

VERITAS NetBackup™ for SAP R/3 Environment Protection

INFORMATION THAT EVERY SAP R/3
ADMINISTRATOR SHOULD KNOW



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INTRODUCTION

The protection of SAP R/3 environments is an inherently challenging process. This process becomes more difficult as data grows in size and as demand for application availability limits the time available to perform backups. Many organizations use custom made scripts and manual backup methods to protect their SAP R/3 data. However, these methods do not have the reliability required by enterprise environments, and do little to improve the ongoing availability of critical systems. They are not suited to handle today's rapidly growing data environment.

Eliminating the backup overhead is also a requirement for many of today's online, all-the-time ERP applications. With SAP R/3 as the foundation for many business operations, even the slightest impact or downtime can translate into significant business losses. A backup and recovery solution must provide both efficiency and speed to support these complicated SAP R/3 environments.

VERITAS NetBackup software is an enterprise-wide backup and recovery solution. VERITAS Software has developed a highly scalable and reliable online backup and recovery solution for SAP R/3 environments. NetBackup for SAP R/3 for Oracle databases protects both the data itself and the availability of the SAP R/3 application.

This paper will discuss the fundamentals and essentials that every SAP R/3 Administrator should know and follow when creating their NetBackup for SAP R/3 for Oracle backup, restore, and recovery strategy. The SAP R/3 backup and recovery strategy that will be discussed will be useful to all SAP R/3 administrators. This paper will also discuss the future direction of SAP R/3 data protection.

SAP R/3 BACKUP BASICS

If you are running SAP R/3 with Oracle databases, then you are probably already investing in a backup and recovery solution to protect your SAP R/3 environment. For many organizations, a solution is an assortment of scripts and manual processes managed and maintained by in-house DBAs. Due to various reasons, many organizations are using backup schemes that are no longer backing up their data efficiently. Often, the problem is not discovered until a recovery fails, resulting in a costly application downtime or loss of critical data.

The backup solution in place may not address the needs of a SAP R/3 environment, which require 24 x 7 availability requirements. Symptoms of an inadequate backup/recovery solution include:

- Excessive SAP R/3 Administrator time spent maintaining and managing backups, without scheduled automated backups.
- Infrequent backups, leading to lengthier recoveries.
- Prolonged SAP R/3 outages due to data restoration errors or problems finding the right files to restore.
- Operator support required for changing tapes.

In the enterprise environment, SAP R/3 environments using Oracle databases offer unique and specific challenges for backup and recovery. These include:

- **Managing large amounts of data:** Backups of SAP R/3 Oracle databases tend to be very high volume operations - managing these backups may mean managing tens, hundreds, or even thousands of gigabytes or megabytes of secondary storage.
- **Maintaining high availability:** As the SAP R/3 Oracle database grows in size, the time spent to create a backup may exceed a designated "backup window."
- **Handling complex recovery scenarios:** Recovering the SAP R/3 Oracle database is much more than simply restoring a file from tape. It requires identifying the cause of the failure, identifying and restoring the correct data and recovering the database appropriately for the current situation.

It is not enough to have SAP R/3 and Oracle database experts in-house - you also need storage management capabilities for handling and managing high volume backups for optimal performance and manageability. VERITAS NetBackup software combines enterprise-level storage management capabilities with SAP R/3-specific functionality to provide a highly scalable backup and recovery solution for protecting the user's SAP R/3 data.

TECHNICAL OVERVIEW OF NETBACKUP FOR SAP R/3

The following figure illustrates the components and architecture for SAP R/3 and NetBackup software.

