Legato NetWorker®
Module for DB2 Universal Database™

Administrator's Guide

Release 1.2
UNIX®, Windows NT®, and Windows® 2000 Versions

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Contents

Preface

This guide contains information on how to configure and manage the Legato NetWorker® Module for DB2 Universal Database™ software.

You *must* install the NetWorker Module software on your server and clients to use the information presented in this guide. If you have not yet installed the software, refer to the *Legato NetWorker Module for DB2 Universal Database Installation Guide* for installation instructions.

Audience

The information in this guide is intended for system administrators who are responsible for installing software and maintaining the servers and clients on a network. Operators who monitor the daily backups may also find this manual useful.

Product Documentation

Legato offers an extensive archive of product documentation at its web site *www.legato.com*. Most of the documents are in Adobe® Acrobat® Portable Document Format (PDF), and can be viewed by downloading and installing the Adobe Acrobat Reader. The Reader is available in the */viewers/acroread* directory on the Legato Documentation Suite CD-ROM, or directly from Adobe at *www.adobe.com*. To install and use the Reader on the platform of your choice, refer to the instructions in the CD-ROM's */viewers/acroread/readme.txt* file or at the Adobe web site.

Conventions

This document uses the following typographic conventions and symbols to make information easier to access and understand.

Convention	Indicates	Example
boldface	Names of DOS or UNIX line commands, daemons, options, programs, or scripts	The **nsradmin** command starts the command line version of the administration program.
italic in text	Pathnames, filenames, computer names, new terms defined in the Glossary or within the chapter, or emphasized words	Displayed messages are also written to */nsr/logs/daemon.log*.
italic in command line	A variable that you need to provide in the command line	`nwadmin -s` *server-name*
`fixed-width`	Examples and information displayed on the screen	`media waiting: recover waiting for 8mm 5GB tape volume name`
`fixed-width, boldface`	Commands and options that you must type exactly as shown	**`nsr_shutdown -a`**
Menu_Name> Command	A path or an order to follow for making selections in the GUI	Volume>Change Mode>Appendable
Important:	Information that you must read and follow to ensure successful backup and recovery of your data	⚠️ **Important:** You must install the NetWorker Module software in the same directory where you installed the NetWorker client binaries.

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Chapter 1: Introduction

For a list of the system requirements that you must meet before using the information in this guide, refer to:

- *Legato NetWorker Module for DB2 Universal Database Installation Guide*
- *Legato NetWorker Installation Guide*
- *Legato NetWorker Module for DB2 Universal Database Release Supplement*

For a description of features provided by the NetWorker Module for DB2 Universal Database and the NetWorker software, see the following sections:

- "What Is NetWorker" on page 14
- "What Is NetWorker Module for DB2 Universal Database" on page 15
- "What is DB2 Backup and Restore Utility" on page 16
- "How NetWorker Module for DB2 Universal Database Backs Up Data" on page 16

For a technical description of the NetWorker Module for DB2 Universal Database storage management process, see "How NetWorker Module for DB2 Universal Database Backs Up Data" on page 16.

For details about configuring and running backups and recoveries of DB2 Universal Database data, see the following chapters:

- "Chapter 3: Manual DB2 Universal Database Backups" on page 31
- "Chapter 4: Scheduled DB2 Universal Database Backups" on page 39
- "Chapter 5: Restoring DB2 Universal Database Data" on page 55

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What Is NetWorker

Legato NetWorker is a network data storage management solution that protects and helps manage data across an entire network. NetWorker simplifies the storage management process and reduces the administrative burden by automating and centralizing data storage operations. As a network expands or as the amount of data grows, NetWorker provides the capacity and performance to handle the load.

With NetWorker, you can:

- Perform automated "lights out" backups during non peak hours
- Administer, configure, monitor, and control NetWorker functions from any system on a network
- Centralize and automate data management tasks
- Increase backup performance by simultaneously sending more than one savestream to the same device
- Optimize performance using parallel savestreams to a single device, or to multiple devices or storage nodes

NetWorker client/server technology uses the network protocol Remote Procedure Call (RPC) to back up data. The NetWorker server software consists of several server-side services and programs that oversee backup and recover processes. The NetWorker client software consists of client-side services and user interface programs.

The server-side services and programs perform the following functions:

- Oversee backup and restore processes
- Maintain client configuration files
- Maintain an online client index
- Maintain an online media database

During a backup, the NetWorker server makes an entry in an online client file index and records the location of the data in an online media database. These entries provide recovery information needed for every database backed-up. The client index entry is maintained in the index until the browse policy configured for the client's save set has been exceeded.

When the retention policy configured for the client's save set is exceeded, the save set changes status from "recoverable" to "recyclable" in the media database. When all the save sets on the storage media change status to "recyclable," the media mode changes status to "recyclable," and the media is eligible for automatic relabeling. The save set entries, however, remain in the media database until the media is actually relabeled.

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Until the media is relabeled, the data is still recoverable, using the NetWorker **scanner** command.

After a scheduled backup, NetWorker sends a record of the server's *bootstrap* file to the default printer. This is a printed record of the dates, locations, and save set ID numbers for the server's online indexes, required for restoring data. Keep the bootstrap printout on file as a quick reference in the event of a disaster, such as a disk crash or server malfunction.

What Is NetWorker Module for DB2 Universal Database

Legato NetWorker Module for DB2 Universal Database is an add-on module for NetWorker that provides:

- Automated backup media management
- Manual backups
- Scheduling for the DB2 Universal Database backup.
- Restoring DB2 Universal Database Data.

NetWorker Module for DB2 Universal Database provides:

- The ability to integrate both database and system file backups, thereby relieving the burden of backup from the database administrator while allowing the administrator to retain control of the restore process
- True "lights out" database storage management through automated scheduling, autochanger support, electronic tape labeling, and tracking
- Support for a backup to a centralized backup server
- High performance through support for multiple, concurrent high-speed devices, such as DLT drives

NetWorker Module for DB2 Universal Database, together with Legato NetWorker, provides reliable, high-performance data protection for DB2 Universal Database Server databases. NetWorker Module for DB2 Universal Database integrates backup and restore procedures for DB2 Universal Database databases with the network-wide data protection solutions that NetWorker provides.

Legato NetWorker, in combination with the NetWorker Module for DB2 Universal Database, provides a storage management solution that addresses the need for cross-platform support of enterprise applications running on Windows® and UNIX® platforms.

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What is DB2 Backup and Restore Utility

DB2 Backup and Restore is a utility included with DB2 Universal Database that provides:

- Online or offline concurrent backups of databases and tablespaces
- Offline restores of databases and online or offline restores of tablespaces
- Automated backup and restore of transactional logs
- An interface to popular storage management software through the X-Open® Backup Service Application Programming Interface (XBSA API)

How NetWorker Module for DB2 Universal Database Backs Up Data

NetWorker Module for DB2 Universal Database provides services that connect the DB2 Backup and Restore utility to the NetWorker server. This is accomplished through the NetWorker XBSA library that implements an XBSA API.

What Happens During a NetWorker Module for DB2 Universal Database Backup

When a DB2 Universal Database manager backup request is initiated, the DB2 Backup utility interacts with NetWorker through the XBSA API to coordinate a backup of the specified DB2 Universal Database database.

When a scheduled backup of a DB2 Universal Database database is triggered by **nsrd** on the NetWorker server, **savegrp** executes the **nsrdb2** script instead of performing the standard save. The **nsrdb2** script prepares the environment for and executes **nsrdb2sv**. The **nsrdb2sv** binary invokes DB2 Backup to perform a database backup.

Figure 1 shows how data moves from the database server to your NetWorker server during a DB2 Universal Database backup session.

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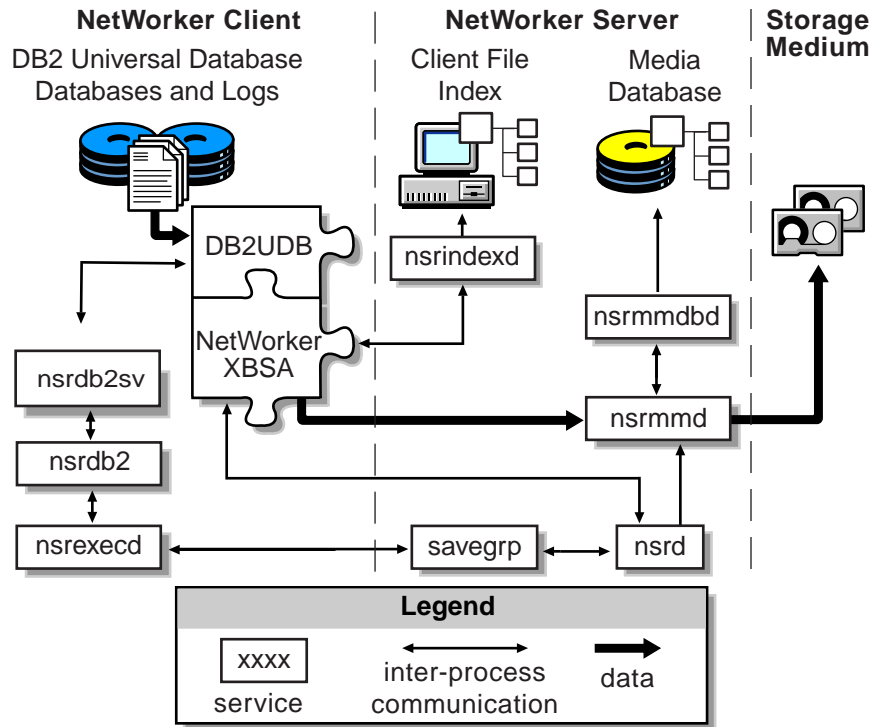#### Figure 1. Scheduled Backup Initiated by NetWorker Module for DB2 Universal Database

What Happens During a NetWorker Module for DB2 Universal Database Restore

When a DB2 Universal Database manager restore request is initiated, the NetWorker Module XBSA library translates the object names requested by DB2 Universal Database into a format understood by NetWorker and forwards it to the NetWorker server's **nsrd** service. The media service, **nsrmmd**, searches the NetWorker server's online media database for the media containing the objects requested and recovers the data to the DB2 Universal Database manager.

