARD DATABASE command. The user exit program then copies the files to the DB2 primary log folder.

This method requires 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.

For information about restoring files to disk, see the the *NetBackup System Adminstrator's Guide*.

Keyword Summary

The following list summarizes the rules regarding how to specify keywords in the `db2.conf` file:

- A `db2.conf` file consists of a series of entries that define a policy and a schedule based upon an `OBJECTTYPE`.
- Specify a different `POLICY` name for `DATABASE` and `ARCHIVE` objects.
- Within a definition, `OBJECTTYPE` and `POLICY` are required keywords. Terminate each entry with an `ENDOPER` keyword. All other keywords are optional.
- Within a definition, the *`keyword value`* pairs can appear in any order.
- The keywords are not case sensitive, but their values are.
- Entries are not nested.
- Lines with a pound character (#) in the first column are treated as comment lines.

The `db2.conf` file accepts the keywords described in this section. If `VENDOR` is configured in your DB2 environment, NetBackup for DB2 ignores the following keywords and keyword phrases:

- `ARCDIR`
- `ARCFUNC SAVE`
- `ARCFUNC COPY`
- `PARTITIONTYPE RAW`
- `RETDIR`

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

Keyword *value* Pairs for the `db2.conf` File

Keyword *value*	Description
`ARCDIR` *`dir`*	Full path to the location of the archive logs. No default. Required if `ARCFUNC COPY` is also specified.

Keyword *value* Pairs for the `db2.conf` File *(Continued)*

Keyword *value*	Description
`ARCFUNC SAVE` `ARCFUNC COPY`	`ARCFUNC SAVE` saves archive logs to / from NetBackup. `ARCFUNC COPY` copies archive logs to / from `ARCDIR` / `RETDIR` directories. You must specify either `ARCFUNC SAVE` or `ARCFUNC COPY` if `OBJECTTYPE ARCHIVE` is also specified.
`DATABASE` *db_name*	DB2 database name. No default. Required only for alternate restores.
`DESTALIAS` *src_db_name* `DESTINST` *src_inst_name*	`DESTALIAS` specifies the database alias name of the destination database for an alternate restore. `DESTINST` specifies the instance name of the destination instance for an alternate restore. No default. Required only for alternate restores.
`ENDOPER`	Signals the end of a defnition. Required at the end of each definition.
`NODE` *number*	Specifies the DB2 node number. Do not specify this keyword unless you are operating within a DB2 Enterprise Extended Edition (EEE) environment. Not required. No default.

`OBJECTTYPE ALTERNATE`
`OBJECTTYPE ARCHIVE`
`OBJECTTYPE DATABASE`
`OBJECTTYPE TABLESPACE`
	Specify `OBJECTTYPE ALTERNATE` to note that the succeeding lines pertain to a performing an alternate restore.
	Specify `OBJECTTYPE DATABASE` or `OBJECTTYPE TABLESPACE` for DB2 policies. Specify `OBJECTTYPE ARCHIVE` for MS-Windows-NT policies.
	One of `OBJECTTYPE ALTERNATE`, `OBJECTTYPE ARCHIVE`, `OBJECTTYPE DATABASE`, or `OBJECTTYPE TABLESPACE` is required in all `db2.conf` files. `OBJECTTYPE ALTERNATE` is required if you are performing an alternare restore.

`PARTITIONTYPE RAW`	Specifies that NetBackup search for archive log files backed up from a raw partition during a restore. Not Required.

Keyword *value* Pairs for the `db2.conf` File *(Continued)*

Keyword *value*	Description
`POLICY` *pol_name*	Name of a NetBackup policy. If not specified, NetBackup uses the first DB2 policy found in the configuration on the NetBackup master server. If `OBJECTTYPE ARCHIVE` is specified, specify an MS-Windows-NT policy. If `OBJECTTYPE DATABASE` or `OBJECTTYPE TABLESPACE` is specified, then a DB2 policy must be specified.
`RETDIR` *dir*	Full path to the location from which the archive logs are retrieved. No default. Required if `ARCFUNC COPY` is also specified.
`SCHEDULE` *sched_name*	NetBackup schedule name in policy. The default is the first application backup in the policy.
`SRCALIAS` *src_db_name* `SRCINST` *src_inst_name*	`SRCALIAS` specifies the database alias name of the source database for an alternate restore. `SRCINST` specifies the instance name of the source instance for an alternate restore. No defaults. Required only for alternate restores.

Environment Variables

The NetBackup automatic scheduler creates the environment variables in the following table when it executes a NetBackup for DB2 backup / restore template or script. You can use the `DB2_FULL`, `DB2_INCR`, and `DB2_CINC` variables within a script to determine the type of backup requested.

Note Only Netbackup's backup and restore templates and scripts use the environment variables in the following table. These variables are unknown to the DB2 backup and restore commands. For example, the backup and restore commands do not

process the DB2_POLICY variable. Instead, the templates and scripts use the POLICY name defined in the *install_path*\NetBackup\dbext\db2\db2.conf file.

DB2 Environment Variables

Enviroment Variable	Purpose
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. Enabled 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).
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.

Enabling Database User Authentication

Because the NetBackup client service is, by default, started under the SYSTEM account, special attention must also be given to database user authentication. The SYSTEM account does not have permission to connect to the target database. run the NetBackup client service under an account that has SYSADM, SYSCTRL, or SYSMAINT privileges for DB2, and the account name must comply with the DB2 naming rules. Use the following procedure to change the user account.

▼ To change the user account for the NetBackup client services

1. Choose **Start** > **Settings** > **Control Panel**.
2. From the Control Panel, open **Services**.
3. Highlight **NetBackup Client Service**, and click **Stop**.
4. Click **Startup**.
5. From the **Log ON As:** pane, select **This Account**.
6. Type in the account name with SYSADM, SYSCTRL, or SYSMAINT privileges.
7. Type in the password.
8. Click **OK**.
9. Click **START** to restart the service.

For more information on naming rules and authentication, see your DB2 documentation.

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 controls the backup job on the NetBackup for DB2 client. You 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 creates backup templates. This wizard is initiated from the NetBackup Backup, Archive, and Restore interface. For more information, see "Creating a Backup Template Using the NetBackup for DB2 Backup Wizard" on page 49.

The NetBackup for DB2 Backup Wizard does not support all of the commands and options provided by DB2. If a template does not provide all of the required functionality, you must write a script.

Shell Scripts

Shell scripts are written by the user and must conform to DB2 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. For more information on the sample scripts, see "Creating DB2 Scripts Manually" on page 54.

NetBackup for DB2 also provides a utility, `bpdbsbdb2`, that can generate a shell script from a backup wizard template. This allows you to create a template with the wizard and then generate a shell script from it. You can then run the shell script or modify the shell script further. For more information, see "Creating Shell Scripts Using bpdbsbdb2" on page 52.

Specifying the NetBackup Master Server from the Client

Use the Backup, Archive, and Restore interface to specify the NetBackup master server from the client. Setting the master server in the client interface ensures that the templates you create are saved to the master server upon which you created the NetBackup for DB2 policies.

▼ **To specify the master server**

1. In the Backup, Archive, and Restore interface, click **File** > **Specify NetBackup Machines and Policy Type**.
2. In the dialog, click the **Servers** 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**.

Creating a Backup Template Using the NetBackup for DB2 Backup Wizard

Create the backup template using the DB2 backup wizard. You can access this wizard from the Backup, Archive, and Restore interface.

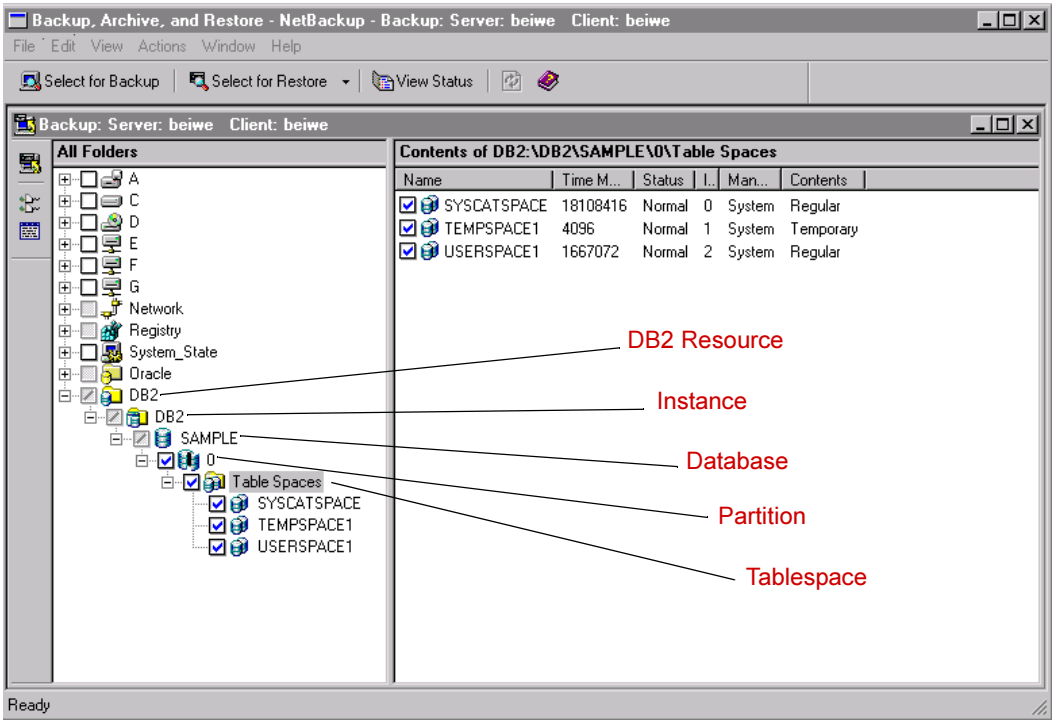
Browsing for the DB2 Instance to Back Up

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

▼ **To browse for a DB2 instance**

- ❖ To start the Backup, Archive, and Restore interface from the **Start** menu, click **Programs** > **VERITAS NetBackup** > **Backup, Archive, and Restore**

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 **Select for Backup** 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 child objects beneath it. The following table explains 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.
Instance	The second level object is a DB2 instance. An instance represents a collection of DB2 databases.
Database	You cannot select a database for backup directly, but by selecting all partitions below it, you can effectively select the whole database. If you select the database for backup, you cannot select other databases. If you select objects within the database, you cannot select objects within other databases at the same time.

DB2 Database Objects in the Backup Window

Partition	The partition is the highest selectable DB2 object. A partition represents a collection of storage within a database in which tablespaces are stored. Partitions contain tablespaces and log folders. Within a database, you can select one or more partitions. 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). The display includes only partitions that reside on the same NetBackup client. It does not display other partitions on remote hosts. For more information, see the Caution that follows this table.
Tablespace	A tablespace is a logical entity representing a collection of physical storage containers. Tablespaces are comprised of containers, which represent database storage units. A tablespace is the lowest-level DB2 object that you can select in the browser.