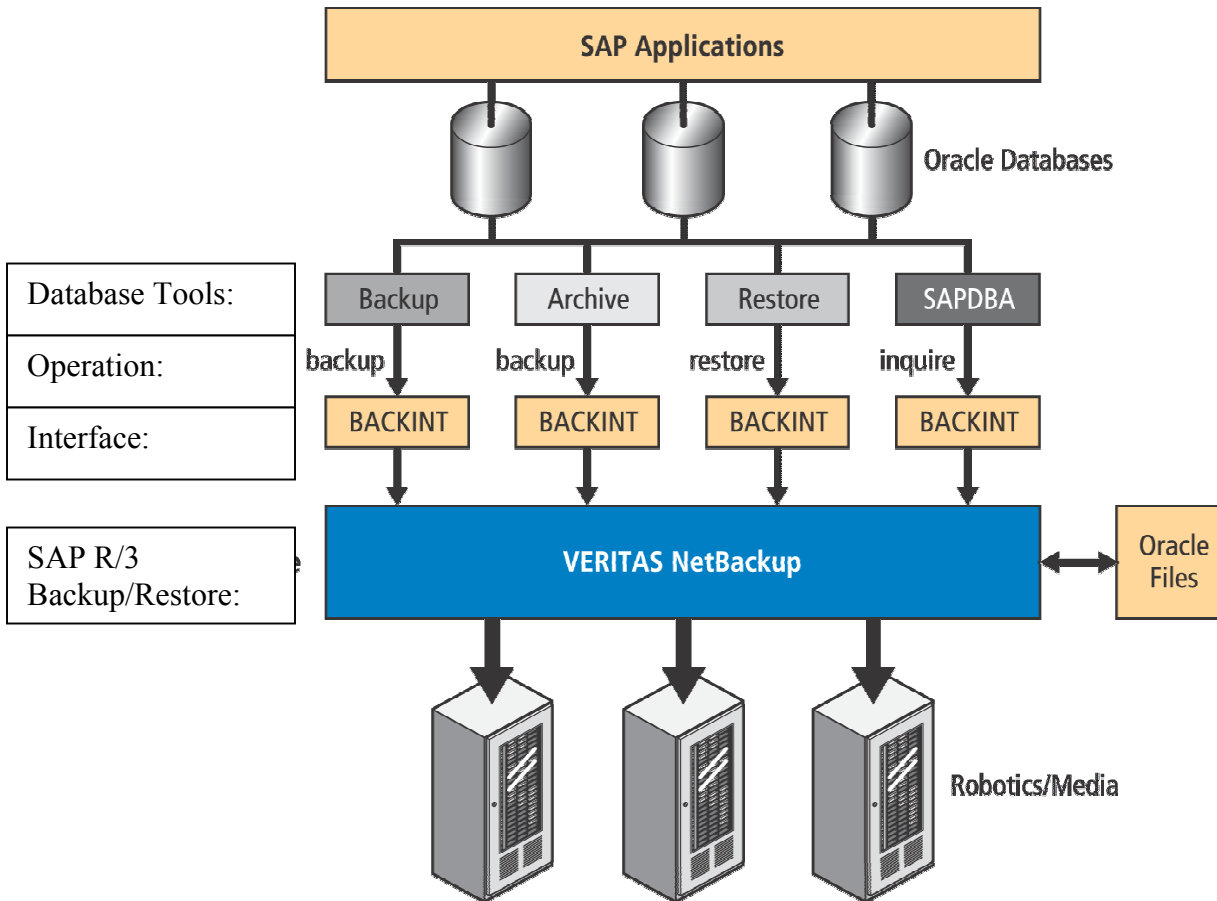


Figure 1: NetBackup for SAP R/3 Architecture

SAP Tools act as database agents, responsible for the database related operations backup, archive, and restore. The database agents communicate with NetBackup software through the NetBackup for SAP backint interface. The SAPDBA component of SAP Tools also accesses the backup catalog used by NetBackup software in order to determine the status of the valid backups of the user's SAP environment. A quick definition of the SAP Tools that are used for the database related operations in the SAP R/3 environment are as follows:

- brbackup: This function is used to backup the SAP R/3 data
- brarchive: This function is used to archive (backup) the SAP R/3 data
- brrestore: This function is used to restore the SAP R/3 data
- SAPDBA: This function is used for SAP R/3 to communicate with NetBackup

Figure 2 below shows the major components in a NetBackup for SAP backint interface configuration.

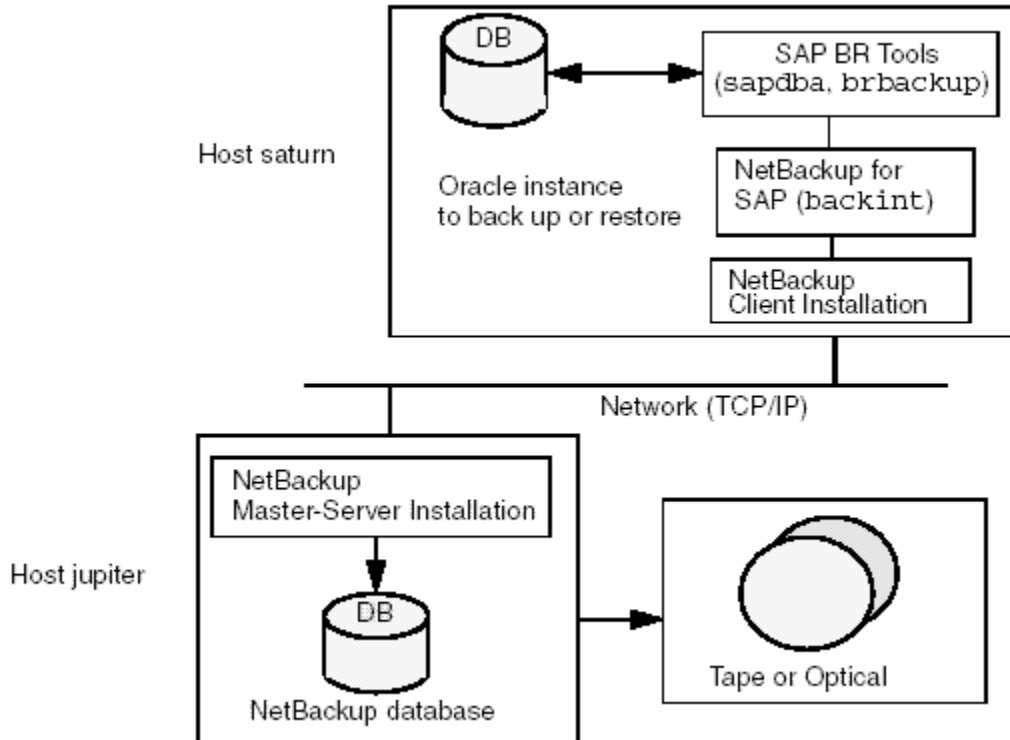


Figure 2: How it works: NetBackup for SAP R/3 Environment protecting SAP R/3 data