Figure 2 shows how data moves from your NetWorker server to the database server during a DB2 Universal Database restore session.

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Figure 2. Restore Initiated by NetWorker Module for DB2 Universal Database
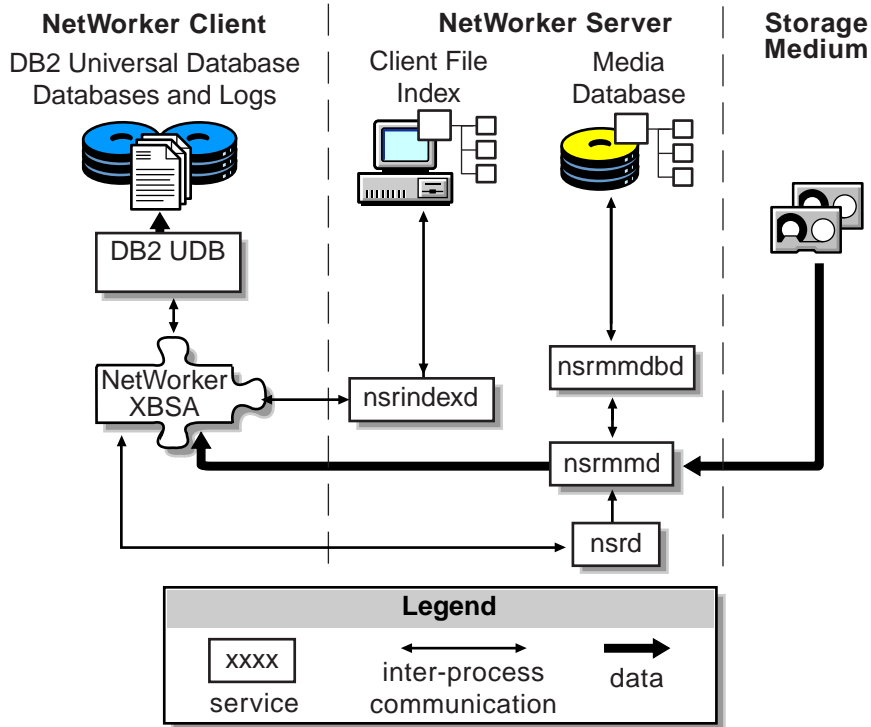
How DB2UEXT2 Moves Log Files

Transactional Logs Backup and Restore is done using the **db2uext2** program provided with NetWorker Module for DB2 Universal Database. DB2 Universal Database must be configured for roll-forward recovery by enabling the USEREXIT database configuration parameter.

The DB2 Universal Database manager calls **db2uext2** to back up online archived logs.

The DB2 Universal Database manager requests **db2uext2** to restore logs during a database roll-forward.

⚠ _____

Important: Do not use the db2uext2.c source code provided with DB2
Universal Database by IBM to create your own db2uext2 program. Only the
db2uext2 program supplied with NetWorker Module for DB2 Universal
Database is supported.

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Figure 3 shows how data moves from the database server to your NetWorker
server during a DB2 Universal Database log backup session.

**Figure 3. Data Movement During a Transactional Log Backup Initiated by
DB2 Universal Database**
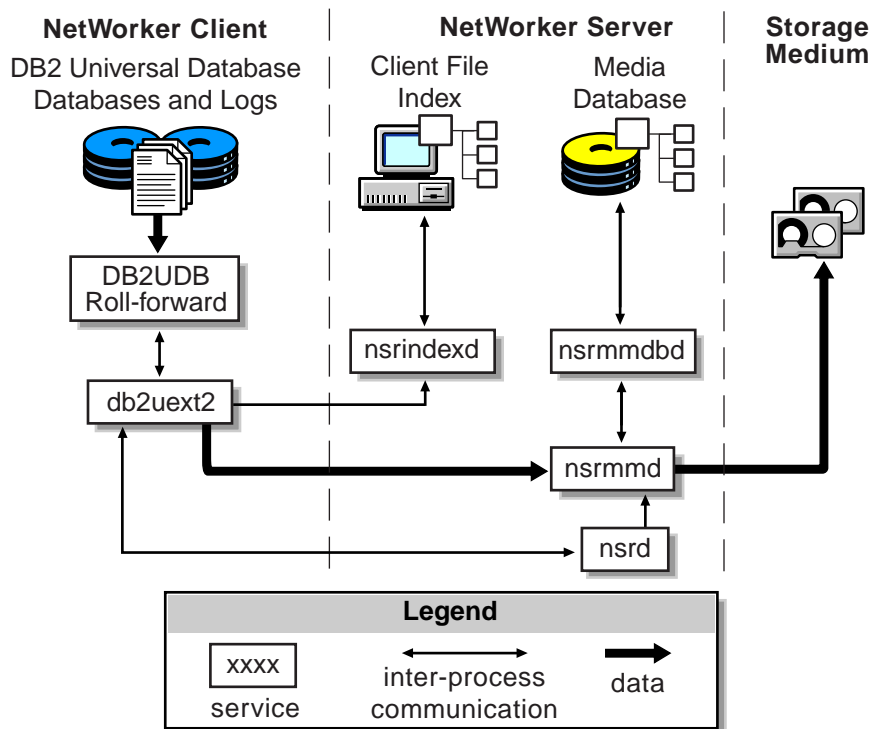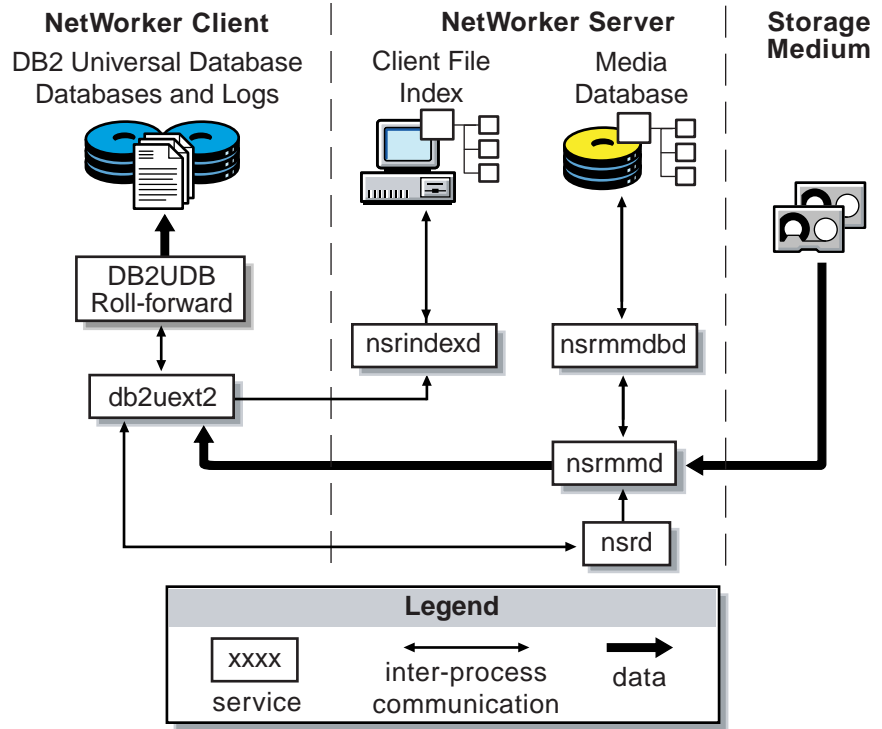

Figure 4 shows how data moves from the NetWorker server to your database
server during a DB2 Universal Database log restore session.

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Figure 4. Data Movement During a Transactional Log Restore Initiated by DB2 Universal Database

Chapter 2: Basic Configuration

This chapter describes the supported options for setting up NetWorker Module for DB2 Universal Database and how to configure the software.

This chapter consists of the following sections:

- "DB2 Universal Database and NetWorker Server Backup Configurations" on page 21
- "Basic Configuration Roadmap" on page 22
- "Task 1: Configure the DB2 Universal Database Instance" on page 22
- "Task 2: Create a Client Resource for DB2 Universal Database" on page 24
- "Task 3: Configure the Volume Pools" on page 27
- "Sources of Information for Additional NetWorker Configuration" on page 29

DB2 Universal Database and NetWorker Server Backup Configurations

NetWorker Module for DB2 Universal Database supports concurrent backup of DB2 Universal Database databases on the same computer or separate computers.

NetWorker Module for DB2 Universal Database must be installed on the same computer as the DB2 Universal Database manager.

NetWorker Module for DB2 Universal Database should be installed only once per computer, regardless of the number of databases to be backed up. All DB2 Universal Database databases can be backed up locally or remotely to the same NetWorker server.

With multiple licenses, DB2 Universal Database databases on separate computers can be backed up concurrently to the same NetWorker server. The NetWorker server can be located on any of the computers containing DB2 Universal Database, or on a separate Windows or UNIX system.

Basic Configuration Roadmap

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Before performing basic DB2 Universal Database and NetWorker system configuration procedures, be sure that you have installed NetWorker Module for DB2 Universal Database using the instructions in the latest *Legato NetWorker Module for DB2 Universal Database Installation Guide*. You must install the NetWorker Module for DB2 Universal Database on the same system as your DB2 Universal Database.

You must properly configure the DB2 Universal Database and NetWorker before you can use NetWorker Module for DB2 Universal Database.

To complete the basic DB2 Universal Database and NetWorker configurations:

1. Configure the required DB2 Universal Database instances. For details, see "Task 1: Configure the DB2 Universal Database Instance" on page 22.

