

# Backup of SAP Oracle Databases in EMC Symmetrix Environments with EMC NetWorker PowerSnap

*Applied Technology*

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## **Abstract**

EMC® NetWorker®, the cornerstone of recovery management solutions at EMC, and its modules can be used effectively in EMC Symmetrix® environments to complement and enhance backup and recovery capabilities for SAP databases running on Oracle using the snapshot technologies of EMC storage arrays and the backup and recover capabilities of NetWorker.

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## Executive summary

SAP is a widely deployed application across different operating systems and is a critical component in many organizations. IT managers regard data corruption, which is a source of many database server failures, as the most immediate threat to their SAP database environment. Most of the challenges that IT managers and backup administrators face are related to methods to offload the application server during backups and how to shorten the backup window.

This white paper provides information on the synergy between EMC® NetWorker®, EMC NetWorker Module for SAP R/3 on Oracle (NMSAP), and the EMC NetWorker PowerSnap™ Modules to effectively perform backups and recoveries with SAP databases using the snapshot technologies of EMC Symmetrix® arrays.

## Introduction

The EMC NetWorker family of products helps to protect data by simplifying and centralizing backup and recovery operations. With its record-breaking performance, NetWorker is the ideal backup software for small offices as well as large data centers. With support for leading applications, such as Oracle, Microsoft SQL Server, and SAP DB, and advanced backup and recovery technologies such as snapshot management and data de-duplication, NetWorker customers can realize the highest level of flexibility, management, and cost control over their data protection operations, while protecting their overall investments in these technologies.

The EMC Symmetrix family of products provides industry-proven storage arrays and maintains a high degree of the robustness and availability. You can centralize and simplify your data protection management with local continuous data protection or remote replication, protecting your organization from data loss due to server failures, data corruption, software errors, viruses, and end-user errors, as well as from catastrophic events.

Integration of EMC Symmetrix storage arrays snapshot technologies with EMC NetWorker provides use of these proven snapshot technologies through the NetWorker Management Console (NMC) interface and creates point-in-time snapshots for rapid recoveries and long-term backup to disk or tape. Centralized management from NetWorker allows customers to schedule snapshots, set policies, and browse the index of these snapshots. When using the NetWorker Module for SAP R/3 on Oracle (NMSAP), customers can take advantage of reduced recovery time through higher-frequency snapshots of their SAP databases.

## Audience

This white paper is targeted to corporate management and business decision-makers, including storage, server, and database administrators; IT managers; and application engineers; as well as storage integrators, consultants, and distributors.

## Terminology

The terminology used in the white paper is only related to PowerSnap, SAP, and NetWorker Module for SAP R/3 on Oracle.

## Backup

Backup provides a copy of original data that is created from a variety of media. Given its low cost, tape media has been the most common media type for backup. Today, disk-based media provides a more ideal medium for reliability, speed, and overall recovery associated with backups. Advanced backup capabilities connect backup with array-based replication and replication management.

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## File level recovery

The file level recovery process is individual file restoration from a mounted replica. It is also referred to as instant recovery or file-by-file recovery.

## Instant backup

A replica or point-in-time copy of data that is initiated and stored on the array as a snapshot session or instance is called an instant backup. An instant backup is a block-level snapshot created from the application server but not written to tape. In the case of NetWorker PowerSnap, the replica is registered within the NetWorker media database to facilitate tracking for recovery.

## Live backup

Live backup is a backup to secondary storage such as tape that occurs from a replica via a proxy host without impact to the original application or data host.

## Recovery management

Recovery management is a strategic approach to data protection that focuses on fast, reliable recovery as the aggregate goal of all protection activities. Key EMC solutions that comprise the recovery management portfolio include NetWorker (for backup and recovery), Backup Advisor (for reporting and analytics), EMC CLARiiON® and Symmetrix (storage array hardware), RecoverPoint (continuous data protection) and Replication Manager (common management for EMC replication technologies).

## Restore from disk or tape backup

Data that has been saved to disk or tape through the live backup process is recoverable in the same manner as any basic restore. Save sets, individual folders, or files can be restored from the command line.

## Rollback

A rollback is the process of returning data to an earlier point-in-time copy in response to a recovery operation, and it is a complete restore from a point-in-time copy to a standard volume without host involvement.

## Rollforward

A rollforward is the process of progressing data from a rollback using one or more instant backups. For example, if three snapshots were created at 10 A.M., 11 A.M., and 12 P.M., the user can perform a rollback to the 10 A.M. snapshot and then a rollforward to the 11 A.M. snapshot or even the 12 P.M. snapshot. Users may perform a rollback from a more recent copy to approximate the same effect.

## What is a snapshot?

A snapshot is an image of your data set (a data set can be just a bunch of file systems or specific application data such as Oracle/Microsoft SQL Server). There are different snapshot technologies available to cater to the needs of snapshots. This white paper will talk in detail about the snapshot technologies of Symmetrix arrays, which are the baseline of the solution using EMC NetWorker, PowerSnap, and the EMC NetWorker Module for SAP R/3 on Oracle, to back up SAP databases on Oracle.