The host with the database must be a NetBackup client (Host saturn above) and have NetBackup for SAP R/3 software, SAP software, and Oracle database software installed. The storage devices are connected to the NetBackup master server (Host jupiter above). A NetBackup media server can access the storage devices through the NetBackup master server. Both the master server and the media server must have NetBackup server software installed. Using NetBackup software requires that the administrator create an SAP script with commands for controlling database backup or recovery. For example, an SAP script to back up Oracle databases would use the brbackup command. A separate SAP script is needed for each type of backup or recovery operation.

SEQUENCE OF OPERATION

NetBackup users can either manually or via a predetermined schedule have NetBackup start database backups or restores by selecting an SAP script. A NetBackup software process called bphdb will start the SAP script on the client. The SAP R/3 application then starts the requested operation on the database(s) in the user's SAP R/3 environment. This is shown below in Figure 3 as follows:

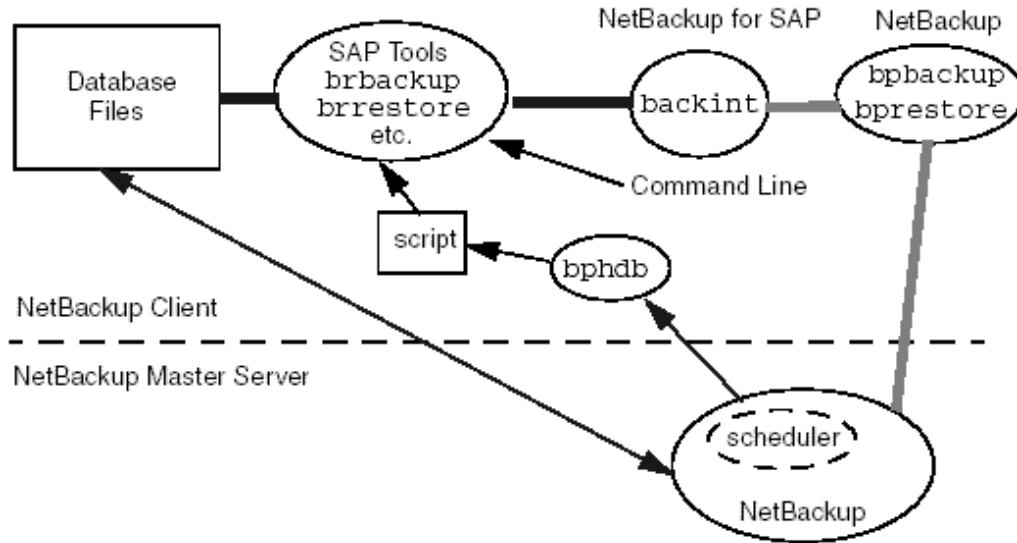


Figure 3: Sequence of Operations: NetBackup for SAP R/3 Environment

For a backup in an SAP environment, brbackup calls the NetBackup for SAP backint interface. From this point the operation is similar to a user-directed backup. A restore works in essentially the same manner except that the NetBackup for SAP backint interface issues a bprestore command, causing NetBackup software to retrieve the data from secondary storage and send the data back to the client for restore.

HOW IT WORKS: PERFORMING A NETBACKUP FOR SAP R/3 BACKUP

This section describes how to perform the following backup methods in an SAP R/3 environment:

- Using NetBackup to backup an SAP Policy
- Using xbp to perform a backup (UNIX only)
- Using SAP R/3 to perform a backup

METHOD 1: USING NETBACKUP TO BACKUP AN SAP R/3 POLICY

Automatic and Manual Backups

The most convenient way to back up your SAP R/3 environment's Oracle database is to set up schedules for automatic backups. When the NetBackup scheduler invokes a schedule for an automatic backup, the SAP scripts run:

- In the same order as they appear in the file list
- On all clients that have them (that is, the clients that have a matching path name(s))

The SAP scripts will then start the database backup. The user would use NetBackup software to create and configure a policy that will use the SAP scripts that you create to automatically back up your SAP R/3 Oracle database according to the schedules that you specify.

The SAP R/3 administrator can use NetBackup software to manually execute a backup using the SAP policy if an immediate ad hoc backup is required.

The following screen shots below are examples of how easy it is to configure and schedule NetBackup for SAP R/3 backups.