2. Configure a client resource to identify the DB2 Universal Database host as a backup client of the NetWorker server. For details, see "Task 2: Create a Client Resource for DB2 Universal Database" on page 24.

3. Configure any required volume pool resources and corresponding label template resources. For details, see "Task 3: Configure the Volume Pools" on page 27.

You can view and configure NetWorker resources and their attributes using the NetWorker Administrator GUI.

Task 1: Configure the DB2 Universal Database Instance

1. Configure each DB2 Universal Database instance to use backup and restore services provided by NetWorker Module for DB2 Universal Database and the NetWorker server.

   a. Specify the location of the NetWorker XBSA library by setting the DB2 Universal Database DB2_XBSA_LIBRARY registry variable to the exact value as follows:

- On AIX:

  $ **db2set
  DB2_XBSA_LIBRARY=*"/usr/lib/libxdb2.a(bsashr10.o)"***

- On Solaris:

  $ db2set DB2_XBSA_LIBRARY=*/usr/lib/libxdb2.so*

- On Windows:

  – With NetWorker 5.5.x:

  %SystemDrive% **db2set DB2_XBSA_LIBRARY=*d:\win32app\nsr\
  bin\libxbsa.dll***

  Note: The above example for Windows NT® and Windows 2000
  assumes that you have installed the NetWorker client in
  d:\win32app\nsr.

  – With NetWorker 5.7 and later:

  *%SystemDrive%***db2set DB2_XBSA_LIBRARY=*d:\Program
  Files\nsr\bin\libxbsa.dll***

2. Create a vendor configuration file. This file contains all the XBSA
   environment settings. You can use any name you like for this file. For more
   information about XBSA environment variables refer to
   "Appendix A: XBSA Environment Variables" on page 63.

![warning triangle icon]

Important: Only use the environment variables listed in Appendix A. Use of
any other NetWorker environment variables may result in unpredictable
behavior.

   a. Each line in the file should have the following format, with the
      environment variable name followed by an equals sign (=) and then
      the variable setting value:

   ```
   Environment_Variable=Setting
   ```

   Note: Ensure that you follow the correct syntax in the vendor
   configuration file, it is format sensitive.

The file must contain at least the NSR_SERVER environment variable, which
must be set to the name of the NetWorker server that performs the scheduled
backups of the DB2 Universal Database client.

The following is an example of a vendor configuration file:

```
NSR_SERVER=oka.legato.com
```

```
NSR_DEBUG_FILE=e:\nmdb2.log

NSR_DEBUG_LEVEL=5

NSR_NO_BUSY_ERRORS=true

NSR_DATA_VOLUME_POOL=DB2Data

NSR_LOG_VOLUME_POOL_DB2Logs
```

b. Set the DB2 Universal Database DB2_VENDOR_INI registry variable to point to the absolute pathname of the configuration file. For example:

On UNIX:

$ db2set DB2_VENDOR_INI=/home/db2inst1/config

On Windows:

%SystemDrive%> db2set DB2_VENDOR_INI=e:\config

3. Restart the database instance.

Important: The vendor configuration file is read at the database manager start time. The DB2 Universal Database engine must be stopped and restarted if any changes are made to the file.

For more information on DB2 Universal Database registry variables and the vendor configuration file, refer to your DB2 Universal Database *Administrator's Guide*.

Task 2: Create a Client Resource for DB2 Universal Database

To create a client resource for the DB2 Universal Database System, follow the instructions in the appropriate section:

- On a UNIX NetWorker server, see "How to Create a Client Resource on UNIX" on page 25.
- On a Windows NetWorker server, see "How to Create a Client Resource on Windows" on page 26.

Important: You can only use NetWorker Module for DB2 Universal Database with NetWorker to perform DB2 Universal Database backups if there is a client resource correctly configured for the DB2 Universal Database host system.

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How to Create a Client Resource on UNIX

1. Run the NetWorker Administrator GUI as one of the users in the NetWorker Administrator list of the server resource.

2. Select Client Setup from the Clients menu in the main NetWorker Administrator window to open the Clients window.

3. If the hostname of the DB2 Universal Database client does *not* appear in the Clients window, create a new client resource for the DB2 Universal Database client. Otherwise, if the hostname of the client does appear in the Clients window, proceed to step 5.

4. Click Create and enter the hostname of the DB2 Universal Database system in the Name field.

5. If desired, select a value for the Browse policy. If you do not select a value for the Browse policy, the NetWorker server uses the default value of one month. The Browse policy cannot exceed the Retention policy.

6. If desired, select a value for the Retention policy. If you do not select a value for the Retention policy, the NetWorker server uses the default value of one year. The Retention policy must be greater than or equal to the Browse policy.

Important: To be able to restore backups of this DB2 Universal Database System to a different system, you must also add the fully qualified host name of that system to the *Remote access* field in this client resource.

7. To apply the client resource settings, click Apply at the bottom of the Clients window.

8. To exit the Clients window, select Exit from the File menu.

For more information on the different attributes of a client resource and how to create a NetWorker client resource, refer to the NetWorker online help and the *Legato NetWorker Administrator's Guide* for UNIX.

How to Create a Client Resource on Windows

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1. Run the NetWorker Administrator GUI as one of the users in the NetWorker Administrator list of the server resource.

2. Click the Configure tab in the Server window (of the main Administrator window).

3. Click Manage Clients to open the Clients window.

4. If the hostname of the DB2 Universal Database client does *not* appear in the Edit Client dialog box, create a new client resource for the DB2 Universal Database client. Otherwise, if the hostname of the client does appear in the Edit Client dialog box, proceed to step 6.

5. Right-click the main Clients icon and select Create from the displayed menu to open the Create Client dialog box.

6. Enter the hostname of the DB2 Universal Database System in the Name text box.

7. If desired, select a value from the Browse policy drop-down list. If you do not select a value for the Browse policy, the NetWorker server uses the default value of one month. The Browse policy cannot exceed the Retention policy.

8. If desired, select a value from the Retention policy drop-down list. If you do not select a value for the Retention policy, the NetWorker server uses the default value of one year. The Retention policy must be greater than or equal to the Browse policy.

Important: To be able to restore backups of this DB2 Universal Database System to a different system, add the fully qualified host name of that system to the *Remote access* field in this client resource.

9. Click OK to apply the client resource settings and exit the Create Client dialog box.

For more information on the different attributes of a client resource and how to create a NetWorker client resource, refer to the NetWorker online help and the *Legato NetWorker Administrator's Guide* for Windows.

Task 3: Configure the Volume Pools

NetWorker provides a means of directing your backups to groups of media or backup volumes called *pools*. Volume pools allow you to establish a logical and systematic method for tracking, organizing, and sorting your backup data. Label templates provide a consistent method for labeling the volumes in pools.

For complete details on volume pools and label templates and their configuration procedures, refer to the *Legato NetWorker Administrator's Guide* for your particular NetWorker server platform.

What Is a Pool?

A *pool* is a specific collection of backup volumes that NetWorker uses to sort and store data. Each NetWorker volume pool is defined by its pool resource in the NetWorker server. The configuration settings specified in the pool resource act as a filter that NetWorker uses to determine which type of data to write to the volumes in that pool.

Each NetWorker volume belongs to a pool, either a preconfigured pool or one you create. Each pool has a specific label template associated with it, providing an automated method of identifying the media assigned to a pool. NetWorker uses pools of volumes in conjunction with their label templates to track what data is on which volume.

How NetWorker Uses Pools

When a DB2 Universal Database backup occurs, NetWorker tries to match the characteristics of the data to the attributes configured for a pool resource. If the data matches the criteria of a pool configuration, NetWorker directs the data to a labeled volume belonging to that pool.

NetWorker checks whether a correctly labeled volume from the pool is mounted in a configured device. If a correctly labeled volume is mounted, NetWorker writes the data to the volume. If an appropriate volume is *not* mounted, NetWorker's actions depend on whether there is a configured device with auto media management enabled:

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- If auto media management is enabled, NetWorker can automatically label and mount an unlabeled or recyclable volume and proceed with the backup. For more information on auto media management, refer to the *Legato NetWorker Administrator's Guide* for your particular NetWorker server platform.

- If auto media management is not enabled, NetWorker requests that a labeled volume be mounted and waits until an operator or an autochanger mounts an appropriate volume. NetWorker then proceeds with the backup to that volume.

Specifying Pools for DB2 Universal Database Backups

Volume pools provide the ability to segregate DB2 Universal Database data such as tablespaces and archived redo logs onto different sets of media. Pools also allow you to direct backup data to specific devices.

Each volume pool has a *Pool type* attribute. For NetWorker Module for DB2 Universal Database, the only valid pool types are *Backup* and *Backup clone*.

NetWorker uses the choices you select in the pool configuration to sort backup data to specific volumes labeled for the pool. For example, you can sort your DB2 Universal Database backup data by pool type and any combination of these criteria:

- Backup group
- NetWorker client

You might want to organize your backup data in different ways, such as by department or type of database. You can send your DB2 Universal Database data backups to separate media by setting up volume pools for those backups.

Setting the NSR_DATA_VOLUME_POOL Variable

The NSR_DATA_VOLUME_POOL environment variable is used for DB2 Universal Database and tablespace backup.

To specify that the NetWorker server backup the DB2 Universal Database data to a pool *other than the Default pool*, you must set the NSR_DATA_VOLUME_POOL environment variable to the volume pool name in the vendor configuration file.

This applies to manual, scheduled or tablespace backup. For details about how to use the DB2 Universal Database vendor configuration file, see .

Setting the NSR_LOG_VOLUME_POOL Variable

The NSR_LOG_VOLUME_POOL environment variable is used for DB2 Universal Database transactional log backup.

To specify that the NetWorker server back up DB2 Universal Database logs to a pool *other than the Default pool*, you must set the NSR_LOG_VOLUME_POOL environment variable to the volume pool name in the vendor configuration file.