## ***Snapshot backups***

Snapshot backups for SAP databases are configured as scheduled backups on the NetWorker server.

NetWorker backups can use the EMC PowerSnap software to create a snapshot (point-in-time copy or PiT copy) of a group of files or file systems on a client. The snapshot serves as an instant backup, which can then be:

- Backed up immediately to a traditional storage medium
- Backed up later

### Instant backup

An instant backup creates a PiT (point-in-time) copy, or snapshot, of an SAP database and retains the snapshot on the primary storage subsystem, for example, Symmetrix. Depending on how backups are configured, a snapshot created during an instant backup may or may not be moved to secondary storage on the NetWorker server or storage node. The retention period of the snapshot is dependent on the snapshot policy. Figure 1 explains the concept of an instant backup creation process.

There are three ways to manage PiT copy backups:

- A PiT copy of the data is created and immediately backed up to tape or disk. The original snapshot is deleted after the backup is complete. A save set that is created on tape is called a “rollover save set.” This process enables you to perform a tape restore.
- An existing PiT copy of the data can be copied to a tape or disk, much like a traditional EMC NetWorker backup, and the original PiT copy is retained on the primary storage subsystem. Thus, two copies of this backup exist. This process enables you to perform a rollover or PiT restore.
- A PiT copy of the data is created and retained on the primary storage subsystem and no other copy is maintained. You can use this copy to perform a PiT restore only once. If the PiT restores fails for any reason, you must restore from another backup (another snapshot or conventional tape restore).

While the snapshot resides on the primary storage subsystem, it is referred to as a persistent snapshot. Retaining persistent snapshots on primary storage enables the EMC NetWorker Module for SAP R/3 on Oracle to perform an instant restore.

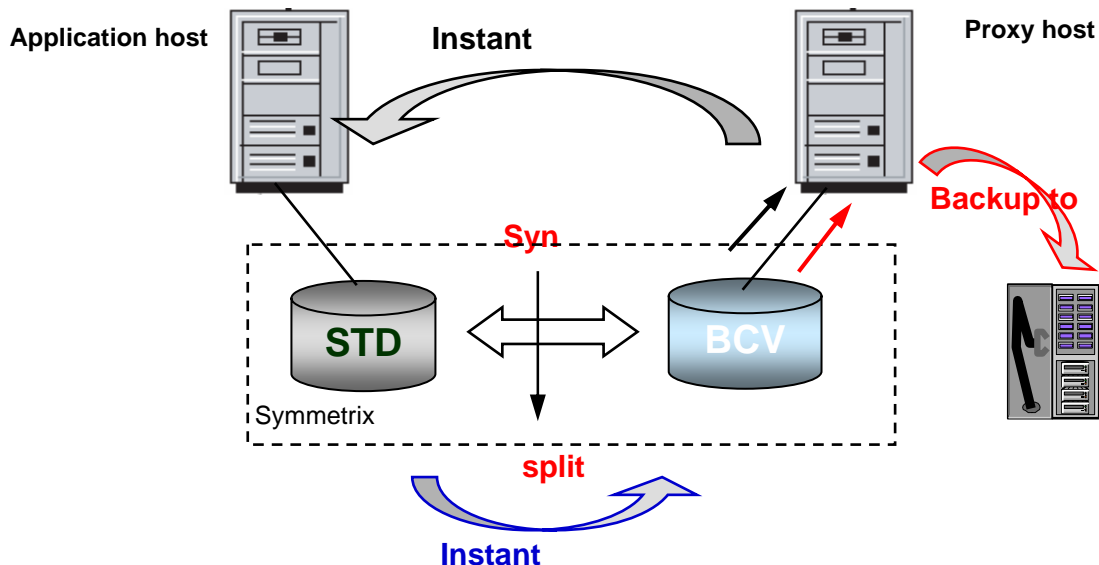


Figure 1. Instant backup to a PiT

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## Nonpersistent backup

A nonpersistent snapshot backup creates a point-in-time copy of a SAP database, and then immediately moves it to secondary storage on the EMC NetWorker server or storage node. The original snapshot is automatically deleted from primary storage.

## Serverless backups

In a serverless backup, a snapshot is created on the primary storage subsystem and is immediately moved to secondary storage by a proxy client. There is no need for the SAP server host to move the data to the secondary storage medium (typically tape).

## File-logical image backup (FLIB)

PowerSnap is optimized to perform nondisruptive backups of large data sets quickly. PowerSnap file-logical image backups (FLIB) are best suited for backups of large files. Currently this capability is provided through a data mover on Solaris and Application Host/Production Host on HP-UX, Microsoft Windows, and IBM AIX platforms.

FLIB tape data format is identical to that of backups performed with traditional NetWorker software using the network, allowing the flexibility of all recovery choices. This includes FLIB and a network recovery or a network backup and a FLIR of the same data

## ***Snapshot recoveries***

Besides restoring databases from tape media using EMC NetWorker and the NetWorker Module for SAP R/3 on Oracle, several advanced restore capabilities exist, including instant restore and rollback.

### Instant restore

A snapshot recovery operation can be performed at the file, file group, or database level from a full database snapshot. The EMC NetWorker Module for SAP R/3 on Oracle supports one type of snapshot restore operation called an instant restore.