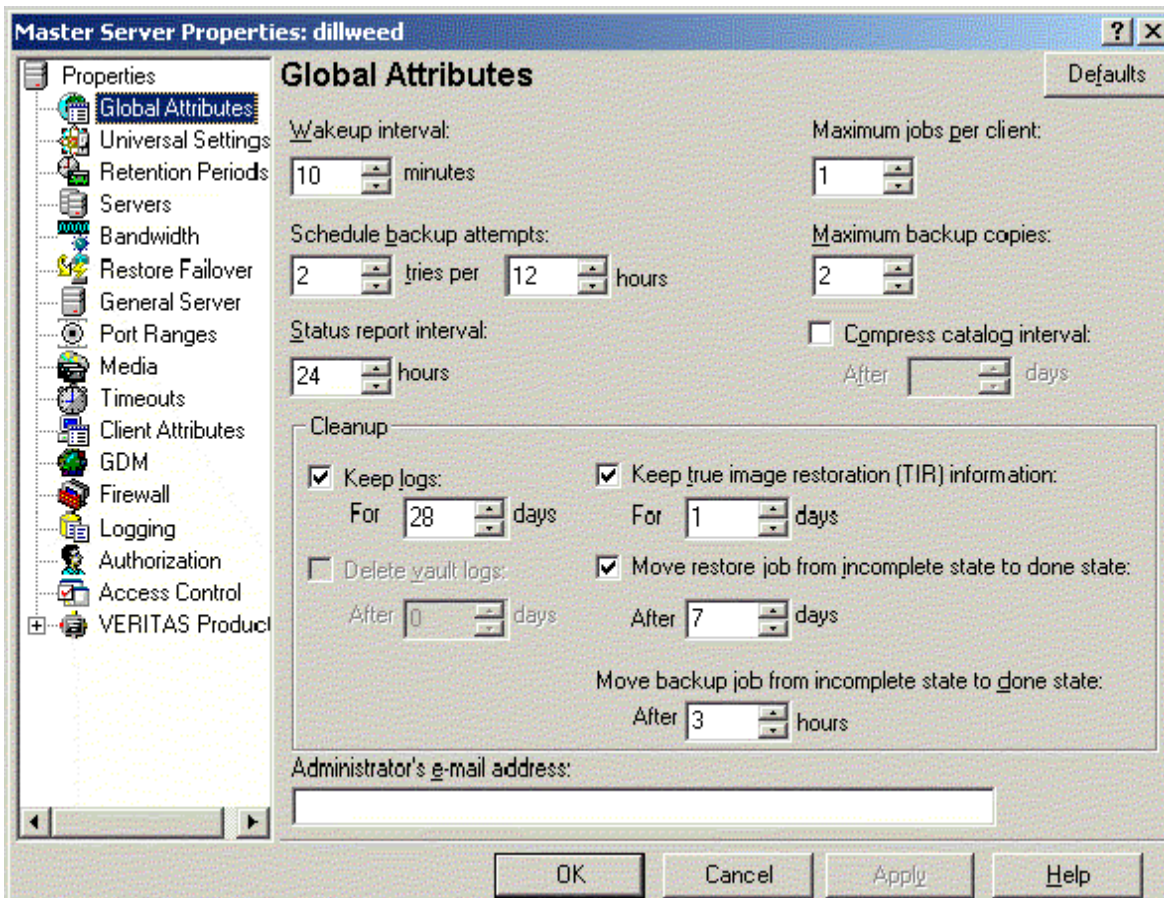


Figure 4: The NetBackup Global Attributes screen allows for fast modification for a variety of server related configuration options.