Caution Because the Backup, Archive, and Restore interface only displays local or resident partitions, templates created on the local client do not back up partitions on remote hosts. 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

After you select the DB2 objects 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 uses 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**.

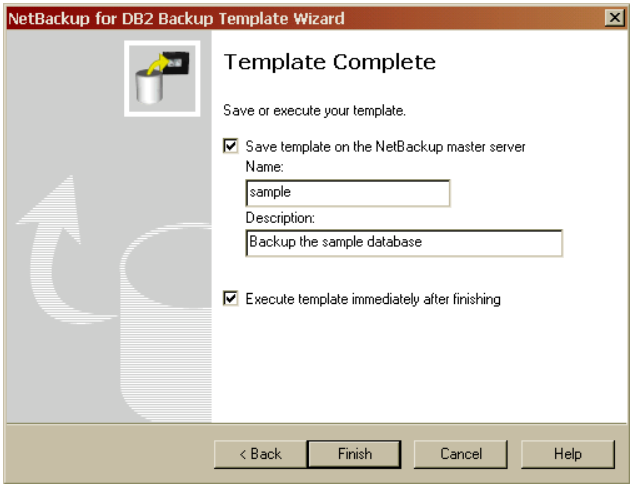
   The NetBackup for DB2 Backup Wizard displays the following screens for you to enter information about the backup operation you want to perform:

   - 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 that initiates template-based, user-directed backup and recovery. It also generates DB2 shell scripts from templates created by the backup wizard.

To create a shell script, issue this command with the following options:

```
bpdbsbdb2 -backup -g script_file_name -t template_name
```

script_file_name	Generates a shell script from a template. Enclose *script_file_name* in quotation marks (" ") if it contains space characters. Do not use this option with this command's -r (for "run") option. For more information, see "Using bpdbsbdb2" on page 72.
template_name	Identifies the template. bpdbsbdb2 retrieves backup templates from a known location on the master server. Specify only the file name.

Caution It is the user's responsibility to review and customize any and 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, so they require manual editing. In addition, generated scripts do not handle all possible error and failure cases and should be used *at your own risk.*

Scripts generated for Windows are intended to be executed using the DB2CMD command processor provided with DB2, DB2CMD C:\TEMP\SCRIPT.CMD. For more information, see the *DB2 Commands User's Guide.*

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. They 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 fails if your version is prior to DB2 V8.1.

When attempting a point-in-time restore, customize the time value. The command DB2 RESTORE ... TAKEN AT strictly interprets the specified time and succeeds only if a backup image with the same time exists. For more information, see your IBM DB2 documentation. This limitation does not exist for templates, which search for an appropriate image.

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

If a script performs a rollforward recovery, customize the DB2NODE variable. In single partition environments, this variable can typically be empty, for example, "DB2NODE=". In a multiple partition environment, set this variable to the catalog partition number.

Creating DB2 Scripts Manually

The NetBackup for DB2 installation software includes the following scripts:

```
db2_backup_db_offline.cmd
db2_backup_db_online.cmd
db2_restore_db.cmd
db2_mpp_backup_offline.cmd
db2_mpp_restore_db.cmd
```

They are installed in the following location:

install_path\NetBackup\dbext\db2\samples\

By default, *install_path* is C:\Program Files\VERITAS.

Note Be sure to modify these scripts for your environment. Do not store your scripts in the sample directory because they are lost if you upgrade or reinstall. 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 does 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 are using DB2 EEE, see "Configuration for a DB2 EEE (DPF) Environment" on page 123.

▼ **To modify the backup and install scripts**

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

2. Modify the script

a. Use a text editor, such as Notepad, to open the script.

b. Follow the instructions in the script.

3. Test the scripts you just created by starting a manual backup of this policy as explained in "Testing Configuration Settings" on page 57.

Script Parameters

The NetBackup for DB2 templates and scripts read parameters from the environment when performing backup and restore operations. The parameters can come from the following sources:

- Environment Variables
- 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 more information, see "Configuring the Runtime Environment" on page 37.

Storing Templates and Scripts

Templates

The Backup Wizard saves a backup template to a NetBackup specific location on the current NetBackup master server. NetBackup retrieves a backup template from the master server as part of a backup (server-directed, scheduled, or user-directed) and runs it 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 use the same copy of the template for each client in the policy client list.

The 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 70.

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. For more information, see “Adding Backup Selections” on page 29.

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

Storing Templates and Scripts in a NetBackup Cluster

“Templates” on page 55 and “Shell Scripts” on page 56 pertain to NetBackup for DB2 environments that are not installed in a NetBackup Cluster. If you are operating within a NetBackup Cluster, make sure that the restore templates and shell scripts reside in a file system that is shared between all nodes in the cluster.

Testing Configuration Settings

After configuring the master server for NetBackup for DB2, test the configuration settings by performing a manual backup (or backups) using the automatic backup schedules you have created.

▼ To test the configuration settings

1. Log onto the master server as administrator (Windows) or root (UNIX).
2. Start the NetBackup Administration Console.
3. In the left pane, click **Policies**.

   From the Windows interface: The policy list appears in the right pane.

   From the Java interface: The right pane splits into an **All Policies** pane and a details pane.
4. Click the policy you want to test.
5. Choose **Actions** > **Manual Backup**.

   The Manual Backup dialog box appears.

   The Schedules pane contains the name of an automatic schedule (or schedules) configured for the policy that you are going to test. The Clients pane contains the name of the client(s) listed in the policy that you are going to test.
6. Follow the directions in the Manual Backup dialog box.
7. Click **Activity Monitor** on the NetBackup Administration Console.

   If the manual backup does not exit with a successful status, see "Troubleshooting" on page 107.

For a description of status codes and other troubleshooting information, see the *NetBackup Troubleshooting Guide*.

Backing up the Database and Archive Logs

Back up the database and archive logs as soon as possible after NetBackup for DB2 is configured and tested.

▼ To back up your configuration

- ❖ Use the templates or scripts you have created in this chapter to back up your DB2 database, archive logs, and configuration files.

For information on how to perform a backup, see "Using NetBackup for DB2" on page 59.

Using NetBackup for DB2 4

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

This chapter contains the following sections:

- Performing a Backup
- Browsing Backups
- Performing a Restore

Caution Always specify the correct DB2 script or template when configuring automatic backups or when starting operations through NetBackup. NetBackup for DB2 does 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

Overview

This section describes the different ways you can perform a backup and explains the relationships between settings.

NetBackup for DB2 provides the following ways to perform backups:

- By issuing a DB2 command from the DB2 control center or command line processor. The DB2 `BACKUP` and `RESTORE` commands use the policies, schedules, and settings specified in the following sources:
  - The NetBackup for DB2 vendor I/O library. This library is named `nbdb2.dll`.
  - The NetBackup for DB2 configuration file. This file is named `db2.conf`.
- By running a script from the operating system command line. You can create scripts from scratch, or you can base a script on a template that you created earlier.
- Through templates initiated from the template wizards or Template Administration interface.
- Through templates and scripts specified in policies. When you back up a NetBackup policy, it uses the templates and scripts specified in the policy.

There are three main types of DB2 backups: database backups, archive log backups, and configuration file backups.

- A database backup is a copy of the entire DB2 database or tablespace. This backup is accomplished by issuing 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. If `VENDOR` is enabled in the DB2 configuration files, NetBackup for DB2 backs up the archive logs along with the database files. If the user exit program is enabled in the DB2 configuration file, you need a separate policy and schedule to back up the archive logs.
- A configuration file backup is a backup of the DB2 configuration files that you need in order to recover the database in the case of a disaster. You can use an MS-Windows-NT policy with a User Backup schedule to back up the files. For information on which files to back up, see your IBM DB2 documentation.

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 as follows:

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

The DB2 scripts initiate the database backup.

To add a new schedule or change an existing schedule for automatic backups, follow the guidelines in “Configuration” on page 17.

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

The following information applies only if you are using the user exit program to back up the archive logs:

- If an online backup of a partition is requested, the user exit program must be enabled. If not, an offline partition backup is attempted. An offline backup is also attempted if the database is in backup-pending mode.
- If a tablespace backup is requested, the user exit program must be enabled. If not, template execution fails because DB2 does not support offline tablespace backups.

For more information about templates, see “Running a NetBackup for DB2 Backup Template” on page 62.

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 those in“Testing Configuration Settings” on page 57.

For instructions on initiating a backup of a DB2 policy, see “Testing Configuration Settings” on page 57.

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 tablespaces residing with the same partition are processed together. For example, if tablespace `T1` resides in partition `P1`, and tablespaces `T2` and `T3` reside in partition `P2`, the processing order is as follows:

1. Process tablespace `T1` in partition `P1`.
2. Process tablespaces `T2` and `T3` in partition `P2`.

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

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 system issues the DB2 `QUIESCE` command before performing the backup or restore. In versions prior to DB2 V8.1, this feature is not available; 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 interface is available in the NetBackup Backup, Archive, and Restore interface. The DB2 Template Administration window provides the following functions:

Function	Purpose
Run	**Run** processes the selected template.
Edit	**Edit** changes the contents of an existing template. The selected template is loaded into the NetBackup for DB2 Template Generation Wizard.

Delete	**Delete** removes the selected template. You must be the root user or the template creator to delete a template.
Rename	**Rename** changes the name of the selected template. You must be the root user or the template creator to rename a template.
View	**View** displays a summary of the selected template.

The templates created by the NetBackup for DB2 template generation wizard are stored in a predetermined location on the master server. For more information, see "Creating a Backup Template Using the NetBackup for DB2 Backup Wizard" on page 49.

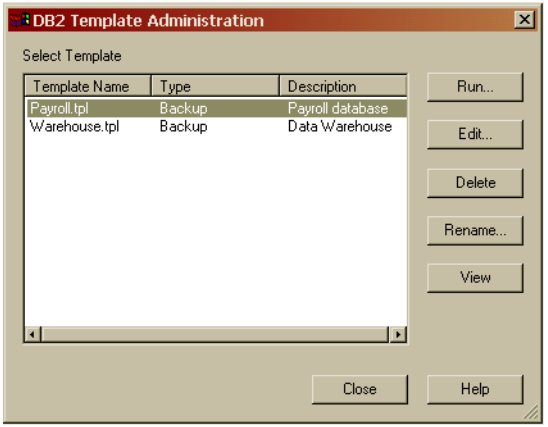
▼ To use the DB2 Template Administration interface

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

   Click **Backup, Archive, and Restore** in the left pane of the NetBackup Administration Console.

2. 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.

3. Select the name of the backup template you want to run.

4. Click **Run**.

   The Run dialog displays.

5. Type your **User Name** and **Password**.

6. Click **OK**.

   A Template Summary window displays.