For details about how to use the DB2 Universal Database vendor configuration file, see "Task 1: Configure the DB2 Universal Database Instance" on page 22.

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Sources of Information for Additional NetWorker Configuration

Refer to the *Legato NetWorker Administrator's Guide* for your particular NetWorker server platform, and the NetWorker online help for detailed information about the following topics:

- Enabling regular filesystem backups
- Configuring the server resource
- Configuring device resources
- Labeling and mounting volumes
- Configuring storage nodes

Refer to th*e Legato Compatibility Guide fo*r a complete list of the storage devices that NetWorker currently supports. The *Legato Compatibility Guide* is available from the Legato web site at *www.legato.com*.

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Chapter 3: Manual DB2 Universal Database Backups

This chapter provides details on setting up and running manual DB2 Universal Database backups.

This chapter contains the following sections:

An important consideration with manual DB2 Universal Database backups is the maintenance of regular NetWorker server bootstrap backups to ensure adequate preparation for future disaster recovery.

Roadmap for Manual DB2 Universal Database Backups

Before configuring manual DB2 Universal Database backups using the steps below, be sure you have followed the "Basic Configuration Roadmap" on page 22. You should have set up the basic NetWorker server, client, device, and pool resources as well as labeled and mounted the required backup volumes.

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Important: The NetWorker server bootstrap and client indexes are *not* automatically backed up at the end of a manual DB2 Universal Database backup, as they are for a scheduled DB2 Universal Database backup. After running a manual DB2 Universal Database backup, you should perform a NetWorker server bootstrap backup. For more information on NetWorker bootstrap backups, refer to the *Legato NetWorker Administrator's Guide* and *Legato NetWorker Disaster Recovery Guide*.

You can use the information in "Monitoring Manual DB2 Universal Database Backups" on page 35 to keep track of the status of your manual DB2 Universal Database backups.

Running Manual DB2 Universal Database Backups

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Important: You must specify the **use xbsa** option each time you use the **db2 backup** or **db2 restore** command.

After you have installed and configured NetWorker Module for DB2 Universal Database as described in "Chapter 2: Basic Configuration" on page 21, you can run manual DB2 Universal Database backups.

To complete a manual DB2 Universal Database backup:

- The required server, client, device, and volume pool resources must be configured.
- A labelled volume must be available.
- The DB2 Universal Database should have two DB2 Universal Database registry variables set, DB2_XBSA_LIBRARY and DB2_VENDOR_INI.
- The DB2 Universal Database vendor configuration file should have been created as described in Chapter 2, "Task 1: Configure the DB2 Universal Database Instance" on page 22.

Use the **db2 backup** command to create a manual database backup. Use the *use xbsa* option with the **db2 backup** command to direct the backup to a NetWorker server. For example:

```
$ db2 backup db sample use xbsa
```

!

Important: On Windows NT and Windows 2000, the *OPEN num-sess SESSIONS* option of the **db2 backup** command is *not* supported. Running multiple **db2 backup** commands in the same instance is *not* supported; the results are unpredictable.

Log Backups

DB2 Universal Database log files are not by default backed up during a database backup. To automatically backup online archived logs as they become filled, the DB2 Universal Database must be configured for roll-forward recovery by enabling the USEREXIT database configuration parameter. If the DB2 Universal Database is enabled for roll-forward recovery, the DB2 Universal Database database engine will call the **db2uext2** program provided with NetWorker Module for DB2 Universal Database.

Setting the NSR_NO_BUSY_ERRORS Variable

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Important: Failure to set the NSR_NO_BUSY_ERRORS environment variable in the DB2 Universal Database vendor configuration file will prevent you from shutting down the DB2 Universal Database backup if the NetWorker server is down.

If the NetWorker server is temporarily unavailable or it is busy when you start a DB2 Universal Database backup, the backup will wait indefinitely for the NetWorker server to become available.

To prevent the backup from hanging, set the NetWorker XBSA NSR_NO_BUSY_ERRORS environment variable to TRUE in the DB2 Universal Database vendor configuration file:

```
NSR_NO_BUSY_ERRORS=TRUE
```

For more information about the DB2 Universal Database vendor configuration file, refer to "Task 1: Configure the DB2 Universal Database Instance" on page 22.

For more information about the NetWorker XBSA NSR_NO_BUSY_ERRORS environment variable, see "Appendix A: XBSA Environment Variables" on page 63.

Monitoring Manual DB2 Universal Database Backups

Use the NetWorker Administrator GUI to monitor the status of DB2 Universal Database backup and restore operations. The GUI displays progress messages and completion messages that advise you when a backup or restore is complete. The GUI also provides information if a backup or restore cannot proceed.

For more information on viewing these types of messages using the NetWorker Administrator GUI, refer to the *Legato NetWorker Administrator's Guide* for your particular NetWorker server platform.

Figure 5 shows the types of messages displayed in the Sessions and Messages sections of the main NetWorker Administrator GUI on UNIX during DB2 Universal Database backups.

Figure 5. DB2 Universal Database Backup Messages on UNIX

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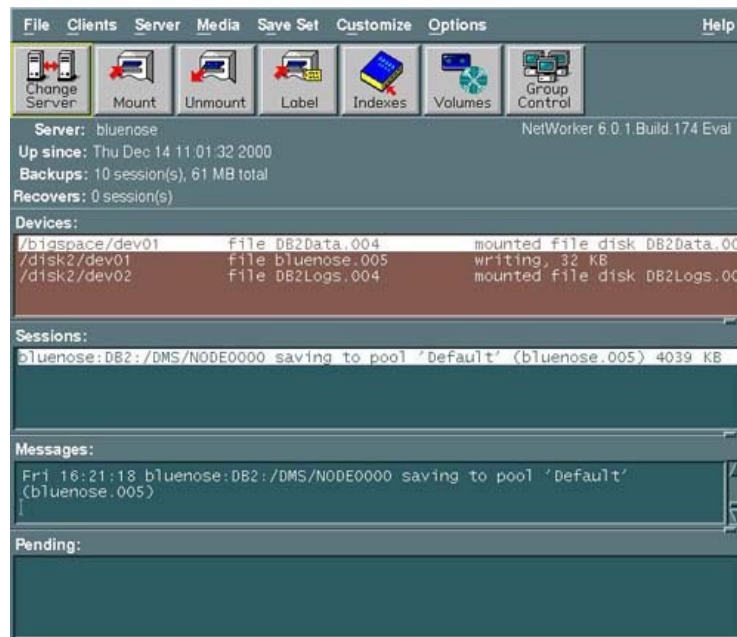
Diagnostic and Error Messages

Diagnostic messages specific to NetWorker Module for DB2 Universal Database are recorded in the following log files by default:

- On UNIX:

    /nsr/logs/xbsa.messages

- On Windows:
    - With NetWorker 5.5.x:

        %SystemDrive%\win32app\nsr\logs\xbsa.messages

    - With NetWorker 5.7 and later:

        %SystemDrive%\Program Files\nsr\logs\xbsa.messages

Only urgent messages are written to these files by default.

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You can specify a different file for the NetWorker Module for DB2 Universal Database error and diagnostic messages, as well as control the level of detail, by setting the NSR_DEBUG_FILE and NSR_DEBUG_LEVEL environment variables in the DB2 Universal Database vendor configuration file. This will also allow you to direct error diagnostic messages for different DB2 Universal Database instances to different files.

For more information about the DB2 Universal Database vendor configuration file, see "Task 1: Configure the DB2 Universal Database Instance" on page 22.

Set the NSR_DEBUG_FILE environment variable to a valid file pathname. Set NSR_DEBUG_LEVEL to an integer in the range of 0 to 9, where 9 is the highest level of detail and 0 is the lowest. NetWorker will write debugging information to the specified file.

For more information about the NetWorker XBSA NSR_DEBUG_FILE environment variable, see "Appendix A: XBSA Environment Variables" on page 63.

To obtain diagnostic and error messages specific to DB2 Universal Database transactional log backup and restore, you must set the NSR_DB2UEXT2_DEBUG_FILE environment variable to a valid pathname in the DB2 Universal Database vendor configuration file. The **db2uext2** program provided with NetWorker Module for DB2 Universal Database writes debugging information to the specified file.

Removing Failed Backups

If the DB2 Universal Database backup failed, you might have to remove it manually from the NetWorker server media database.

To manually remove a failed DB2 Universal Database:

1. Use the **mminfo** command on the NetWorker server to see if the record for the failed backup was created in the media database. For example:

   ```
   $ mminfo -v -c oka.legato.com
   ```

   where oka.legato.com is the hostname of the computer in which the DB2 Universal Database resides.

2. Using the output of the **mminfo** command on the NetWorker server, see if a saveset was created for the failed backup and note its saveset id (ssid).Use the **nsrmm** command to remove it from the media database:

   ```
   $ nsrmm -S ssid -d
   ```

   where ssid is the saveset that you found from the output of the **mminfo** command.

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Chapter 4: Scheduled DB2 Universal Database Backups

This chapter describes how to set up and run scheduled DB2 Universal Database backups using NetWorker Module for DB2 Universal Database. It outlines the procedures for testing scheduled DB2 Universal Database backups as well as monitoring scheduled DB2 Universal Database backups using the NetWorker Administrator GUI and specific log files.

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Important: Before configuring and running scheduled DB2 Universal Database backups using the instructions in this chapter, you should execute a manual DB2 Universal Database backup successfully, using the instructions in "Chapter 3: Manual DB2 Universal Database Backups" on page 31, to verify your NetWorker Module for DB2 Universal Database configuration.