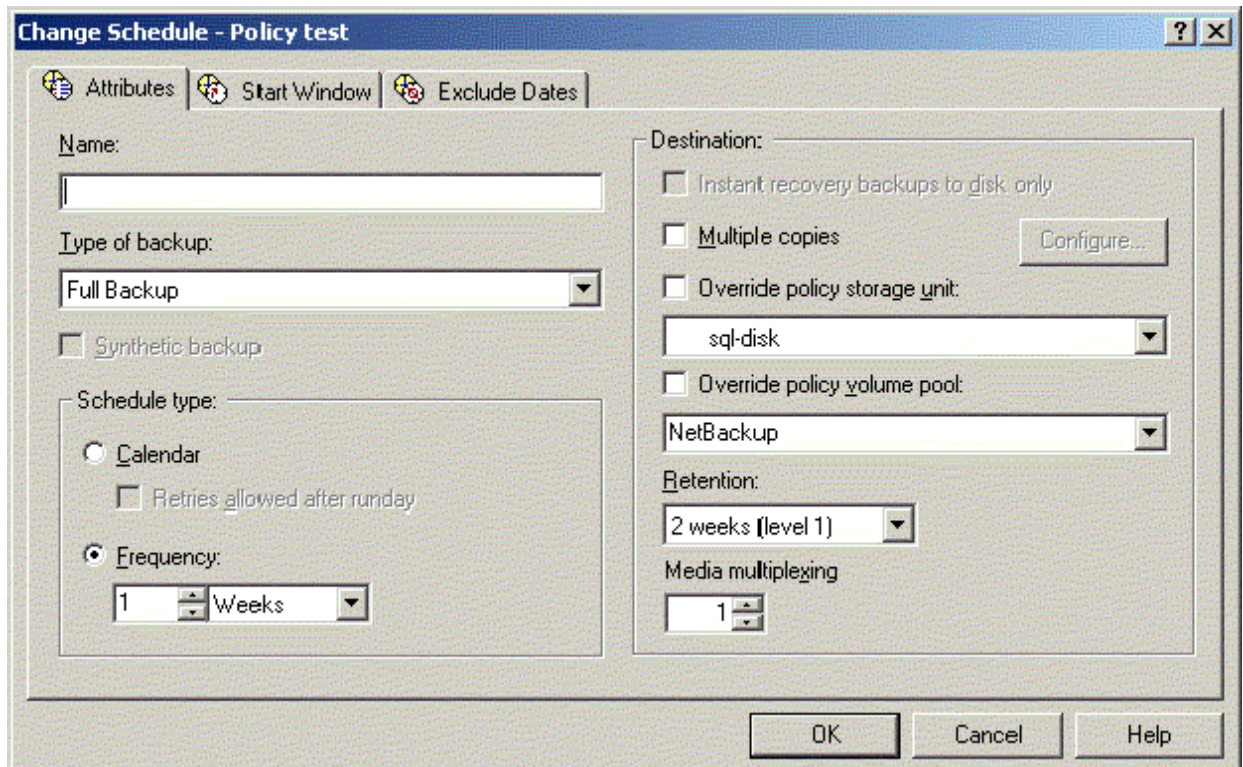


Figure 5: NetBackup software's scheduling functionality can be used to create flexible backup schedules for automatic SAP R/3 Oracle database backups.

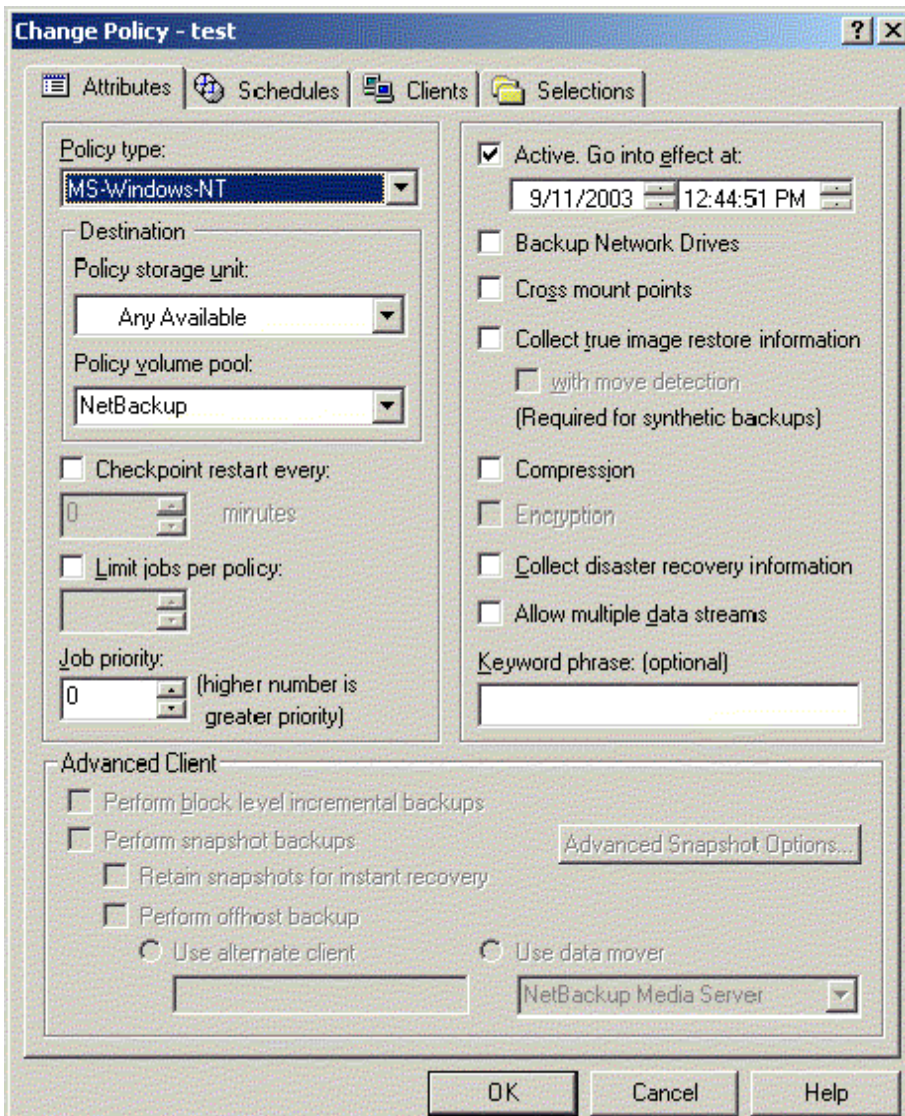


Figure 6: The Change Policy screen displays an easy-to-understand interface for all NetBackup for SAP R/3 policy selections and functionality.