7. Click **Run**.

   The template runs 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**.

Using bpdbsbdb2

The `bpdbsbdb2` command runs a backup template created by the NetBackup for DB2 Backup Wizard. At the command prompt, issue the `bpdbsbdb2` in the following format:

```
bpdbsbdb2 -backup -r -t template_name
```

In the preceding command, `-r` runs a template and `-t` identifies the template.

For example:

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

`bpdbsbdb2` retrieves backup templates from a predetermined location on the master server, so you only need to specify the template file name.

Using DB2 to Perform a Backup

You can start a backup by executing the DB2 `BACKUP DATABASE` command from the DB2 command window on the client.

Depending on the release of DB2 that you are using, issue the `BACKUP DATABASE` command in one of the following formats to perform a backup.

Format 1 - Supported in all DB2 Releases

Issue the command in the following format:

```
db2 backup db sample load install_path\NetBackup\bin\nbdb2.dll
```

For example:

```
db2 backup db sample load C:\Program Files\Veritas\NetBackup\bin\nbdb2.dll.
```

Format 2 - Supported in DB2 8.2 and Later Releases

If you are using a DB2 8.2 or later release and if VENDOR is enabled, you can use the command in the following format:

```
db2 backup db sample online load install_path\NetBackup\bin\nbdb2.dll include logs
```

For more information on the DB2 BACKUP DATABASE command, see your IBM DB2 documentation.

BACKUP DATABASE Command Options

You can back up a DB2 database with either the DB2 BACKUP DATABASE command or with its alternative syntax, BACKUP DB. This command backs up a database to NetBackup. The following list provides reference information for the DB2 BACKUP command options when used in a NetBackup for DB2 environment.

Option	Purpose
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 you have multiplexing enabled in NetBackup. Use this option only if you are using the user exit program to back up the archive logs. This option does not apply if you specified a VENDOR library.
WITH *number* BUFFERS	Use this option when opening multiple sessions. See OPEN *number* SESSIONS. The number of buffers must be twice the number of sessions. Use this option only if you are using the user exit program to back up the archive logs. This option does not apply if you specified a VENDOR library.
BUFFER *size*	Use this option to increase or decrease the buffer size, if necessary. Increased size can benefit performance, but decreased size might 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. It must be specified in backup scripts executed by NetBackup.
INCREMENTAL	Use this option to perform a cumulative backup.

Option	Purpose
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. Use this option only if you are using the user exit program to back up the archive logs. This option does not apply if you specified a VENDOR library.

Browsing Backups

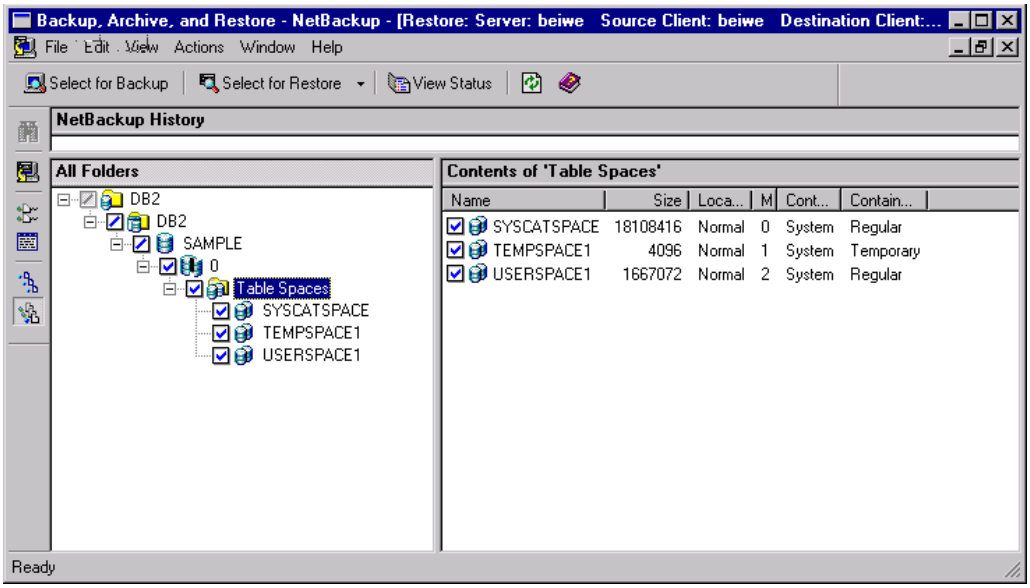
This section describes how to browse backup images. You can also use the DB2 LIST HISTORY command.

Using the Backup, Archive, and Restore Interface 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 allow you to browse 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. For more information, see “Using the NetBackup for DB2 Recovery Wizard” on page 70.

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 tablespace level. You can select a tablespace or tablespaces, a partition or partitions, or one entire database (by selecting all of its partitions) for the restore.



Using bplist to Browse

You can use the `bplist` command to search DB2 backup images.

The examples in this section use `bplist` to search all DB2 backup images for a client named `camel`, which is also the master server. The information comes from the NetBackup catalog on the master server. For more information on the `bplist` command, see the NetBackup online help.

The output from `bplist` differs depending on how you are managing your archive log files. Examples 1 and 2 assume that the user exit program is used to back up the archive logs. Example 3 assumes that `VENDOR` is set and that the user exit program is not used to back up the archive logs.

Example 1

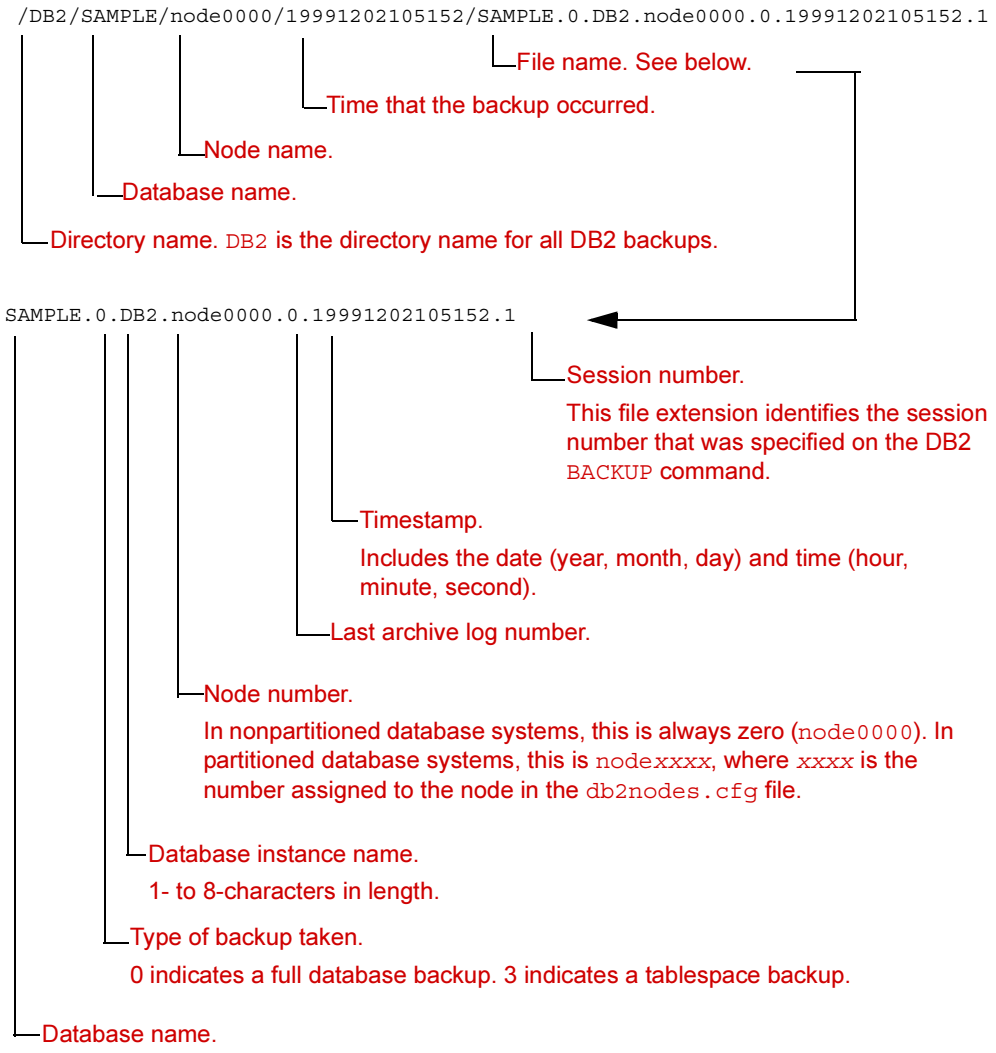
The `-t 18` option on this command specifies the DB2 backup type. The `bplist` output shows the DB2 database backup images that are stored in the NetBackup database.

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

Output from bplist



Example 2

This example uses bplist to search for all DB2 archive log file backups. The -k DB2_Log_Policy option 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 /
C:\DB2\NODE0000\SQL00001\SQLOGDIR\S0000026.LOG
C:\DB2\NODE0000\SQL00001\SQLOGDIR\S0000025.LOG
C:\DB2\NODE0000\SQL00001\SQLOGDIR\S0000024.LOG
```

Example 3

This example uses bplist to search for DB2 archive log files. The -k log_policy option specifies files backed up using this policy. The output format in the following example differs from the previous examples because for this database, the VENDOR archive log method is enabled in DB2:

```
install_path\NetBackup\bin\bplist -C camel -S camel -k log_policy -R /
C:\DB2\SAMPLE\LOGFILE\node0000\db2v864d\C00000_S00000.LOG
```

The following list explains the information in this example's bplist output.

Output Component	Meaning
DB2	DB2 is the folder name for all DB2 backups.
SAMPLE	Name of the database.
LOGFILE	Identifies this as a logfile.
node0000	Name of the node.
db2v864d	Name of the DB2 instance.
C0000_S00000.LOG	Name of the log file. Provided by DB2.

Performing a Restore

Using 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 typical circumstances, a recovery template is 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 might be necessary to perform manual steps as part of the operation. For more information, see your IBM DB2 documentation.

▼ To start the Backup, Archive, and Restore interface from the NetBackup Administration Console

You can launch the NetBackup for DB2 Recovery Wizard from the Backup, Archive, and Restore interface. You can access the interface through the NetBackup Administration Console or from the command line.

- ❖ Click **Backup, Archive, and Restore** in the left pane of the NetBackup Administration console.

▼ To select for restore

1. Click **Select for Restore**
2. Expand the DB2 resource in the left pane to view a DB2 instance hierarchy.
3. Select a node in the left pane to view details in the right pane.

▼ To change the client policy type

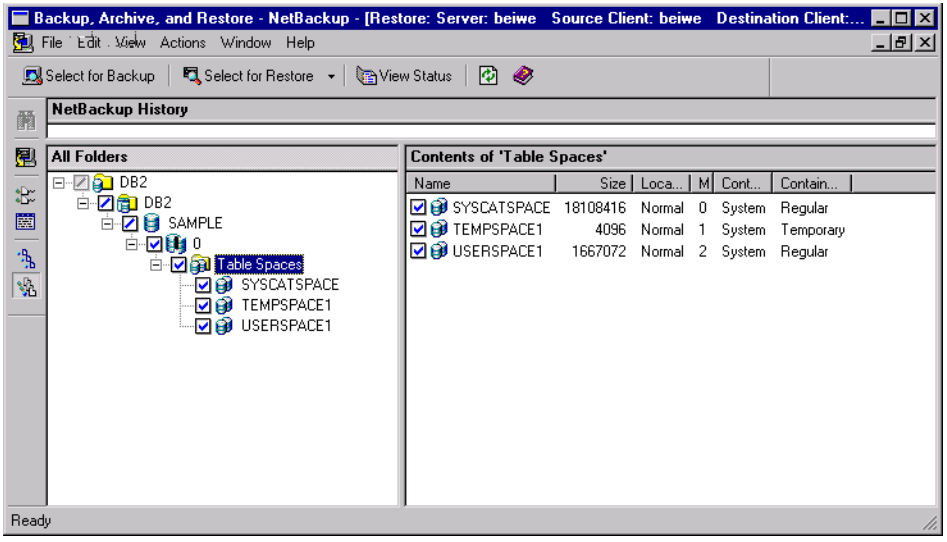
If the DB2 node is not visible, it is possible that your NetBackup for DB2 client does not have the appropriate policy type specified. Complete the following steps to change the policy type:

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**.

▼ To use the Recovery Wizard

When you are ready to perform a recovery, complete the following steps to create and run a template with the Recovery Wizard:

1. In the Backup, Archive, and Restore interface, expand a DB2 instance and select the database object(s) you want to restore.
2. Click **Actions** > **Start Restore of Marked Files**.



The NetBackup for DB2 Recovery Wizard displays the following screens for you to enter information about the restore 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, save the template locally, or both. For explanations of your choices, click **Help**.

When running a template, all restore operations are performed before any and all rollforward 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, not the activity monitor, is the best indication of overall success.

Caution The DB2 warning SQL2539W indicates that the requested restore operation will replace the existing database. That is, the existing database files will be deleted. When running 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 rollforward recovery. If the template is configured to perform a rollforward, this step is skipped.

Template execution does not support the use of local time when performing a rollforward. The rollforward time specified in the template is passed to DB2, and it is interpreted as GMT by DB2. For more information, see the `ROLLFORWARD` command in your DB2 documentation.

Using bpdbsbdb2

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

At the command line, type the following:

install_path\netbackup\bin\bpdbsbdb2 -restore -r -t *templ_name*

The -r option runs the template, and the -t option identifies the template

For example:

bpdbsbdb2 -restore -r -t \db2\restore_templates\full_restore.tpl

Restore templates do not reside in a predetermined location on the master server. They are considered to be temporary in nature and should reside on the client. If the full path is not specified as part of the restore template name, the file might not be found.

For details about creating a script from a template using bpdbsbdb2, see "Creating Shell Scripts Using bpdbsbdb2" on page 52.

Using DB2 to Perform a Restore

The exact process for recovering a DB2 database differs from site to site depending on the methods used for backing up the archive logs, the settings used in the NetBackup for DB2 configuration file, db2.conf, and the location of the archive logs.

The procedures in the following sections show how to restore the example database, SAMPLE, to the level of a recent database backup plus archive logs:

- "Recovering a DB2 Database - Simplest Case" on page 73. You can use this procedure if the archive logs are in an accessible location and they were all created using the same parameters in db2.conf.
- "Recovering a DB2 Database - Restoring Archive Logs" on page 74. This is the more complex case. Use this procedure if you have to browse for archive logs and restore them from secondary storage.

For more information on how to recover a DB2 database, see the *DB2 UDB Administration Guide Data Recovery and High Availability Guide*.

Recovering a DB2 Database - Simplest Case

The DB2 commands for recovering a database differ from release to release. You can use the procedure in this section to restore a database if the archive logs are in a location that is known and accessible to DB2 and NetBackup.

For example, you can probably use the procedure in this section if the following are true:

- If ARCFUNC SAVE was in effect in the db2.conf file when all archive logs were backed up.
- If ARCFUNC COPY was in effect in the db2.conf file when all archive logs were backed up and the logs were not moved from the ARCDIR and RETDIR directories.

- If VENDOR was in effect in DB2 at the time all the archive logs were created.

The commands in the following procedure restore a DB2 database and its archive logs. These commands assume that the archive log files reside in a location that is known and accessible to DB2 and Netbackup.

▼ To restore a DB2 database when the archive logs are accessible to DB2 and NetBackup

❖ Depending on the release level of DB2, enter one of the following commands:

- For DB2 8.2 and later releases, enter the following command:

  db2 recover db *db_name*

- For DB2 releases prior to 8.2, enter the following two-command sequence:

```
db2 restore db db_name load install_path\NetBackup\bin\nbdb2.dll
db2 rollforward db db_name to end of logs and stop
```

For *db_name*, specify the name of the DB2 database you are restoring.

Recovering a DB2 Database - Restoring Archive Logs

You can use the procedure in this section if you need to restore the archive logs before you perform the rollforward. Use the procedure in this section to restore the archive logs manually if the following situations exist:

- If the archive logs are not in standard locations, which prevents NetBackup from performing a seamless restore of DB2. This might be the case if you moved one or more of the needed archive logs to secondary storage such as tape, network storage, or some other location. For example, if ARCFUNC COPY is in effect and the old archive logs were moved to tape, perform procedure in this section.
- If ARCFUNC COPY was in effect in the db2.conf file at the time the archive logs were backed up *and* the ARCDIR and RETDIR parameters specify two different locations.
- If PARTITIONTYPE RAW was in effect in the db2.conf file for some, but not all, of the archive log backups.

▼ To restore a DB2 database when the archive logs are in a nonstandard location

1. Restore the database.

   Issue the DB2 RESTORE DATABASE command to restore the database itself. For example:

```
db2 restore db db_name load install_path\NetBackup\bin\nbdb2.dll
```

where *db_name* is the name of the DB2 database you are restoring.

2. Use NetBackup to browse the archive logs.

   If a restore requires log files backed up from a file system and log files backed up from a raw device, retrieve the logs from the file system manually.

   You can use either the Backup, Archive, and Restore interface or the `bplist` command to browse the archive logs and find those missing from the restore directories.

   If `PARTITIONTYPE RAW` is specified in the `db2.conf` file, the user exit program looks for only those logs when performing the restore. The missing logs are those that were written when `PARTITIONTYPE RAW` was *not* in effect.

   For more information, see "Browsing Backups" on page 66.

3. Use operating system commands to copy the missing archive logs to the correct locations in your operating system.

   For example, use your mouse to copy the files from one location to another.

   If `ARCFUNC COPY` is in effect and the `ARCDIR` and `RETDIR` parameters specify different locations, copy the logs in the `ARCDIR` directory to the `RETDIR` directory. If `ARCDIR` and `RETDIR` specify the same location, you do not have to take any action. If some of the log files have been moved to secondary storage, restore these files to the `RETDIR` directory.

4. Use NetBackup to restore the archive logs.

   Use either the NetBackup Backup, Archive, and Restore interface or the `bprestore` command. For example:

```
bprestore C:\vedb2\db2\v8\db2V832d\NODE0000\SQL0001\SQLOGDIR\S0000009.LOG
```

5. Bring the database online.

   When the rollforward is initiated, DB2 sends a request to NetBackup to restore the log files it needs. DB2 then reapplies the transaction information in the archive logs since the last full backup was performed and brings the database back online.

   For example, you can use the following command options if `PARTITIONTYPE RAW` was not specified when any of the log files were backed up:

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

   The `ROLLFORWARD DATABASE` command issues messages if it cannot locate all the archive log files it needs. If you receive these messages, browse and restore the missing archive log files, and issue the `ROLLFORWARD DATABASE` command again.

After the database is successfully restored, the ROLLFORWARD DATABASE command restores and reapplies the transactions recorded in the archive log files since the last backup was performed. 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.

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

RESTORE DATABASE Command Options

You can restore a DB2 database with either the DB2 RESTORE DATABASE command or with its alternative syntax, RESTORE DB. The DB2 RESTORE DATABASE command restores a database from NetBackup. The following list provides reference information for the DB2 RESTORE command options when used in a NetBackup for DB2 environment.

Option	Purpose
LOAD *NBDB2_Library_Path*	Instructs DB2 to use the NBDB2 vendor library when performing the restore.
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 if you have multiplexing enabled in NetBackup. Typically, you should specify the same number of sessions used during the backup. Using fewer sessions is allowed, but it might degrade overall restore performance. Specifying more sessions has no benefit. Use this option only if USEREXIT or LOGRETAIN are in effect. This option does not apply if VENDOR is in effect.
WITH *number* BUFFERS	Use this option when opening multiple sessions. See OPEN *number* SESSIONS. The number of buffers must be twice the number of sessions. Using fewer buffers can degrade performance or can cause the restore to fail when reading multiplexed images. Use this option only if USEREXIT or LOGRETAIN are in effect. This option does not apply if VENDOR is in effect.
BUFFER *size*	Use this option to increase or decrease the buffer size if necessary. Increased size can benefit performance, while decreased size might be necessary if using numerous buffers. DB2 alters the actual size to be a multiple of the size used during the backup.

`WITHOUT PROMPTING`	This option is required for unattended restores, and it must be specified in backup scripts executed by NetBackup.
`INCREMENTAL`	When using this option, DB2 might not read the entire image from NetBackup media. Consequently, NetBackup logs an error in the Activity Monitor, which can safely be ignored.
`AUTOMATIC`	Use this option to restore a series of full and incremental images. An automated restore coordinates the restoration of a full backup and all associated incremental backups. A single automated restore restores a full backup, an optional cumulative incremental backup, and one or more differential incremental backups.
`HISTORY FILE`	When using this option, DB2 might not read the entire image from NetBackup media. Consequently, NetBackup logs an error in the Activity Monitor, which can safely be ignored.

Performing an Alternate Restore

An alternate restore allows you to restore a DB2 database to a different client or to a different instance. You can also change the name of the database during the restore.

When to Use an Alternate Restore

Alternate restores differ from regular restores, as follows:

- Use the regular restore procedures described earlier in this chapter if you are restoring a database into the same instance on the same NetBackup client that hosted it previously. In this case, the database also retains its original name.
- Use use alternate restore procedures described in this section if you are restoring a database to a different instance or to a different client or if you must rename the database during the restore.

  Databases within an instance must have unique names. If you restore a database into an instance that already has a database by that name, the alternate restore process overwrites the existing database.

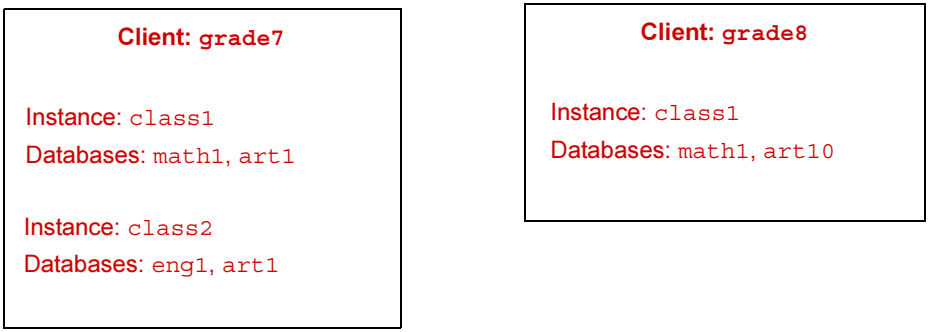
The following table summarizes the types of restores you can perform and whether you need to use regular or alternate restore procedures:

Types of Restores Permitted

Object	Regular Restore	Alternate Restore	Alternate Restore	Alternate Restore	Alternate Restore	Alternate Restore	Alternate Restore	Alternate Restore
Database name	Same	Same	Same	Different	Same	Different	Different	Different
Instance	Same	Same	Different	Same	Different	Different	Same	Different
Client	Same	Different	Same	Same	Different	Same	Different	Different

For example, assume that you have two NetBackup clients, `grade7` and `grade8`. Instances `class1` and `class2` are on `grade7`. Instance `class1` is on `grade8`. The following figure shows this:

Alternate Restore Example



The following list shows some of the types of restores you can perform using alternate restore procedures:

- You can restore database `eng1` from instance `class2` on client `grade7` into instance `class1` on client `grade8`. Database `eng1` can retain its name because it is unique to instance `class1`.
- You can restore database `math1` from instance `class1` on client `grade7` into instance `class1` on client `grade8`. During the restore, you need to rename `math1` to `math2` because `class1` on `grade8` already has a database named `math1`. Without renaming, the existing database `math1` would be overwritten.

- You can restore database art1 from instance class2 on client grade7 into instance class1 on client grade7. During the restore, you need to rename art1 to art2 because instance class1 already has a database named art1. Without renaming, the existing database art1 would be overwritten.

Preparing the Master Server for an Alternate Restore

The examples in the following procedure assume that database SAMPLE was backed up by client2, and you want to restore SAMPLE to client1.

▼ To prepare the NetBackup master server for alternate restores

1. Log onto the NetBackup master server that hosts the policy that backed up database SAMPLE.

2. Create one of the following files on the NetBackup master server:

   install_path\NetBackup\db\altnames\No.Restrictions

   Or

   install_path\NetBackup\db\altnames*dest_client_name*

   where *dest_client_name* is the name of a client that is allowed to be a destination client for alternate restores. For example, client1.

3. (Conditional) Add the name of the NetBackup for DB2 source client to the *dest_client_name* file.

   Perform this step if you created a *dest_client_name* file. For example, add the following line to this file:

   client2

4. Start the Backup, Archive, and Restore interface.

5. Click **File > Specify NetBackup Machines and Policy Type**.

6. Specify the source and destination clients.

   a. For the NetBackup server, specify the name of the master server that contains the policy that backed up the database.

   b. Specify the source client. For example: client2.

   c. Specify the destination client. For example: client1.

For more information on managing client restores, see the the *NetBackup System Administration Guide, Volume 1*.

Performing the Alternate Restore on the Clients

The following procedures explain how to restore a DB2 database and its transaction logs.

▼ To perform an alternate restore of a DB2 database

This procedure builds a request to DB2 to find the backup images that correspond to the database you are trying to restore. Type the commands in this procedure from the client that is receiving the restored database.

1. Modify the `db2.conf` file on the destination client by adding the following new object identifiers:
   - One to specify the alternate restore
   - One to define the new database
   - One to define the old database
   - One to define the new log files
   - One to define the old log files

   The following example shows the keyword lines needed to specify the alternate restore:

   ```
   OBJECTTYPE ALTERNATE # Specifies an alternate restore
   SRCINST db2v832d     # Names the source instance that was backed up
   SRCALIAS SAMPLE      # Names the source database that was backed up
   DESTINST db2v832t    # Names the destination instance name
   DESTALIAS NEWSAMPL   # Names the destination database alias name
   ENDOPER              # Ends the object identifier
   ```

   The following example shows the keyword lines needed to define the new database:

   ```
   DATABASE NEWSAMPL
   OBJECTTYPE DATABASE
   POLICY db2-bkup
   SCHEDULE Default-Application-Backup
   ENDOPER
   ```

   The following example shows the keywords lines needed to define the old database:

   ```
   DATABASE SAMPLE
   OBJECTTYPE DATABASE
   POLICY db2-bkup
   SCHEDULE Default-Application-Backup
   ENDOPER
   ```

The following example shows the keyword lines needed to define the new data archive log files:

```
DATABASE NEWSAMPLE
OBJECTTYPE ARCHIVE
POLICY db_a_db2
SCHEDULE Default-Application-Backup
#SCHEDULE User
ARCFUNC SAVE
#ARCFUNC COPY
#ARCDIR C:/home/db2inst1/arcdir
#RETDIR C:/home/db2inst1/arcdir
ENDOPER
```

The following example shows the keyword lines needed to define the old data archive log files:

```
DATABASE SAMPLE
OBJECTTYPE ARCHIVE
POLICY db_a_db2
SCHEDULE Default-Application-Backup
#SCHEDULE User
ARCFUNC SAVE
#ARCFUNC COPY
#ARCDIR C:/home/db2inst1/arcdir
#RETDIR C:/home/db2inst1/arcdir
ENDOPER
```

2. On the destination client, type the DB2 RESTORE command.

Type this command in the following format:

```
db2 restore db db_being_restored load lib_path into new_db_name redirect
```

where:

db_being_restored	Specify the name of the database that was backed up.
lib_path	Specify the full path to the NetBackup library.
new_db_name	Specify the name for the new database. If the name of the new database matches the name of a database presently included in the new instance, the new database overwrites the existing database.

For example:

```
db2 restore db sample load install_path\NetBackup\bin\nbdb2.dll into newsampl redirect
```


3. Set the location of the data files for the tablespace.

   Type this command in the following format:

```
db2 set tablespace containers for 0 using "(path path)"
```

   where *path* specifies the DB2 install path.

   For example, type one or more commands similar to the following:

```
db2 set tablespace containers for 0 using "(path
DB2_install_path\db2v832t\NODE0000\SQL00001\SQLT0000.0)"
```

4. Restore the database.

   Type the RESTORE command in the following format:

   db2 restore db *db_bring_restored* continue

   For example:

   db2 restore db sample continue

5. (Optional) Restore the transaction logs.

   Perform this step if one of the following is true:

   - The archive logs did not originally reside on a raw device.
   - The user exit program was used to back up the archive logs.

   a. On the destination client, create a directory for the restored transaction log files.

      For example:

      mkdir C:\db\db2_v5\home\db2inst1\NODE0000\SQL00001\SQLOGDIR

   b. Use the bprestore command to restore the logs.

      For example:

```
bprestore install_path\db\db2_v5\home\db2inst1\NODE0000\SQL00001\SQLOGDIR\S00001.LOG
```

   c. (Optional) Move the logs to the correct directory for the destination database.

      If the directory into which you restored the log files is not the correct directory for the destination database, move the logs to the proper location.

   d. Verify that the correct owner and group permissions are enabled on the log directory.

6. Use the DB2 ROLLFORWARD command to restore the logs.

   Type this command in the following format:

```
db2 rollforward db new_db_name to end of logs and stop
```

For example:

```
db2 rollforward db newsampl to end of logs and stop
```


NetBackup for DB2 with Advanced Client 5

This chapter explains how to use NetBackup for DB2 with NetBackup Advanced Client to perform snapshot 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

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

- NetBackup for DB2 6.0
- NetBackup Advanced Client 6.0

No additional VERITAS NetBackup software is required. You might need to modify other hardware and software configurations. For more information about the following, see the *NetBackup Advanced Client System Administrator's Guide*:

- How to install and configure the NetBackup Advanced Client
- Configuration requirements for specific advanced backup methods

NetBackup for DB2 with Advanced Client Overview

The following sections describe the NetBackup Advanced Client features that are available for use with NetBackup for DB2.

Snapshot Backup

A *snapshot* is a disk image of the client's data made almost instantaneously. When used in conjunction with NetBackup Advanced Client, NetBackup for DB2 can back up DB2 objects by taking snapshot images of the component files. Later, it backs up the snapshot version, either to a Media Manager or disk storage unit.

Snapshot backup captures the data at a particular instant without causing significant client downtime. Client operations and user access continue without interruption during the backup. The resulting capture or snapshot can be backed up without affecting the performance or availability of the database.

Instant Recovery

This feature makes backups available for *instant recovery* from disk. Instant recovery combines snapshot technology with the ability to do rapid disk-based restores. NetBackup creates the image without interrupting user access to data. Optionally, the image is retained on disk as well as backed up to storage. Instant recovery makes it possible to perform block-level restores.

Offhost Backup

An offhost backup shifts the burden of backup processing onto a separate backup agent, such as an alternate client. This reduces the effect on the client's computing resources ordinarily caused by a local backup. The backup agent reads the data from the client disk and writes it to storage.

Proxy Copy

A proxy copy is a special type of backup in which NetBackup for DB2 turns over control of the data transfer to the NetBackup for DB2 agent. During NetBackup for DB2 backup and restore operations, proxy copy enables NetBackup for DB2 to manage the entire data movement between the disks containing DB2 data files and the storage devices managed by NetBackup.

Backups and restores remain tightly integrated with NetBackup for DB2 and its catalog, greatly simplifying administration tasks.

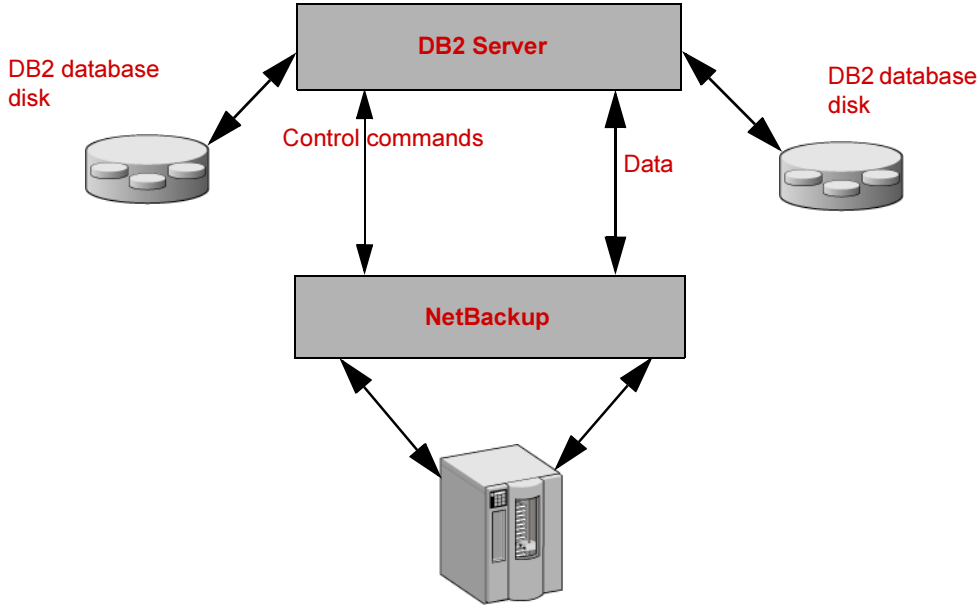
File-based Operations

Standard NetBackup for DB2 backups and restores are stream-based. NetBackup for DB2 with Advanced Client operations are file-based. The following sections illustrate the differences between these operation types.

Stream-based Operations

Stream-based operations are the standard NetBackup implementation of conventional NetBackup for DB2 backup and restores. In a stream-based backup, NetBackup moves the data provided by the DB2 server process. NetBackup captures the data stream content provided by DB2. If the user has specified multiple streams, then NetBackup for DB2 opens multiple streams and NetBackup catalogs them as separate images.

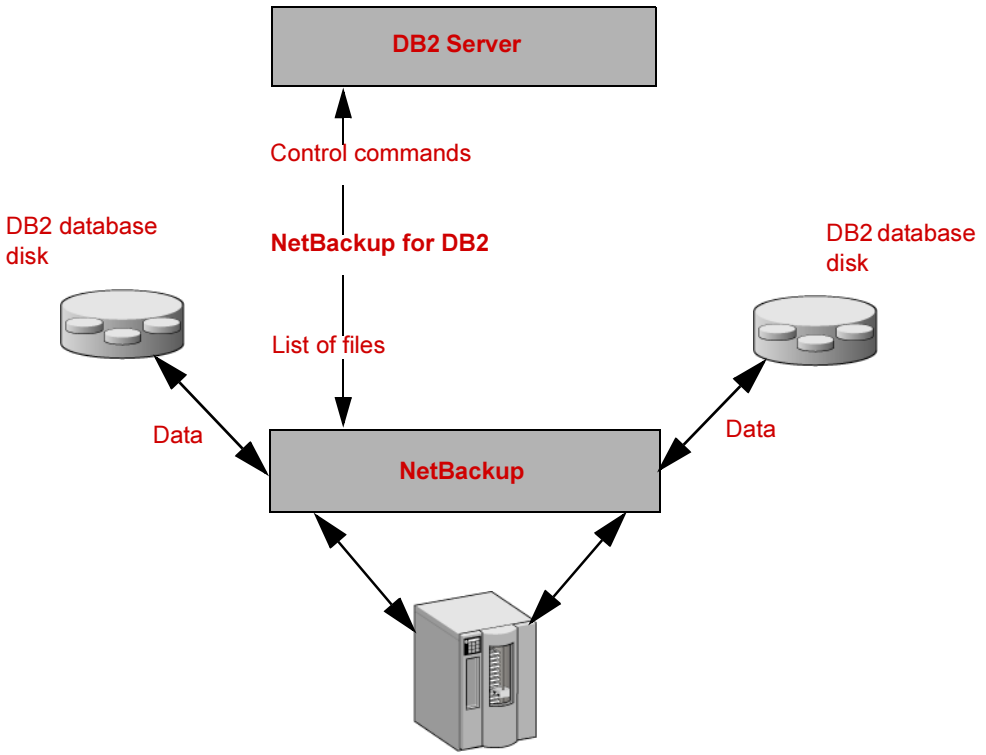
NetBackup for DB2 stream-based backup or restore



File-based Operations

In a file-based operation, DB2 provides the list of files that require backup or restore to NetBackup for DB2 with Advanced Client. NetBackup for DB2 with Advanced Client performs the 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 the objects or commands that perform the backup or restore on the client. You can also use the `bpdb2proxy` command to initiate a NetBackup for DB2 Advanced Client backup.

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 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. After 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 in 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. Determines the list of files that make up the DB2 database.
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. Uses DB2 APIs to takes the files out of the quiesced state. This puts the database in a rollforward pending state.

5. Reruns the transactions from the log files (performs the rollforward operation).

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

Database Objects Supported by Advanced Backup Methods

DB2 allows proxy method backups of databases at the node level, so NetBackup can use file-based Advanced Client backup methods to back up databases. NetBackup for DB2 cannot use Advanced Client methods to back up individual tablespaces or container files.

DB2 performs only conventional backups for transaction log files. Advanced Client methods cannot be used for transaction logs backed up using either the user exit program or the `VENDOR` method.

File-based and stream-based backups require different configurations. When configuring NetBackup for DB2 with Advanced Client backups, be sure to configure policies that allow both kinds of backups. For more information, see "Advanced Client Effects" on page 102.

Multistreaming

You can use either the `-s` option on the `bpdb2proxy` command or the sessions parameter in the Backup Options screen of the Backup Wizard to specify the number of proxy copy backup streams to start. 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.

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

The following NetBackup for DB2 sample command initiates a database backup on a per-node basis, which includes the transaction logs:

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

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 transaction logs.

Issue this command on each node of the database.

Configuring Snapshot Backups

You can combine two NetBackup features, *snapshot backup* and *instant recovery*, to enable fast database backups and recoveries. These features are as follows:

- A snapshot backup occurs when NetBackup creates a point-in-time disk image of the database and copies that image to disk. This process is nearly instantaneous, so user access to the database is not interrupted during the backup.
- An instant recovery occurs when NetBackup restores the on-disk snapshot copy of the database.

Another feature, *offhost backup*, can reduce the I/O processing load on the client that hosts the database. To use offhost backup, specify an alternate client (UNIX and Windows clients) or a data mover (UNIX clients only) to assume the I/O processing load.

Configuration Requirements

The *NetBackup Advanced Client System Administrator's Guide* and the VERITAS Technical Support Web site contain information on hardware requirements, software requirements, compatibility, snapshot methods supported for your agent, and special requirements for specific types of backups. Familiarize yourself with this information before you configure any shapshot backups.

The following list highlights some of the requirements that pertain to database agents:

- The user and group identification numbers (UIDs and GIDs) associated with the files to be backed up must be available to both the primary client and the alternate backup client.
- It is recommended that you allocate at least two different volumes or file systems for database activities, as follows:
  - Allocate one or more volumes or file systems to the database data files.
  - Allocate a different set of volumes or file systems to the DB2 executables, configuration files, and the transaction logs.

  There are several reasons for doing this. One reason for separating the data files from the other files is that because if the logs are configured on the same volumes (or file systems) as the datafiles, the logs are temporarily frozen while NetBackup takes the snapshot. As a result, the DB2 process cannot access the logs when the database is active, so the database activity might freeze until the logs become accessible again. Another reason for writing the data files to their own repository is because an Instant Recovery point-in-time rollback requires that there be *only* data files on the volume or file system being restored.
- The hardware and software required for the appropriate snapshot method must be installed and configured correctly.

- NetBackup Advanced Client must be installed and configured correctly, and the license key for this option must be registered.
- To perform offhost backups, perform any special configuration that is required.

Configuring a DB2 Policy with Advanced Client Backup Methods

This section explains how to configure snapshot and instant recovery backups for a DB2 policy. For information about configuring a policy, see "Configuring Backup Policies" on page 19. For information on how a snapshot method is automatically selected and details on the types of backup methods, see the *NetBackup Advanced Client System Administrator's Guide*.

Snapshot backups do not back up all database objects. Your backup configuration must include policy and schedule types to perform file-based and stream-based backups in order to ensure that the entire database can be successfully restored.

For snapshot or instant recovery backups, configure the following policies and schedules:

- A DB2 policy with the following attributes:
  - Snapshot methods for the file systems in which the database files reside.
  - A backup method on the policy attributes dialog.
  - An Automatic Full Backup schedule to perform file-based snapshot and offhost backups of the database.
  - (Conditional) An Application Backup schedule to back up the transaction logs. Configure this policy if you are using the `VENDOR` method. DB2 does not support proxy backups of transaction logs.
- (Conditional) An MS-Windows-NT policy to perform stream-based backups of transaction logs. Configure this policy if you are using the user exit program. DB2 does not support proxy backups of database transaction logs.

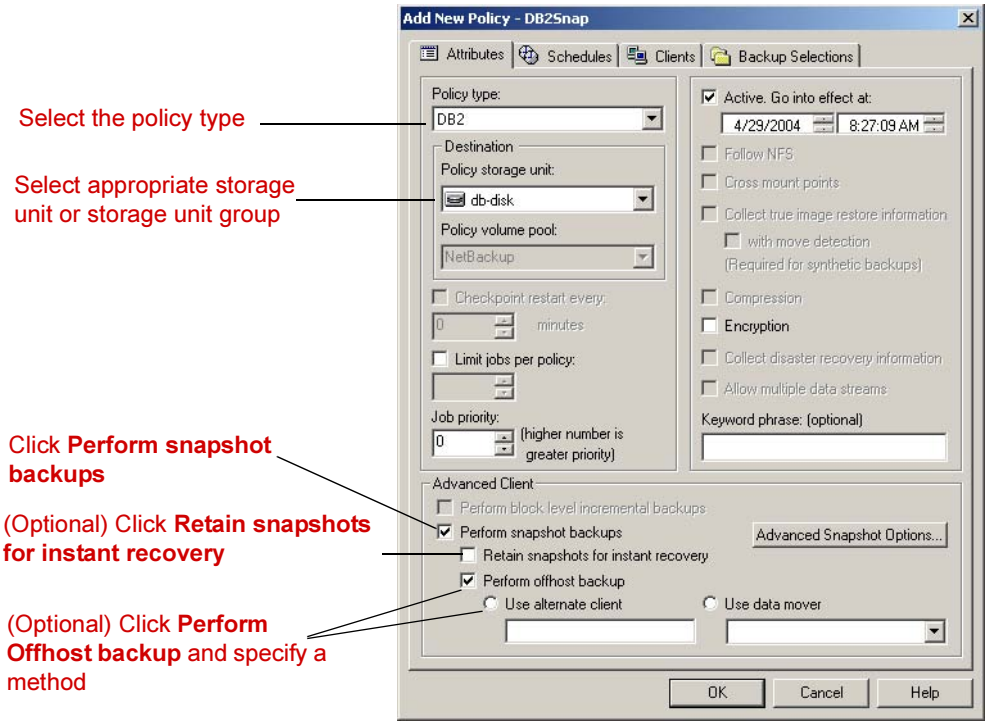
For information about policy and schedule attributes that differ for a NetBackup for DB2 with Advanced Client policy, see "Advanced Client Effects" on page 102.

Configuring a Snapshot Policy

The following procedure shows how to configure a snaphot policy with optional instant recovery, snapshot retention, and offhost backup.

▼ To configure a snapshot policy

1. Open the policy you want to configure.
2. Click on the **Attributes** tab.
3. Select the DB2 policy type.



4. Select a policy storage unit from the **Policy storage unit** list.

   Select a policy storage unit in this step even if you plan to select **Instant Recovery Snapshots Only** later in this procedure. NetBackup uses this storage unit for the stream-based backups of control files and transaction logs that are included in this policy.

5. Click **Perform snapshot backups**.

6. (Optional) Click **Advanced Snapshot Options** to choose a snapshot method.

   By default NetBackup chooses a snapshot method for you. To choose a snapshot method, click **auto** (the default) or click one of the methods presented in the list.

The snapshot method you can use depends on your hardware and software environment. For information about the snapshot methods supported in your environment, see the *NetBackup Advanced Client System Administrator's Guide* or the supported platforms matrix on the VERITAS technical support website.

You can configure only one snapshot method per policy. For example, if you want one snapshot method for clients `a`, `b`, and `c`, and a different method for clients `d`, `e`, and `f`, then create two policies for each group of clients, and select one method for each policy.

7. (Optional) Select **Retain snapshots for instant recovery**.

   When selected, NetBackup retains the snapshot backup image on disk for later use in recovery.

8. (Optional) Select **Perform offhost backup**.

   By default, the client that hosts the database performs the backup. If you want to reduce the I/O processing load on the client that hosts the database, you can specify an alternate client to perform the backup. Select an offhost backup method by specifying the following:

   - **Use alternate client** (UNIX and Windows clients). If you click **Use alternate client**, also specify the name of the client to perform the backup. This option might require additional configuration. The alternate client must be a client that shares the disk array.

9. Click the **Schedules** tab.

10. Click **New**.

    Configure both an Automatic schedule and an Application Backup schedule, as follows:

    - The Automatic schedule is for the database files.

      If you want to create only disk images, in the **Destination:** panel, under **Instant Recovery:**, select **Snapshots only**. This supresses NetBackup's default behavior, which is to copy the snapshot to a Media Manager or disk storage unit. When you select **Snapshots only**, NetBackup creates the on-disk snapshot copy of the database, but it does not copy the snapshot to a storage unit. The on-disk snapshot becomes the only backup copy. Note that the on-disk snapshot is not considered to be a replacement for a traditional backup.

    - (Conditional) The Application Backup schedule is for the transaction logs. Configure this schedule only if you are using the `VENDOR` method for backing up the transaction logs.

NetBackup copies the database's transaction logs to the Media Manager or disk storage unit you selected.

For UNIX clients, if you selected **Third-Party Copy Device** as an offhost backup method, click **Override policy storage unit** and select a non-SAN Media Manager or disk storage unit type that is appropriate to back up the transaction logs.

11. Click the **Clients** tab.

    Specify the clients to be included in this policy.

12. Click the **Backup Selections** tab.

    Specify a backup template or script. For information about using templates and scripts with a NetBackup for DB2 with Advanced Client policy, see "Advanced Client Effects" on page 102.

13. Configure other attributes and add any additional schedules and backup selections.

Restoring Data from a Snapshot Backup

Restoring Individual Files

You can use the procedure in "Performing a Restore" on page 70 to restore data from a snapshot backup. This is the same procedure you use to restore data that is not backed up with Advanced Client methods. Use this procedure for files backed up with, or without, Instant Recovery enabled. In all cases, NetBackup for DB2 determines the files that were backed up with a proxy method, and it initiates a corresponding restore request to the NetBackup for DB2 agent.

If Instant Recovery is enabled, NetBackup attempts to restore the file by using the unique restore methods available with the Instant Recovery feature. The type of restore method that NetBackup uses depends on your environment and the type of backup performed. If NetBackup is unable to use any of the Instant Recovery methods, it restores the file in the typical manner by copying the data from the snapshot to the primary file system. For information on the Instant Recovery methods that NetBackup uses, see the *NetBackup Advanced Client System Administrator's Guide*.

Restoring Volumes and File Systems Using Snapshot Rollback

You can request that an entire volume or an entire file system be restored from an Instant Recovery Snapshot backup. This type of a restore is called a *point in time rollback.* All the data in the snapshot is restored; single file restore is not available in a rollback.

You can perform a snapshot rollback from an Instant Recovery backup that was made with the following methods:

- vxvm snapshot
- FlashSnap snapshots

The *NetBackup Advanced Client System Administrator's Guide* contains more information on snapshot rollbacks.

In addition, the following considerations are relevant for NetBackup for DB2 restores:

- Snapshot rollback overwrites the entire volume.
- With NetBackup for DB2, snapshot rollback always performs file verification, checking for the following:
  - The requested files (number and names) are identical to those in the snapshot
  - The primary volume does not contain files created after the snapshot was made

If verification fails, the rollback aborts with 249.

- Snapshot rollback should be used with database files only. Database files and archived logs should exist on different file systems or volumes.

The procedure for specifying a snapshot rollback restore depends on the method you choose to perform the restore. Use one of the following methods:

▼ To specify a snapshot rollback restore from the Java or Windows interface

1. Go to the NetBackup Backup, Archive and Restore Interface.
2. Click the **Restore Files** tab.
3. Set the **Restore Type** to **Point in Time Rollback**.
4. Use the NetBackup for DB2 Recovery Wizard for the restore.
5. Follow the restore procedure that is used for typical backups.

   For information on restoring from a typical backup, see "Performing a Restore" on page 70.

▼ To specify a snapshot rollback restore using a command

- Use the `bpdb2proxy` command in the following format:

```
install_path\NetBackup\bpdb2proxy -rollbkrestore -d dbalias -u user -p password [-s session]
[-n node_number] [-t mm/dd/yyyy [HH:MM:SS]]
```

`-rollbkrestore`	Specifies that this is a restore from a snapshot rollback.
`-d dbalias`	Database alias.
`-u user`	User name of the DB2 user. Required.
`-p password`	Password for the DB2 user. Required.
`-s session`	The number of sessions. Optional.
`-n node_number`	The node number. The default is 0. Optional.

`-t` *mm*`/`*dd*`/`*yyyy* [*HH*`:`*MM*`:`*SS*]	The time of the backup, as follows: ◆ For *mm*, type the month. ◆ For *dd*, type the day of the month. ◆ For *yyyy*, type the year. ◆ For *HH*, type the hour of the day. Optional. ◆ For *MM*, type the minute of the hour. Optional. ◆ For *SS*, type the second of the minute. Optional. Optional.

Troubleshooting

If the rollback restore fails, it might be because DB2 still has a file open. Shutting down and restarting the database can correct this problem.

Advanced Client Effects

The following sections describe the ways in which the Advanced Client software affects backup types, schedule properties, templates, and scripts.

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. The following table explains these roles:

Backup Types for DB2

Backup Type	Description
Application Backup	The Application Backup schedule enables stream-based NetBackup operations. The Default-Application-Backup schedule is automatically configured as an Application Backup schedule.
Automatic Full Backup, Automatic Differential Incremental Backup, Automatic Cumulative Incremental Backup	For file-based proxy copy backups, the Automatic backup schedule types serve two purposes: ◆ Automatic backup schedules automatically start the backups by running the NetBackup for DB2 scripts or templates. ◆ Automatic backup schedules control file-based snapshot backups of the database objects. **Note** Specifying any of the Automatic backup types results in a full backup.

Schedule Properties

Some schedule properties have a different meaning for Advanced Client database backups than for a regular database backup. The following table explains these properties:

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.
Multiple copies	For proxy file-based backups, configure **Multiple copies** on the automatic backup schedule.

"Schedule Properties" on page 26 describes other schedule properties that are specific to DB2 backups.

Templates and Scripts

You can use a template created by the NetBackup for DB2 Backup Wizard to perform NetBackup for DB2 with Advanced Client backups. After they are created, templates reside on the NetBackup master server and are available for use by other NetBackup for DB2 clients. For information on creating a backup template, see "Creating Templates and Shell Scripts" on page 48.

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 it initiates the proxy file-based backup.

If you use a script, the script must reside on each client included in the policy. Include the DB2 `bpdb2proxy` command in the script to perform the advanced backup method. NetBackup for DB2 provides sample scripts with the installation.

Using NetBackup for DB2 with Advanced Client

After configuration is complete, performing NetBackup for DB2 with Advanced Client backups and restores is similar to regular NetBackup for DB2 operations. The following sections describe some of the differences.

Performing Backups

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

- Server-directed, both 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 95. These policies specify 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 is an Advanced Client backup if the policy for the client is configured for Advanced Client methods. You can 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`.

Use the bpdb2proxy command in the following format to back up a DB2 database with an Advanced Client method:

install_path\NetBackup\bpdb2proxy -backup -d *dbalias* -u *user* -p *password*

For information on the the arguments to the bpdb2proxy command, see "To specify a snapshot rollback restore using a command" on page 100.

Performing Restores

Perform NetBackup for DB2 Advanced Client restores from the DB2 client. The following sections describe the restore methods.

User-Directed Restores Using Templates

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

User-Directed Restores Using bpdb2proxy

To perform a restore from the command line, use the bpdb2proxy command. 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 fails.

Use the bpdb2proxy command in the following format to restore a DB2 database with an Advanced Client method:

install_path\NetBackup\bpdb2proxy -restore -d *dbalias* -u *user* -p *password*

For information on the the arguments to the bpdb2proxy command, see "To specify a snapshot rollback restore using a command" on page 100.

Restoring from a Snapshot Backup

For information on restoring files from a snapshot backup, see "Restoring Data from a Snapshot Backup" on page 99.

Troubleshooting 6

NetBackup, NetBackup for DB2, 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

The NetBackup server and client software allow you to enable detailed debugging logs. The information in these log files can help you troubleshoot problems that occur outside of either NetBackup for DB2 or the DB2 commands. Note the following with regard to these logs:

- These logs do not reveal errors that occur during the execution of the DB2 commands unless those errors also affect NetBackup for DB2. DB2 might (or might not) write to the NetBackup for DB2 logs for errors in the application. Your best sources for DB2 error information are the logs provided by DB2.
- Generally, each debug log corresponds to a NetBackup process and executable.

For information about the debugging log files, see the *NetBackup Troubleshooting Guide* and the *install_path*\NetBackup\logs\README.debug file.

Enabling Logging

▼ To enable the NetBackup for DB2 logs

1. Create the following folders on the client in a DOS window:

   install_path\NetBackup\logs\bpbackup
   install_path\NetBackup\logs\bpbkar32
   install_path\NetBackup\logs\bphdb
   install_path\NetBackup\logs\bprestore
   install_path\NetBackup\logs\tar32
   install_path\NetBackup\logs\bpdb2
   install_path\NetBackup\logs\bpdbsbdb2

   For example:

   cd *install_path***\NetBackup\logs**
   mkdir bphdb

2. Make sure there is share access to the log folders.

3. Enable logging for the nbpem, nbjm, and nbrb scheduling processes, which use unified logging.

   NetBackup writes unified logs to /usr/openv/logs on UNIX and to *install_path*\NetBackup\logs on Windows. You do not need to create log directories for processes that use unified logging. For information on using logs and reports, see the *NetBackup Troubleshooting Guide*.

Accessing the Log Files

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 Folder on the Client

The *install_path*\NetBackup\logs\bphdb folder contains the following types of logs:

db2_stdout.*mmddyy.hhmmss*.txt

Unless redirected elsewhere, NetBackup writes DB2 script output to this file.

db2_stderr.*mmddyy.hhmmss*.txt

Unless redirected elsewhere, NetBackup writes DB2 script errors to this file.

mmddyy.log

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

bpdb2 Folder on the Client

The *install_path*\NetBackup\logs\bpdb2 folder contains the following execution log:

mmddyy.log

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

bpdbsbdb2 Folder on the Client

The *install_path*\NetBackup\logs\bpdbsbdb2 folder contains the following execution log:

mmddyy.log

This log contains debugging information and execution status for the NetBackup for DB2 Backup and Recovery Wizards and for the bpdbsbdb2 command line utility. This log also contains the debugging information and

execution status information that is generated when a DB2 template is run from an automatic schedule (when `bphdb` invokes `bpdbsbora` to execute the template).

NetBackup Server Reports

NetBackup provides other reports that are useful in isolating problems. One such report is `All Logs Entries` on the server. For information on server reports, see the *NetBackup System Administrator's Guide, Volume I*.

Setting the Debug Level

You can control the amount of information written to the debugging logs in the *`install_path`*`\NetBackup\logs\` folders by changing the Database debugging level. The higher the value, the more information is logged. Typically, the default value of 0 is sufficient. However, Technical Support might ask you to set the value higher when a problem is being analyzed. You can set the debugging levels to 0, 1, 2, 3, 4, or 5. A level of 5 provides the most detail.

▼ **To change the debugging level**

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

   The Backup, Archive, and Restore interface displays.

2. Choose **File** > **NetBackup Client Properties**.

3. In the NetBackup Client Properties dialog, select the **Troubleshooting** tab.

   By default, the setting is 0.

4. Set the Database debug level to adjust the amount of information from the NBDB2 vendor library.

5. Set the Verbose level to adjust the amount of information from the user exit program.

Note Information from both settings is logged to the same file, *`mmddyy`*`.log`

Minimizing Timeout Failures on Large Database Restores

Large database restores sometimes fail when multiple restore sessions compete for resources. In this situation, a restore session can be delayed while waiting for media or device access. If the delay is too long, the restore session times out. Use the following procedures to minimize session timeouts and to allow the restores to complete successfully.

▼ To minimize database session timeouts

1. In the NetBackup Administration Console, expand **NetBackup Management** > **Host Properties** > **Clients**
2. Set the **Client read timeout** property to a large value.

   The default for the **Client read timeout** setting is 300 seconds (5 minutes). For database agent clients, increase the value significantly from the value recommended in the *NetBackup System Administrator's Guide, Volume 1*. For example, change this setting to 30-60 minutes to minimize timeout errors.
3. Click **OK** for each client.

Using NET_BUFFER_SZ to Speed Up a Slow Restore

If file restores are slow, and your NetBackup master server is a UNIX machine, you can increase file restore speeds by creating a file called `NET_BUFFER_SZ` on the NetBackup master server in the NetBackup install directory.

▼ To create the NET_BUFFER_SZ file

1. Log into a UNIX master server.
2. Use `vi`(1) or another editor to create file `/usr/openv/netbackup/NET_BUFFER_SZ`.
3. Add a line that specifies the socket size, in bytes.

   For example:

   ```
   32768 bytes = 32K
   ```
4. Save and close the file.

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, DB2 reports a successful restore status, but the NetBackup Activity Monitor reports failures. This can occur during restores if DB2 reads a portion of a backup image but not the entire image.

Reason Codes

Errors can occur while accessing the NetBackup DLL during the processing of a DB2 database utility BACKUP or RESTORE. This subsection describes the DB2 and NetBackup reason codes. For more information about an error message, see the the log files.

1

Message (from DB2):