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This chapter contains the following sections:

- "Roadmap for Scheduled DB2 Universal Database Backups" on page 40
- "Task 1: Setting XBSA Environment Variables" on page 41
- "Task 2: Customizing the nsrdb2 Script" on page 41
- "Task 3: Configuring a Backup Schedule" on page 47
- "Task 4: Configuring a Backup Group" on page 48
- "Task 5: Client Resource for a Scheduled Backup" on page 49
- "Testing Scheduled Backups" on page 52
- "Monitoring Scheduled DB2 Universal Database Backups" on page 54

NetWorker can be configured to run DB2 Backup on a regular basis by setting up scheduled DB2 Universal Database backups.

NetWorker works with NetWorker Module for DB2 Universal Database to back up your DB2 Universal Database host according to the NetWorker schedule you set up.

Roadmap for Scheduled DB2 Universal Database Backups

Before configuring scheduled DB2 Universal Database backups using the steps below, be sure you have followed the "Basic Configuration Roadmap" on page 22 to complete the basic DB2 Universal Database and NetWorker system configurations. You should have set up the basic NetWorker server, client, device, and pool resources before configuring scheduled DB2 Universal Database backups.

To configure scheduled DB2 Universal Database backups:

1. Set the necessary NetWorker XBSA environment variables in the DB2 Universal Database vendor configuration file. For details about configuring the vendor configuration file see "Task 1: Setting XBSA Environment Variables" on page 41.

2. Customize a copy of the **nsrdb2** script for the scheduled backup (the file *nsrdb2* on UNIX or *nsrdb2.bat* on Windows). Set the required environment variables in your copy of the **nsrdb2** script. For details, see "Task 2: Customizing the nsrdb2 Script" on page 41.

3. Configure the required backup schedules. For details, see "Task 3: Configuring a Backup Schedule" on page 47.

4. Configure the required backup groups. For details, see "Task 4: Configuring a Backup Group" on page 48.

5. Configure a NetWorker client resource for the scheduled backup. For details, see "Task 5: Client Resource for a Scheduled Backup" on page 49.

After completing these configuration steps:

• Run a test scheduled DB2 Universal Database backup using the steps in "Testing Scheduled Backups" on page 52.

• Review the steps for stopping a scheduled DB2 Universal Database backup in "Stopping Scheduled Backups" on page 53.

You can use the information in "Monitoring Scheduled DB2 Universal Database Backups" on page 54 to keep track of the status of your scheduled DB2 Universal Database backups.

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Task 1: Setting XBSA Environment Variables

The NetWorker XBSA Environment variables are set in the DB2 Universal Database vendor configuration file. For more information about configuring the DB2 Universal Database environment variables, see .

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Important: The NSR_SERVER variable must be set to the NetWorker server that is performing the scheduled backup. The DB2 Universal Database backup will be directed to the NetWorker server specified by this environment variable. If the NetWorker server doing the scheduled backup and the NetWorker server specified by the NSR_SERVER variable do not coincide, the scheduled backup will fail.

Task 2: Customizing the nsrdb2 Script

Create a copy of the **nsrdb2** script in the NetWorker Client executables directory:

- **nsrdb2** on UNIX, found in the template file provided in */etc/nsrdb2.sh*
- **nsrdb2.bat** on Windows, found in the NetWorker client executables directory

Do *not* modify the templates.

Give your script a unique name, starting with *nsr* or *save*--and on Windows, ending with *.bat* or *.cmd.*

Note: On UNIX, the **nsrdb2** script file must be an executable. If required, add executable permissions to the file on UNIX using the **chmod +x** *filename* command.

You can create multiple versions of the **nsrdb2** script on the same DB2 Universal Database host. You must have at least one customized copy of the **nsrdb2** script per DB2 Universal Database instance that uses NetWorker Module for DB2 Universal Database to back up its data.

In your copy of the **nsrdb2** script, only use the following environment variables:

- DB2INSTANCE in
- INSTHOME in

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- PATH in
- NSR_BACKUP_OPT in
- DB2_BACKUP_OPT in
- PRECMD in
- POSTCMD in
- DB2_ONLINE in

Table 1. Environment Variables in the nsrdb2 script

Environment Variable	Description	Example
DB2INSTANCE	*Mandatory* for each scheduled backup. Set DB2INSTANCE to specify DB2 Universal Database instance in your copy of the **nsrdb2** script.	**UNIX:** If the UNIX username of your DB2 Universal Database instance is *db2inst1*, then you must set DB2INSTANCE in your copy of the **nsrdb2** script: **DB2INSTANCE=db2inst1** **WINDOWS:** If the DB2 Universal Database instance on Windows NT or Windows 2000 is *DB2*, then you must set DB2INSTANCE in your copy of the **nsrdb2.bat** file as follows: **DB2INSTANCE=DB2**

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Table 1. Environment Variables in the nsrdb2 script (Continued)

Environment Variable	Description	Example
INSTHOME	*Mandatory* for each scheduled backup. Set INSTHOME in your copy of the **nsrdb2** script to the home directory of the DB2 Universal Database instance.	**UNIX:** If the DB2 Universal Database instance home directory is */home/db2inst1*, set INSTHOME as follows in your copy of the **nsrdb2** script: **INSTHOME=/home/db2inst1** **WINDOWS:** If the DB2 Universal Database instance home directory is *e:*, set INSTHOME as follows in your copy of **nsrdb2.bat**: **INSTHOME=e:**

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Table 1. Environment Variables in the nsrdb2 script (Continued)

Environment Variable	Description	Example
PATH	*Mandatory* for each scheduled backup. Set PATH in your copy of the **nsrdb2** script to include the directory containing the **nsrdb2sv** and the **db2** executables.	**UNIX:** If the program **nsrdb2sv** is located in the directory */usr/sbin* on your DB2 Universal Database host and the **db2** program is located in */home/db2inst1/sqllib/bin*, you must set PATH in the **nsrdb2** script to the following value: **PATH=/usr/sbin: $INSTHOME/sqllib/bin** **WINDOWS:** If the program **nsrdb2sv** is located in the directory *d:\win32app\nsr\bin* on your DB2 Universal Database host and the **db2** program is located in *%INSTHOME%\sqllib\bin*, you must set PATH in the **nsrdb2.bat** to the following value: **PATH=d:\win32app\nsr\ bin;%INSTHOME%\sqllib\ bin**
NSR_BACKUP_OP T	This environment variable can be used to pass additional options to the **nsrdb2sv** executable.	Set NSR_BACKUP_OPT to increase the debug level: **NSR_BACKUP_OPT="-D 4"**

Table 1. Environment Variables in the nsrdb2 script (Continued)

Environment Variable	Description	Example
DB2_BACKUP_OPT	Used to pass additional options to the DB2 Backup command. For a list of DB2 Backup command options, refer to your DB2 Universal Database *Administrator's Guide: Design and Implementation*. **Note:** On Windows, the ***OPEN num-sess SESSIONS*** option is *not* supported. Running multiple DB2 Backup commands in the same instance is *not* supported; the results are unpredictable.	Set DB2_BACKUP_OPT to specify the number of buffers: `DB2_BACKUP_OPT="WITH 10 BUFFERS"`

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Table 1. Environment Variables in the nsrdb2 script (Continued)

Environment Variable	Description	Example
PRECMD	PRECMD is *optional*. You can set PRECMD to the full pathname of a file containing a preprocessing script to be executed before the DB2 Backup backup script. **Note:** The script file must have permissions allowing execution by the root user, as the scheduled DB2 Universal Database backup is always launched by root. The script should return a zero value when it succeeds and a nonzero value when it fails. The return of a nonzero value will cause the scheduled backup to fail. If the pre-command script fails (returns a nonzero value), the scheduled DB2 Universal Database backup does not proceed.	

4

Table 1. Environment Variables in the nsrdb2 script (Continued)

Environment Variable	Description	Example
POSTCMD	POSTCMD is *optional*. You can set POSTCMD to the full pathname of a file containing a post-processing script to be executed after the DB2 Universal Database backup script. If the DB2 Universal Database backup script fails, the failure is reported, and the post-processing script is executed nevertheless. If the post-processing script fails, an error message is reported.	
DB2_ONLINE	Can be used to specify that an online DB2 Universal Database backup should be done. The default value is FALSE; the backup will be offline if it is not set to TRUE.	Set DB2_ONLINE to TRUE: `DB2_ONLINE=TRUE`

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Task 3: Configuring a Backup Schedule

NetWorker uses backup schedules to automate its scheduled backups. The NetWorker Administrator GUI provides a graphical calendar for configuring the schedule resource, in which you can specify the days of the week to run a scheduled DB2 Universal Database backup.

NetWorker provides several preconfigured schedules. You can also create, modify, and remove your own schedules. For details on how to do this, refer to the *Legato NetWorker Administrator's Guide* for your particular NetWorker server platform.

You must customize a NetWorker schedule resource for your DB2 Universal Database backup. In the schedule resource, select a level for each day of the week. Level *full* specifies that NetWorker run the DB2 Backup on that day. Level *skip* specifies that NetWorker does *not* run the backup script on that day. Enter the name of the NetWorker schedule in the *Schedule* field of the client resource as explained in .

![warning icon]

Important: You must specify the level of the DB2 Universal Database backup as *either full or skip*. Only level *full* backups are supported by DB2 Universal Database. If you set the level to *incremental* or level *1 to 9*, a level *full* backup is performed.

Task 4: Configuring a Backup Group

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A NetWorker backup group is a set of NetWorker client resources, all of which start backing up data at a specified time (once you enable the Autostart feature in the group resource). You can assign one or more client resources configured for the DB2 Universal Database host(s) to a NetWorker backup group.

NetWorker provides a preconfigured backup group named Default with the following settings:

- Autostart = Disabled
- Start time = 3:33
- Client retries = 1
- Clones = No
- Clone pool = Default Clone

You can create other NetWorker backup groups. You cannot remove the Default group, but you can modify it. If you want to use the Default group for testing your scheduled DB2 Universal Database backups, change its *Autostart* attribute to *Enabled*.