METHOD 2: PERFORMING A MANUAL CLIENT INITIATED BACKUP USING THE NETBACKUP XBP COMMAND (UNIX ONLY)

The following describes how to perform a manual client initiated backup using the NetBackup xbp command (UNIX only) to back up your SAP R/3 environment's Oracle database. The procedure is described as follows:

1. Log in as the SAP administrator or as root.
 - If you are already logged in under a different user account, use the su - command to change to the SAP administrator.
2. Execute xbp on the client to which you want to backup a database.

install_path/netbackup/bin/xbp

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

install_path/netbackup/ext/db_ext/sap/scripts/

4. From the File menu, click **Browse File System for Backup Scripts**.
5. Select the backup script from the Files pane.
6. On the Backup menu, click **Backup Database Using Selected Scripts**. The xbp_confirm dialog box appears.
7. Click **OK**.
A NetBackup process called bphdb starts the SAP script on the client.
8. View the status of the script execution.

a. On the Backup menu, click **Report Progress Of Backup**. The xbp_progress dialog box will appear.

b. Select the log file for your backup.

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

9. View the log file for the NetBackup operation.

Performing a Backup

a. Change directories to the bphdb log directory.

cd install_path/netbackup/logs/bphdb

b. Open the log file with the tail option.

tail -f log.mmddyy

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

METHOD 3: USING SAP R/3 TO PERFORM A BACKUP

There are two ways to start a backup using SAP R/3:

- sapdba via the utility menu
- brbackup via the command line

When the backup is started through the sapdba utility or the brbackup command, brbackup status messages will appear on the SAP R/3 console. These messages show when the database server has been started or stopped. These messages will also indicate when the backup mode of the tables has been changed. The NetBackup for SAP backint interface is then started by the SAP Tools brbackup command. brbackup submits the files that will be backed up.

The NetBackup for SAP backint interface will generate messages for each bbackup program, and will show a progress log for each. Debugging messages and bbackup log messages will also be displayed. During the file-online mode, each database file is backed up individually. The NetBackup for SAP backint interface handles coordination with brbackup using a semaphore file.

Once all of the files are backed up, the full file list is displayed, indicating whether a particular file was backup up successfully or if the backup of the file in question failed. Information that is provided to the user includes a Backup ID (BID) that the NetBackup for SAP user may need to use at a later time for restores. SAP Tools will maintain its own log of the backup session. The standard NetBackup logs will keep track of the backup images that were created. The NetBackup for SAP backint interface only needs to keep track of the BID date and time. This allows for cross-referencing using the SAP command brrestore.

OFF-LINE (COLD) BACKUP USING SAPDBA

The procedure required to perform a sapdba Off-line (cold) backup is as follows:

1. Complete the configuration of NetBackup software, NetBackup for SAP, and SAP Tools.
2. As user sapadm, shut down SAP R/3 by executing the stopsap R3 command.
3. Start sapdba.

You will be presented with a SAP utility menu screen sequence similar to the ones shown below:

SAPDBA V6.10 - SAP Database Administration

```

ORACLE version      :      9.0.1.4.0
ORACLE_SID          :      SAP
ORACLE_HOME         :      /oracle/SAP
DATABASE            :      shut down
SAPR3               :      not connected
  
```

```

a - Startup/Shutdown instance  h - Backup database
b - Instance information       i - Backup offline redo logs
c - Tablespace administration j - Restore/Recovery
d - Reorganization           k - DB check/verification
e - Export/import            l - Show/Cleanup
f - Archive mode             m - User and Security
g - Additional functions      n - SAP Online Help
  
```

q - Quit

Please select ==> h

4. Select the Backup database menu item by typing in h.

Backup database

	Current value
a - Backup function	Normal backup
b - Parameter file	initSAP.sap
c - Backup device type	util_file
d - Objects for backup	all
e - Backup type	offline_force
g - Query only	no
h - Special options ...	
i - Standard backup	yes
j - Backup from disk backup	
k - Restart backup	
l - Make part. backups compl.	

S - Start BRBACKUP
q - Return

Please select ==> d

5. Select an Object for backup by selecting d and typing PSAPUSER1D.

For this example, the user would see the backup type is util_file, the backup type is offline_force, and tablespace is PSAPUSER1D.

Backup database

	Current value
a - Backup function	Normal backup
b - Parameter file	initSAP.sap
c - Backup device type	util_file
d - Objects for backup	PSAPUSER1D
e - Backup type	offline_force
g - Query only	no
h - Special options ...	
i - Standard backup	yes
j - Backup from disk backup	
k - Restart backup	
l - Make part. backups compl.	

S - Start BRBACKUP
q - Return

Please select ==>S

6. Start the backup by typing S.

If everything is correct, you will first see sapdba and the SAP command brbackup performing actions on the Oracle database. brbackup will then start the NetBackup for SAP backint interface. When the backup has completed, the NetBackup for SAP backint interface will generate a list of files that tells sapdba/brbackup that the backup was completed successfully.

ON-LINE (HOT) BACKUP USING BRBACKUP

You can use brbackup instead of sapdba to perform database backups. In this example we will demonstrate an on-line backup. You can change the backup_mode by changing the initSAP.sap parameter file or specifying -t online on the brbackup command.

Here is what these changes look like in initSAP.sap:

```
backup_type = online_file
```

This backup mode allows sapdba/brbackup to use a semaphore file with the NetBackup for SAP backint interface. This provides better performance when executing an on-line backup that contains very large files, since only the necessary tablespaces are placed into backup mode. When NetBackup software is ready to process another file, it notifies brbackup. The user can change the backup_mode to online to test this mode.