```
SQL2071N An error occurred while accessing the shared
library "dll_path". Reason code: "1".
```

Cause:

The vendor library DLL cannot be found or accessed.

Action:

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

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 cannot be found in the NetBackup database.

Action:

Use bplist to make sure the image you are trying to restore exists. Make sure the correct instance is being used. Make sure the correct values are set in db2.conf.

If logging is enabled, check the current log file in the *install_path*\NetBackup\logs\bpdb2\ folder for more information.

305

Message:

`ERR - found more than one object.`

Cause:

Multiple 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 typical operations. If logging is enabled, check the current log file in the *`install_path`*`\NetBackup\logs\bpdb2\` folder for more information.

310

Message:

`ERR - bp.config failed with` *`status`* `status.`

Cause:

Unable to read configuration file.

Action:

Make sure this file exists and is properly configured.

If logging is enabled, check the current log file in the *`install_path`*`\NetBackup\logs\bpdb2\` folder for more information.

330

Message:

`ERR - Invalid options encountered for action` *`action`*`.`

Cause:

Invalid option(s) encountered for *`action`*.

Action:

Make sure the action parameters are used properly.

335

Message:

`ERR - in get DB2 UDB level.`

Cause:

NetBackup server and the NetBackup for DB2 DLL are not at the same level.

Action:

Make sure that the NetBackup and the DB2 DLL are at the same level. Check the log file in *install_path*\NetBackup\logs\ for the version number of the DLL and the version number for NetBackup. If they are not the same, install the same level.

380

Message:

ERR - db2.conf read status error *error*.

Cause:

db2.conf read status error.

Action:

Make sure the folder is accessible with read and write permissions. 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 entry was encountered in the *install_path*\NetBackup\dbext\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 entry was encountered in the *install_path*\NetBackup\dbext\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 entry was encountered in the *install_path*\NetBackup\dbext\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 entry was encountered in the *install_path*\NetBackup\dbext\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 entry was encountered in the *install_path*\NetBackup\dbext\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 entry was encountered in the *install_path*\NetBackup\dbext\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 entry was encountered in the *install_path*\NetBackup\dbext\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 database> and <OBJECTTYPE objecttype>.
```

Cause:

Policy name or schedule name is not specified in the POLICY or SCHEDULE entry in the *install_path*\NetBackup\dbext\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 = *error_no* : *string*.

Cause:

Invalid ARCDIR is specified in db2.conf.

Action:

Add an appropriate folder 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 *install_path*\NetBackup\dbext\db2.conf file.

Action:

Add an ARCDIR field to the *install_path*\NetBackup\dbext\db2.conf file with an appropriate folder name as a parameter.

435

Message:

ERR - RETDIR field needs to contain a valid file when OBJECTTYPE is equal to ARCHIVE: *string*.

Cause:

RETDIR field does not contain a valid file.

Action:

RETDIR field must contain a valid file when OBJECTTYPE ARCHIVE is specified in the *install_path*\NetBackup\dbext\db2.conf file.

440

Message:

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

Cause:

Found OBJECTTYPE ARCHIVE but no ARCFUNC in the db2.conf file.

Action:

Need to specify a copy or save parameter for ARCFUNC if OBJECTTYPE ARCHIVE is also specified.

445

Message:

ERR - Invalid <OBJECTTYPE> entries: *entry*.

Cause:

Invalid OBJECTTYPE entry in the *install_path*\NetBackup\dbext\db2.conf file.

Action:

Add the appropriate object type to the *install_path*\NetBackup\dbext\db2.conf file.

450

Message:

ERR - OBJECTTYPE entry needs to be specified.

Cause:

OBJECTTYPE entry is not specified in the *install_path*\NetBackup\dbext\db2.conf file.

Action:

Add the appropriate object type to the *install_path*\NetBackup\dbext\db2.conf file.

455

Message:

ERR - POLICY entry needs to be specified.

Cause:

POLICY entry is not specified in the *install_path*\NetBackup\dbext\db2.conf file.

Action:

Add the appropriate policy name to the `POLICY` entry in the *`install_path`*`\NetBackup\dbext\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 can result from using an unsupported version of DB2.

507

Message:

`NetBackup Initialize Failed`

Cause:

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

510

Message:

`NetBackup Read Config Failed`

Cause:

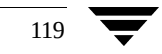
NetBackup encountered errors in reading configuration settings.

Action:

Check that the NetBackup client and server settings have been configured. Also verify 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 can result from improper configuration.

513

Message:

```
NetBackup Begin Action Failed
```

Cause:

NetBackup encountered errors when attempting to start the requested operation. This can 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 that the previous operation has failed, and DB2 is attempting to delete any incomplete images.

Configuration for a DB2 EEE (DPF) Environment A

The IBM DB2 Enterprise Extended Edition (EEE) environment is a database that is distributed across multiple hosts or partitions. In a non-EEE environment, the database is typically centralized on a single host. The Database Partitioning Feature (DPF) is equivalent to the EEE.

This appendix contains instructions for installing and 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.

Installing NetBackup for DB2

In a DB2 EEE (DPF) environment, install the NetBackup client and NetBackup for DB2 software on every client used by DB2.

Configuring NetBackup for DB2

The configuration process for NetBackup for DB2 in a DB2 EEE environment is the same as the configuration process for NetBackup for DB2 in a non-EEE environment with the exception of the procedure for adding a backup policy.

Creating DB2 Scripts or Templates for a DB2 EEE Environment

Templates and scripts operate on a single NetBackup client. If your EEE / DPF environment spans multiple machines, create at least one template or script 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 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 the first partition restored. For more information, see the *DB2 Data Recovery Guide*.

For information on creating Backup templates, see "Using the NetBackup for DB2 Backup Wizard" on page 51. For information on creating recovery templates, see "Using the NetBackup for DB2 Recovery Wizard" on page 70.

Rollforward recovery to a point-in-time (PIT) is not supported. DB2 requires that PIT recovery be run via the same operation for all partitions and tablespaces on all machines. Templates do not span machines.

Using NetBackup for DB2 with SAP® B

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

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`.

The use of the NetBackup user exit program is required because it automatically archives log files to a Media Manager or disk storage unit and because it enables 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 can 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 do not invoke NetBackup.

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 depend on the SAP user exit program for proper operation.

Backup of SAP Files

Be certain to include any and 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.

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