Eventually, you might want to create your own backup group(s) for your scheduled DB2 Universal Database backup(s). For details on how to configure a NetWorker backup group, refer to the *Legato NetWorker Administrator's Guide* for your particular NetWorker server platform.

![warning icon]

Important: The scheduled backup will never occur if you do *not* enable the *Autostart* attribute in the backup group for the scheduled DB2 Universal Database backup.

By configuring one or more NetWorker backup groups for scheduled DB2 Universal Database backups, you can distribute the backups to alleviate network traffic and schedule the backups for a time of day when performance demands on your database and NetWorker server are lower.

Task 5: Client Resource for a Scheduled Backup

At this point, it is assumed that you have configured a basic client resource for the DB2 Universal Database host. This basic client resource is required for running manual DB2 Universal Database backups. For details on configuring a basic client resource, see "Task 2: Create a Client Resource for DB2 Universal Database" on page 24.

For scheduled DB2 Universal Database backups, you must specify additional attributes in the client resource for the DB2 Universal Database instance.

To complete the client resource configuration for scheduled DB2 Universal Database backups:

1. Run the NetWorker Administrator GUI as an administrative user and open the Clients window. Select the client resource for the DB2 Universal Database instance.

2. Enter the databases and tablespaces that you want to back up in the *Save set* list. To specify multiple databases for UNIX that belong to the same DB2 Universal Database instance, place each name on a separate line. If you want to back up only some tablespaces of a database, place them all on the same line after the database name.

   The save set name should start with DB2:/; *this is case sensitive.*

   If you want a complete database backup, follow DB2:/ with a database name. For example, to back up database *SAMPLE*, specify:

   ```
   DB2:/SAMPLE
   ```

   Running the scheduled backup with this save set name in the client resource is equivalent to performing the following manual backup:

   ```
   $ db2 backup db sample use xbsa
   ```

If you want to back up only specific tablespaces, specify tablespaces after the database name and separate them with /. For example, to back up the *USERSPACE1* tablespace of the database *SAMPLE*, specify:

```
DB2:/SAMPLE/USERSPACE1
```

Running the scheduled backup with this save set name in the client resource is equivalent to performing the following manual backup:

$ **db2 backup db sample tablespace (USERSPACE1) use xbsa**

To back up two tablespaces, *USERSPACE1* and *USERSPACE2* of database *SAMPLE*, specify:

```
DB2:/SAMPLE/USERSPACE1/USERSPACE2
```

The above save set name results in two tablespace backups taken together; this is equivalent to performing the following manual backup:

$ **db2 backup db sample tablespace (USERSPACE1, USERSPACE2) use xbsa**

On UNIX, if you have more than one database under your DB2 Universal Database instance, you can use one client resource to back them up. The following example creates a full database backup of database *TEST* and a tablespace backup of database *SAMPLE*:

```
DB2:/TEST
```

```
DB2:/SAMPLE/USERSPACE1/USERSPACE2
```

4

Important: Scheduling multiple backups of the same database, at the same time will fail. You must have only one save set name per database in the *Save set* list.

On Windows, you must have only one line in the saveset list specifying a database or a tablespace backup.

Important: Running multiple DB2 backup commands in the same instance is not supported; the results are unpredictable. You must have only one save set name per database in the *Save set* list.

Note: The save set name specified in the *Save set* list of the client resource and the save set name actually created in the media database are different. The reason is that the actual save set name is created in the XBSA library from

arguments passed from the DB2 Universal Database manager. It is of the form *DB2:/database_name/node_number*. For example, if you enter *DB2:/SAMPLE* in the client resource saveset list, the actual save set name is *DB2:/SAMPLE/NODE0000*.

3. Select a NetWorker group. For details on NetWorker backup groups, see "Task 4: Configuring a Backup Group" on page 48.

4. Enter the name of a single customized **nsrdb2** script (see step 2) in the *Backup command* field. For example, this could be *nsrdb2_prodDB* on UNIX or *nsrdb2_prodDB.bat* on Windows.

5. Specify all known aliases for the DB2 Universal Database host.

6. On UNIX, leave the *Directive*, *Archive users*, *Remote user*, and *Password* fields blank.

   On Windows, leave the *Directive* and *Archive users* fields blank. Make sure that you add the DB2 Universal Database instance user name in the *Remote user* field and the DB2 Universal Database instance password in the *password* field.

⚠

Important: Each DB2 Universal Database instance requires a separate NetWorker client resource because the *Backup command* field of the client resource can contain only one **nsrdb2** script name and DB2_INSTANCE is a mandatory variable for each **nsrdb2** script.

4

If multiple DB2 Universal Database save set names are specified in the *Save set* list of the client resource and the **nsrdb2** script contains a well-defined PRECMD and/or POSTCMD variable, the pre-command and post-command files will be:

- Common for all the DB2 Backups
- Executed once for each DB2 Backup

Note: If a scheduled DB2 Universal Database backup is retried, the specified pre- and post-commands will be executed again for that backup.

For more information on how to configure a NetWorker client for scheduled backups, refer to the *Legato NetWorker Administrator's Guide* for the appropriate operating system.

Configuring an E-mail Notification

To send an e-mail notification of the scheduled backup results to the owner of a save set, edit the detailed view of the client resource for the DB2 Universal Database instance. To activate the detailed view of the client resource:

- On UNIX:
    1. In the NetWorker Administrator GUI, select Clients>Client Setup.
    2. In the Clients window, enable Details in the View menu.
- On Windows:
    1. In the NetWorker Administrator GUI, select Options>Customize.
    2. In the Window Configurations tab, select Display Hidden Attributes and click OK.

In the detailed view of the client resource, edit the Owner notification attribute and enter a notification command directed to the login ID of the owner, for example: */usr/bin/mail -s "jupiter-mars-venus backup" jdoe*.

Testing Scheduled Backups

4

When you have finished configuring a scheduled backup for a DB2 Universal Database instance, run a test scheduled backup manually using the NetWorker Administrator GUI.

Before you run the test scheduled backup:

- The required environment variables must be set in your **nsrdb2** script.
- The required environment variables must be set in the DB2 Universal Database vendor configuration file.
- The (optional) pre- and post-processing scripts must be in place.
- The NetWorker server and DB2 Universal Database instance must be correctly configured as described in the preceding sections of this chapter.

To run a test scheduled DB2 Universal Database backup:

1. Run the NetWorker Administrator GUI as an administrative user on the NetWorker server.

2. On UNIX, select Server>Group Control to open the Group Control window. On Windows, open the Groups window. For more information on the NetWorker Administrator GUI, refer to the *Legato NetWorker Administrator's Guide* for your particular NetWorker server platform.

3. In the Group Control window on UNIX or the Groups window on Windows, highlight the correct Group name for the scheduled DB2 Universal Database backup. In the Group Control window, click Start. On Windows, click the appropriate button in the NetWorker Administrator program toolbar.

4. When the Status of the selected group changes to Finished, the scheduled backup is complete. An e-mail "savegroup completion" message provides a report of the scheduled backup if the e-mail notification has been configured in the client resource as described in "Configuring an E-mail Notification" on page 52.

Error Messages for Scheduled Backups

If the scheduled backup fails, you receive an error message. To obtain more details from the NetWorker Administrator GUI, select Server>Group Control>Details.

You can view the *savegrp.log* file in the NetWorker *logs* directory:

- On UNIX:

  /nsr/logs/savegrp.log

- On Windows:

  – With NetWorker 5.5.x:

  %System Root%\win32app\nsr\logs\savegrp.log

  – With NetWorker 5.7 and later:

  %System Root%\Program Files\nsr\logs\savegrp.log

If the scheduling portion of your scheduled DB2 Universal Database backup succeeds but the actual backup fails, you might receive error messages and debugging information in the locations described in "Diagnostic and Error Messages" on page 36.

Stopping Scheduled Backups

NetWorker Module for DB2 Universal Database does *not* currently support the use of the Stop button in the NetWorker Administrator program for stopping scheduled DB2 Universal Database backups. if you press the Stop button to cancel the scheduled DB2 Universal Database backup, you might create a record for the incomplete backup in the NetWorker media database. For information about removing failed backups, see "Removing Failed Backups" on page 36.

Monitoring Scheduled DB2 Universal Database Backups

You can monitor scheduled DB2 Universal Database backups the same way you monitor manual DB2 Universal Database backups. For more details, see .

In addition, you can monitor messages appearing in the Group Control window of the NetWorker Administrator GUI and review the report generated upon completion of the scheduled DB2 Universal Database backup. For more details, refer to the *Legato NetWorker Administrator's Guide* for your particular NetWorker server platform.

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Chapter 5: Restoring DB2 Universal Database Data

This chapter provides details on setting up and running DB2 Universal Database data restore operations. NetWorker Module for DB2 Universal Database enables you to run DB2 Universal Database restores using the DB2 Universal Database command line interface.

This chapter also describes the basic procedures for recovering the DB2 Universal Database database to a consistent state. See "Disaster Recovery" on page 62 for different disaster recovery scenarios, and information on preparing for disaster recovery.

This chapter contains the following sections:

Preparing to Restore Data

During a DB2 Universal Database backup, the NetWorker server adds entries for the backup to the online client index and media index files. These entries provide information needed for restoring every DB2 Universal Database data object backed up:

- To the client index, NetWorker adds information about the specific DB2 Universal Database data backed up for the client.
- To the media index, NetWorker adds information about the location of each backup volume and the DB2 Universal Database data written to the volume.

The NetWorker Client resource configured for the DB2 Universal Database system includes a browse policy and retention policy. A client index entry is maintained until the time period specified by the browse policy has been exceeded. A media index entry is maintained until the time period specified by the retention policy has been exceeded.

When the browse and retention policies for all the save sets on a backup volume have been exceeded, the volume becomes recyclable and eligible for automatic relabeling by NetWorker. When a volume is relabeled, the data on the volume becomes inaccessible and can no longer be restored.