PERFORMING A RESTORE IN THE SAP R/3 ENVIRONMENT

This section describes how to perform the following recovery methods in an SAP environment:

- Using xbp to perform a restore (UNIX only)
- Using SAPDBA to perform a restore

Using xbp to Perform a Restore

The following steps describe how to use xbp to restore your SAP environment's database.

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

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

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

```
install_path/netbackup/bin/xbp
```

3. In the Directory to Search Box, type in the path name of the location of the SAP scripts.

For example:

```
install_path/netbackup/ext/db_ext/sap/scripts/
```

4. From the File menu, click Browse File System for Restore Scripts. The xbp dialog box appears.
5. Select the restore script from the Files pane.
6. On the Restore menu, click Restore Database Using Selected Scripts. The xbp_confirm dialog box appears.

7. Click **OK**.

A NetBackup software process called bphdb starts the SAP script on the client.

8. View the status of the script's execution.

a. On the Restore menu, click Report Progress Of Restore. The xbp_progress dialog box will appear.

b. Select the log file for your restore.

The Contents of Selected Log File pane displays only the status of the script execution. A status =0 message indicates that the script was successfully completed. Go to Step 9 for a detailed status report.

9. View the log file for the NetBackup software operation.

a. Change directories to the bphdb log directory.

```
cd /usr/opensv/netbackup/logs/bphdb
```

b. Open the log file with the tail option.

```
tail -f log.mmdyy
```

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

Using sapdba to Perform a Restore

To restore specific parts or the full database in the user's SAP R/3 environment, the sapdba system should be used to maintain the list of valid restores for specific tablespace or complete database restores.

Before restoring either individual tablespaces or full databases, the user is prompted prior to deleting an existing copy of the target file. The user will use sapdba to execute the brrestore command.

brrestore submits the BID and filename list to the NetBackup for SAP backint interface. The backint interface will cross-reference the exact date and time to when the backup was made and uses NetBackup to recover the file. The backint interface monitors the progress of the restore and reports status back to brrestore.

Upon completion, the backint interface saves a copy of the NetBackup software restore logs for auditing purposes. sapdba then provides required database recovery, such as media recovery, and restarts the database server.

REDIRECTING A RESTORE TO A DIFFERENT CLIENT

With NetBackup for SAP R/3 software you have the option to restore a database to a client other than the one that originally performed the backup. The process of restoring data to another client is called a redirected restore.

The following illustrates a typical redirected restore in a NetBackup for SAP environment:

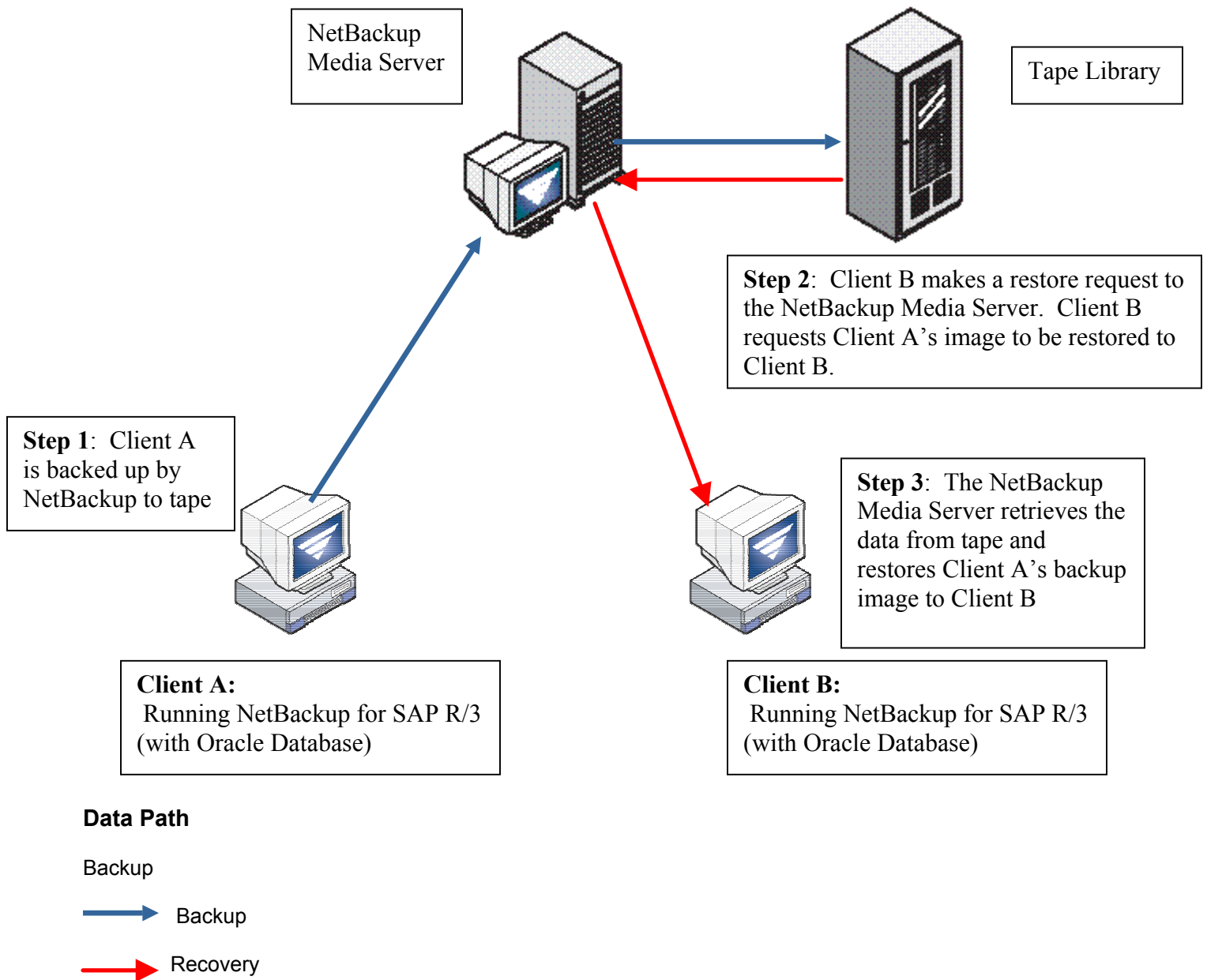


Figure 7: A NetBackup for SAP R/3 Alternate Client Restore

Note that the user on the NetBackup for SAP Client A machine was not able to initiate a redirected restore to NetBackup for SAP Client B. Only the user on Client B, the client receiving the backup image, could initiate the redirected restore.

To perform a redirected restore, you must complete the following steps:

1. Change the name of the destination client to the name of the original source client.

There are two ways to make this change:

On the destination client, change the client parameter in the **%Oracle_home%\initSID.utl** parameter file to the name of the client that originally performed the backup.

On the destination client, change the environment variable **\$SAP_CLIENT** to the name of the original source client.

2. Ensure that the NetBackup server is configured to allow the redirected restore:

- Allowing all clients to perform redirected restores
- Allowing a single client to perform redirected restores
- Allowing redirected restores of specific clients' files.

3. Perform the restore on the destination client

Note: When the redirected restore is completed, change the settings back to the name of the destination client to enable regular backups.

THE BENEFITS OF VERITAS NETBACKUP FOR SAP R/3

There are many benefits to the NetBackup for SAP R/3 user. These benefits are listed below:

- **Centralized and Networked Backup Operations** — From the single central management console at the NetBackup master server, the SAP R/3 Administrator can perform scheduled SAP R/3 Oracle database backups or start them manually for any client. Centralized management dramatically reduces the cost of backing up large SAP R/3 environments.
- **Online, Nondisruptive Backup** — Supporting the 24x7 needs of mission-critical SAP systems, backups occur with no interruption to database access.
- **Interfaces** — NetBackup is fully integrated with SAPDBA, leveraging existing knowledge to lower training costs. Additionally, backups can be administered through either Java™ or Windows graphical user interfaces for maximum ease of use. NetBackup also supports the full set of SAP BACKINT "BR" commands.
- **Flexible Implementation** — An SAP R/3 Administrator can perform database operations through NetBackup software, or can use the SAP Tools (SAPDBA interface) as if NetBackup software were not present. The powerful NetBackup scheduling facilities can be used to schedule automatic and unattended SAP backups. To avoid interfering with normal daytime operations, database backups can be scheduled to occur only at night.
- **Parallel Backup and Restore Operations** - VERITAS NetBackup for SAP R/3 software supports the parallel backup and restore capabilities of an SAP Oracle database. This permits the use of more than one tape device at a time for a single SAP backup or restore, thereby reducing the time necessary to complete the operation. Users can also take advantage of multiplexing to maintain maximum performance for a single fast tape drive.

- **A Fault Tolerant Solution** - VERITAS NetBackup *for SAP R/3* software reduces the percentage of failed backups. This feature allows for automatic execution of a failed data stream transparent to the SAPDBA. All backups and restores are executed simultaneously without any action from the NetBackup or SAP administrator. Backup operations can be executed through NetBackup or SAP Tools as if NetBackup software was not present. Additionally, NetBackup software has the capability of reinitiating a failed backup operation before reporting a failed job to SAPDBA. An administrator or any authorized user can use NetBackup software to execute backups and restores. This transparent execution of tasks frees up administrative resources for other essential jobs.
- **Disaster Recovery** - VERITAS NetBackup *for SAP R/3* software simplifies disaster recovery by allowing the creation of multiple copies of your data on tape. This means that a duplicate copy of your data can be created for data redundancy, possible media failure and for offsite vaulting. NetBackup *for SAP R/3* software reduces the time needed to complete a recovery operation by permitting the use of more than one tape at a time.

CONCLUSION: VERITAS OFFERS THE LEADING SOLUTIONS FOR THE PROTECTION OF YOUR SAP R/3 ENVIRONMENTS

VERITAS is committed to providing quality backup and recovery solutions to meet the needs of your SAP R/3 enterprise, whether your company has a small SAP R/3 deployment or is a Fortune 100 corporation with a large SAP R/3 environment with multiple Oracle databases and many terabytes or petabytes of data.

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