![warning icon]

Important: You must always restore DB2 Universal Database data using the DB2 Universal Database command line interface. You *cannot* use the NetWorker client and server command line and GUI interfaces to perform a DB2 Universal Database data restore operation.

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Roadmap for DB2 Universal Database Data Recovery

You will only be able to restore DB2 Universal Database data that has been backed up according to the instructions in "Chapter 3: Manual DB2 Universal Database Backups" on page 31 or "Chapter 4: Scheduled DB2 Universal Database Backups" on page 39.

To recover your target DB2 Universal Database database when one or more files of the database are damaged:

1. Configure the DB2 Universal Database restore operation. For details, see "Task 1: Configure a DB2 Universal Database Restore" on page 57.

2. Perform the DB2 Universal Database restore operation. For details, see "Task 2: Perform a DB2 Universal Database Restore" on page 57.

3. Perform a DB2 Universal Database roll-forward recovery, if required. For details, see "Task 3: Perform a DB2 Universal Database Roll-Forward Recovery" on page 58.

Task 1: Configure a DB2 Universal Database Restore

NetWorker Module for DB2 Universal Database performs restores of DB2 Universal Database data based on NetWorker XBSA environment variables. You should set these variables in the DB2 Universal Database vendor configuration file. For more information on the DB2 Universal Database vendor configuration file, see the Chapter 2 section "Task 1: Configure the DB2 Universal Database Instance" on page 22.

1. You must set the NSR_SERVER environment variable to the name of the NetWorker server that contains the backup you want to restore.

2. In the NetWorker Client resource for DB2 Universal Database host that was backed up, set the *Remote access* field to the host that you are restoring to.

⚠

Important: To be able to restore backups of a DB2 Universal Database system to a different system, you must add the fully qualified domain name of that system to the *Remote access* field in the NetWorker Client resource configured for the DB2 Universal Database system.

You can also set other NetWorker XBSA environment variables. For more information, see "Appendix A: XBSA Environment Variables" on page 63.

Task 2: Perform a DB2 Universal Database Restore

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Important: You must specify the **use xbsa** option each time you use the **db2 backup** or **db2 restore** command.

You perform a restore using the **db2 restore** command. For more information on the **db2 restore** command, refer to your DB2 Universal Database *Administrator's Guide: Design and Implementation*.

To specify that the backup image you are restoring resides on the NetWorker server, use the **db2 restore** command with the **use xbsa** option. For example:

```
$ db2 restore db sample use xbsa
```

This command restores the latest backup image of the database server from the NetWorker server.

You can use any **db2 restore** command options with the exception of *OPEN num-sess SESSIONS* on Windows NT and Windows 2000.

![warning icon]

Important: On Windows NT and Windows 2000, the *OPEN num-sess SESSIONS* option of the **db2 restore** command is *not* supported. Opening multiple sessions during a restore is *not* supported; the results are unpredictable.

For the correct syntax of the **db2 restore** command and its options, refer to the DB2 Universal Database *Command Reference*.

If you do not specify the **taken at date-time** option of the **db2 restore** command and you did not create any tablespace backups, the latest database backup image will be restored from the NetWorker server.

If you have full database backups and tablespace backups on the NetWorker server, you should always use the **taken at date-time** option to specify which backup image you want to restore. Otherwise, the DB2 Universal Database database manager cannot distinguish between backup images and you will get an error message from the **db2 restore** command.

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Task 3: Perform a DB2 Universal Database Roll-Forward Recovery

If your database is enabled for roll-forward recovery (setting the USEREXIT database configuration parameter) and you created log backups as described in "Log Backups" on page 34, you can recover a database or tablespace to a particular time that is after the time the database backup was taken.

First you must restore a database as described in "Task 2: Perform a DB2 Universal Database Restore" on page 57. Then you can roll forward changes in a database or tablespace using the **db2 rollforward** command. When you issue the **db2 rollforward** command, the DB2 Universal Database database manager calls the **db2uext2** program (provided with NetWorker Module for DB2 Universal Database), which restores the required logs, and reapplies the transactions recorded in the logs to the restored database. For more information on the **db2 rollforward** command, refer to the DB2 Universal Database *Administrator's Guide: Design and Implementation*.

For example, the following **db2 rollforward** command restores all the logs stored on the NetWorker server that were created after the database backup and reapplies the transactions.

```
$ db2 rollforward db sample to end of logs and complete
```

Performing a Manual Roll-Forward Recovery

If you are performing a roll-forward recovery to a database with another name (using the **into target-database-alias** option of the **db2 restore** command) or you have changed the *Path to log files* database configuration parameter, you must restore the logs and roll forward changes in the database manually using the procedure outlined below. The reason is that the logs are stored on the NetWorker server as XBSA objects with a database name and a log path directory being their attributes. If a database name or log path directory has changed since the time of the backup, the DB2 Universal Database database manager will not be able to find the logs during the roll-forward recovery.

To restore the logs and roll forward changes in the database manually:

1. Restore the database as described in "Task 2: Perform a DB2 Universal Database Restore" on page 57. Change your working directory to the directory specified by the Path to log files database configuration parameter.

2. Set the necessary NetWorker XBSA environment variables. Since you are restoring the logs manually, you should set the variables in your shell and *not* in the DB2 Universal Database vendor configuration file. Set the NSR_SERVER environment variable to the name of the NetWorker server containing the backup. If you are restoring to a different host from where the backup was taken, set the NSR_CLIENT environment variable to the NetWorker client where the backup was taken. For a description of other NetWorker XBSA environment variables that you may want to set, see "Appendix A: XBSA Environment Variables" on page 63.

3. Issue the **db2 rollforward** command with the **query status** option to find out the first log file to be read.

4. Run the **db2uext2** command. A sample **db2uext2** command on Solaris is:

```
$ db2uext2 -OSSolaris -RLSQL06010 -RQRETRIEVE -DBSAMPLE\
-NNNODE0000 -LP/space1/home/db2inst1/db2inst1/NODE0000/\
SQL00001/SQLOGDIR -LNS0000001.LOG
```

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The options used with this sample **db2uext2** command are described in Table 2.

Table 2. db2uext2 Command Example

Command Option	Description
-OSSolaris	The operating system is **Solaris**.
-OSAIX	The operating system is **AIX.**
-OSNT	The operating system is **Windows NT** or **Windows 2000**.
-RLSQL06010	The DB2 Universal Database version is **SQL06010**.
-RQRETRIEVE	The action to perform is **RETRIEVE**.
-DBSAMPLE	The name of the database (all uppercase letters) the log belonged to during the time of the backup is **SAMPLE**.
-NNNODE0000	The node number is **NODE0000**.
-LP/space1/home/ db2inst1/db2inst1/ NODE0000/SQL00001/ SQLOGDIR/	The absolute path of the database log path directory from which the log was backed up is specified after **-LP**.
-LNS0000001.LOG	The name of the log you want to restore is **S0000001.LOG**.

5. Restore all the logs by running **db2uext2** for each log you need to restore. Use the appropriate options with each **db2uext2** command, as described in Table 2.

6. Reapply the transactions in the logs to the database by issuing the **db2 rollforward** command.

Note: If you have a lot of log files and they are large, you may want to roll forward the transactions in the logs one by one. Restore the log using the **db2uext2** program as described above. Roll forward the changes in the log by using the *db2 rollforward* command without a **stop** or **complete** option. If you are doing a database roll-forward to a point in time, examine the output from the *db2 rollforward* command to see if you have reached that point in time already. If yes, issue *db2 rollforward* with a **stop** or **complete** option to bring the

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database into a consistent state. Otherwise, continue restoring and applying transactions in the logs. If you run **db2uext2** with a log name and such a log is not restored, this means that the backup of this log does not exist on the NetWorker server. Issue *db2 rollforward* with a **stop** or **complete** option to bring the database into a consistent state.

Multiple Transactional Log Sequences

If you restore a database enabled for rollforward recover without roll forward or with rollforward to a specific time, you will create multiple transactional log sequences. This happens because log names are reused. For more information about how DB2 Universal Database instance manages logs, refer to *DB2 Universal Database Administration Guide: Design and Implementation* from IBM.

With the db2uext2 program provided with DB2 Universal Database you can only restore the latest sequence of transactional logs.

In some circumstances, you might need to restore your database to a different system from the one where it was originally backed up.

Redirected Restore

To restore your DB2 Universal Database database to a secondary system:

1. Install and configure NetWorker Module for DB2 Universal Database on the secondary system where you will be restoring the DB2 Universal Database data.

2. In the DB2 Universal Database vendor configuration file, set the NSR_SERVER environment variable to specify the name of the NetWorker server.

3. In the DB2 Universal Database vendor configuration file, set the NSR_CLIENT environment variable to either the name of the NetWorker client that was backed up or the value of NSR_CLIENT used during the backup.

4. To restore backups of a DB2 Universal Database system to a different system, you must also add the fully qualified domain name of that system to the *Remote access* field in the NetWorker Client resource configured for the DB2 Universal Database system.

5. Run the **db2 restore** command with the appropriate options to restore the DB2 Universal Database database. For more information, see and .

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Disaster Recovery

It is important to develop a disaster recovery plan on your computer system. Perform the following tasks:

- Back up important data on a daily basis.
- Develop and test a plan to recover your data should you experience a disk crash or loss of data.

The more time and effort you invest in creating and testing your disaster recovery plan, the better prepared you will be for a possible disaster.

You can use NetWorker to recover from different types of disasters. The degree of data loss during a disaster can range from one or more files lost when a disk crashes, to an entire computer system. The degree of severity of the disaster determines the procedures you need to perform to recover your data.

The *Legato NetWorker Disaster Recovery Guide* explains how to recover the NetWorker server from various types of disasters.

The DB2 Universal Database *Administrator's Guide: Design and Implementation* contains information on how to prepare for a disaster recovery of your DB2 Universal Database database.

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Appendix A: XBSA Environment Variables

This appendix lists the NetWorker XBSA environment variables, their default values, and valid options.

NetWorker XBSA

NetWorker XBSA allows for configuration of environment options to activate certain features of NetWorker not directly supported by X/Open specifications. NetWorker XBSA enables a DB2 Universal Database instance and NetWorker to interact during backups and restores.

Default Values and Valid Options

This section contains tables for each of the NetWorker XBSA environment variables that you can set in the DB2 Universal Database vendor configuration file.

Setting NetWorker XBSA Variables

Put the NetWorker XBSA environment variables in the DB2 Universal Database vendor configuration file. Do not set NetWorker XBSA environment variables in the vendor configuration file that are not listed in this appendix.

Important: For a DB2 instance to recognize a change in the environment, after you have updated the vendor configuration file, you must stop and restart the DB2 Universal Database instance using the **db2stop** and **db2start** commands.

For more details about the vendor configuration file see "Task 1: Configure the DB2 Universal Database Instance" on page 22 of this guide.

NSR_CLIENT

Definition	**The NSR_CLIENT environment variable indicates the NetWorker client resource to use for the XBSA session.**
Default Value	Host from which the XBSA session is initiated, as indicated by **getlocalhost()**.
Possible Values	NetWorker client resource name. Since the client name is an arbitrary string, the value for NSR_CLIENT is not checked directly. An incorrect value may cause an authentication or system error in NetWorker.

NSR_DB2UEXT2_DEBUG_FILE

Definition	**The NSR_DB2UEXT2_DEBUG_FILE environment variable indicates the full pathname of a log file to which diagnostic and error messages specific to DB2 Universal Database transactional log backup and restore should be written to. If this variable is not set, the log file will not be created.**
Default Value	None.
Possible Values	Any valid pathname.

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NSR_COMPRESSION

Definition	**The NSR_COMPRESSION environment variable indicates whether to compress the backup data as it is sent to the NetWorker server.**
Default Value	**FALSE**
Possible Values	**TRUE** Setting NSR_COMPRESSION to a value of TRUE means the standard compression technique for XBSA for NetWorker is performed on the data backed up. **FALSE** Setting NSR_COMPRESSION to a value of FALSE means that compression is not performed. *Note:* Compressing data from the database server may speed up backups, as long as the database server is able to send data to the backup server fast enough to keep the tape drive streaming. Data compression during backup will impact CPU usage on the computer that the DB2 Universal Database resides, and will reduce the amount of data sent to the NetWorker server.

NSR_DATA_VOLUME_POOL

Definition	**The NSR_DATA_VOLUME_POOL environment variable indicates the volume pool to which data files should be backed up.**
Default Value	XBSA does not set a pool by default. If not specified, the pool is selected by the NetWorker server based on its pool resources configuration.
Possible Values	Any valid NetWorker pool name.

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NSR_DEBUG_FILE

Definition	**The NSR_DEBUG_FILE environment variable indicates the full *pathname* and *filename* to which** NetWorker XBSA **messages should be written. Message logs for XBSA are separated from regular NetWorker messages.**
Default Value	**UNIX,** *\/nsr\/applogs\/xbsa.messages* **WINDOWS,** NetWorker 5.5.x: *%SystemDrive%\win32app\nsr\logs\xbsa.messages* NetWorker 5.7 and later: *%SystemDrive%\Program Files\nsr\logs\xbsa.messages*
Possible Values	Any valid *pathname* or *filename*. If the file specified cannot be opened, a BSA_RC_INVALID_KEYWORD error message is written to the default file.

NSR_DEBUG_LEVEL

Definition	**Indicates the level of debugging to use during the NetWorker backup and recover sessions.**
Default Value	The default value is 2, which means that critical error messages and all network (RPC) errors are written.
Possible Values	• **0**, no debugging information • **1**, only errors causing fatal system errors • **2**, all network related errors • **3**, messages concerning the operation taking place • **4**, all starting and ending of sessions • **5**, parameters for all entries and exits from NetWorker • **6**, all entries and exits from internal NetWorker functions • **7**, all NetWorker internal errors • **8**, all NetWorker parameters

A

NSR_ENCRYPTION

Definition	**Indicates whether encryption of the data to be backed-up will take place.**
Default Value	None
Possible Values	• **NONE**, no encryption • **TRUE**, standard Legato encryption

NSR_GROUP

Definition	**The NSR_GROUP environment variable indicates the group configuration to use for a backup session.**
Default Value	None
Possible Values	Any valid NetWorker group name of 1024 characters or less. Invalid group names may cause authentication or system errors in another routine.

NSR_LOG_VOLUME_POOL

Definition	**The NSR_LOG_VOLUME_POOL environment variable indicates the volume pool to which transactional logs should be backed up.**
Default Value	NetWorker XBSA does not set a pool by default. If not specified, the pool is selected by the NetWorker server based on its pool resources configuration.
Possible Values	Any valid NetWorker pool name.

A

NSR_NO_BUSY_ERRORS

Definition	**The NSR_NO_BUSY_ERRORS environment variable indicates whether the savegroup should wait for a busy NetWorker server or fail immediately.**
Default Value	FALSE. Wait for the NetWorker server to accept the connection.
Possible Values	Setting NSR_NO_BUSY_ERRORS to a value of TRUE causes the backup to fail immediately when the NetWorker server is busy. A network error message describing the reason for the failure is written to *xbsa.messages*.

NSR_SERVER

Definition	**The NSR_SERVER environment variable indicates the *hostname* of the server that NetWorker XBSA should use for a save session.**
Default Value	The most appropriate server, based on the index name and client name for the session. *See also* NSR_CLIENT.
Possible Values	The server name defined by the NSR_SERVER environment variable is checked using **gethostbyname**(). If this routine call fails, the NetWorker XBSA error code "BSA_RC_INVALID_KEYWORD" is returned.

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Glossary

This glossary contains terms and definitions found in this manual. Most of the terms are specific to Legato NetWorker Module for DB2 Universal Database products.

API
: An acronym for Application Programming Interface, an agreed-upon set of computer library routines to accomplish a task.

autochanger
: A device that has the ability to move media among various components (including slots, media drives, media access ports, and transports) located in the device. Autochangers automate the media loading, labeling, and mounting during backups and recovers.

backup group
: A NetWorker client or group of clients configured to start backing up files to the NetWorker server at a designated time of day.

bootstrap
: A particular type of save set. At the end of a scheduled backup, NetWorker saves the server's media database, NetWorker configuration files, and part of the server index to a special save set named *bootstrap*. The bootstrap provides vital information needed for recovering from a disk crash. It is convenient to have the printouts generated from the bootstrap backup.

daemon	A program that is not invoked explicitly, but lies dormant waiting for a specified condition or set of conditions to occur.
DB2-Backup	A backup and recover utility that provides backup and recovery service to DB2 Universal Servers
DB2 Universal Server	DB2 Universal Server, considered by NetWorker as one or more instances of a DB2 *RDBMS*.
database name	The name of an individual DB2 Universal Server running on a host.
emergency boot file	An DB2-Backup ASCII file containing all of the information stored in the DB2-Backup *catalog tables* that pertain to critical *databases*.
fileserver	A machine with disks that provide file storage to other machines on a network.
filesystem	1. A sub-tree of a UNIX file tree that is on a specific disk partition or other mount point. 2. A method for storing files.
media manager	The NetWorker component that tracks save sets to backup volumes. The **nsrmmdbd** daemon is responsible for making entries in the NetWorker online media index.
multiplex	A method of transmitting multiple streams of data simultaneously through the same channel.
NetWorker client	A computer on a network running the NetWorker client software that can access storage management services from a NetWorker server. Clients may be workstations, PC desktops, or fileservers with gigabytes of data.
NetWorker server	A computer on a network running the NetWorker server software, containing online client indexes and providing storage management services to clients on a network.

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online client indexes	Databases on a NetWorker server that contain information pertaining to client backups and backup volumes.
page	A *physical unit* of disk storage used by DB2 Universal Server to read from and write to DB2 databases.
parallelism	The number of client savestreams that can be backed up at one time.
preconfigured	The initial default selections or configurations for several NetWorker features.
RDBMS	Relational Database Management System.
resource	A component of the NetWorker software that describes the NetWorker server and its clients. Devices, schedules, clients, groups, and pools are all examples of NetWorker resources. Each resource contains a list of attributes, defining the parameters to use for the configured NetWorker resource. Use the **nwadmin** or **nsradmin** program to configure NetWorker resources and their attributes.
RPC	Remote Procedure Call, a protocol that allows a program running on one host to cause code to execute on another host without needing explicitly coded instructions.
save set	A set of files or a filesystem that NetWorker has backed up onto backup media during a backup session. Save sets are assigned a save set id, an internal number that identifies the backup session to NetWorker for subsequent restoration to primary disk.
server parallelism	The number of client savestreams and the degree to which the backup efficiencies can be exploited. Server parallelism also defines the number of client savestreams accepted, for back up, at one time.

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shell prompt	1. UNIX command line prompt, for example, % or $ (or # for the root user). 2. DOS command line prompt, for example, C:\.
storage manager	An application that manages the storage devices and media used for DB2-Backup backup and restore requests. DB2 Universal Server is a storage manager that connects NetWorker to DB2-Backup through XBSA.
table space	A storage model that allows you to assign the location of a database and table data directly to a container, such as a directory name, device name, or file name.
transactional log	A record of DB2 Universal Server database transactions, stored in a log file to execute a fast recovery and roll back transactions.
XBSA	An acronym for X/Open® Backup Services Application Programming Interface, which connects NetWorker functionality to DB2-Backup. For more information about X/Open, visit the X/Open website at *www.xopen.org*.

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