An instant restore operation recovers data from a PiT snapshot but does not eradicate the original snapshot.

### Rollback

EMC NetWorker Module for SAP R/3 on Oracle backups with EMC NetWorker PowerSnap functionality create a PiT copy (instant backup) of an SAP database. Many instant backups can be performed in a single day, thus reducing the exposure to data loss.

A rollback recovers a specific PiT copy to one or more volumes. You can request a rollback without having to retrieve data from a secondary storage system, such as tape. Rollback of a managed or nonmanaged volume prevents the snapshot from being maintained and causes the snap set to become invalid. To minimize risk to data, first perform a tape backup of the snapshot before performing a rollback operation. Rollbacks are destructive by nature, which means that the entire contents of the file system are overwritten. As a default safety check, a rollback can only restore the original volume.

## File-logical image recovery (FLIR)

FLIR uses the same technology as FLIB, but in reverse without any required BCVs or VDEVs of the production volume. This recovery is directly from the proxy client host to the production volume (STD volume), consisting only of data blocks that make up the files. This requires file preallocation, extension, and truncation to be performed beforehand on the application host using native operating system I/O paths.

Data movement is bounded by data blocks of files requested for recovery.

In case of FLIR recovery, STD should be made visible to the data mover.

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## SC Restore (SymmConnect Restore, FLIR that uses a mirror)

FLIR using a mirror recovers to a BCV rather than to a STD device, and then synchronizes the BCV with the STD. Such recoveries do not go over the LAN, but instead, the recovered data travels from the PowerSnap server to the Symmetrix storage array. Also, by performing a BCV recovery/rollback to the standard, the data is immediately available to the client and does not wait for the BCV recovery/rollback to complete. PowerSnap also supports performance of granular recoveries from tape to the BCV, and then initiates a full BCV rollback to the standard. The file system is unmounted by PowerSnap prior to recovery.

## Conventional restore

Conventional restores are performed from tape attached to the NetWorker storage node directly to the standard device (STD) on the application host.

## EMC Symmetrix storage arrays

The NetWorker PowerSnap Module interacts with the Symmetrix storage system, using its EMC TimeFinder® functionality to create and maintain snapshots of the data.

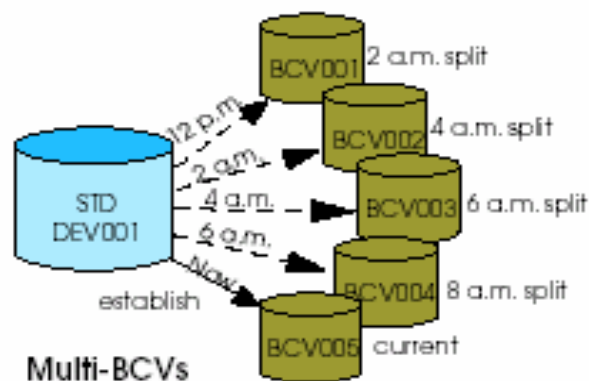
TimeFinder is a business continuance solution that allows you to use Symmetrix business continuance volumes (BCVs) or Symmetrix virtual devices (VDEVs) to create a PiT copy.

### ***TimeFinder/Mirror***

The EMC TimeFinder/Mirror feature provides for the creation of copies of data, made simultaneously, on multiple target devices from a single source device. The data is available to a target's host instantly. You can copy data from a single source device to as many as 16 target devices.

For TimeFinder/Mirror the target device can be a standard device or TimeFinder business continuance volume (BCV) as shown in Figure 2.

A BCV is a Symmetrix device with special attributes created when the Symmetrix is configured. It can function either as an additional mirror to a Symmetrix logical volume or as an independent, host-addressable volume. Establishing BCV devices as mirror images of active production volumes allows the user to run multiple simultaneous business continuance tasks in parallel. The principal device, known as the standard device, remains online for regular Symmetrix operation from the original production server. Each BCV contains a unique host address, making it accessible to a separate backup/recovery server.



**Figure 2. Multiple copies of a single source volume using TimeFinder/Mirror (BCV)**

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**Note:** PowerSnap supports only a BCV as the target device for TimeFinder/Mirror

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## TimeFinder/Snap

The TimeFinder/Snap features allow you to make copies of data simultaneously on multiple target devices from a single source device. The data is available to a target's host instantly. You can copy data from a single source device to as many as 16 target devices.

With TimeFinder/Snap, the target device is a Symmetrix virtual device that consumes negligible physical storage through the use of pointers to track data.

The virtual device is a host-addressable Symmetrix device with special attributes created at configuration time. But unlike the BCV, which contains a full volume of data, the virtual device is a "slim" device that offers a space-saving way to create instant point-in-time copies of logical volumes. Any updates to a source device after its activation with a virtual device cause the pre-update image of the changed tracks to be copied to a save device. The virtual device's indirect pointer is then updated to point to this original track data, preserving a point-in-time image of the volume. TimeFinder/Snap uses this copy-on-first-write technique to conserve disk space, since only changes to tracks on the source cause any incremental storage to be consumed. Figure 3 displays this concept.

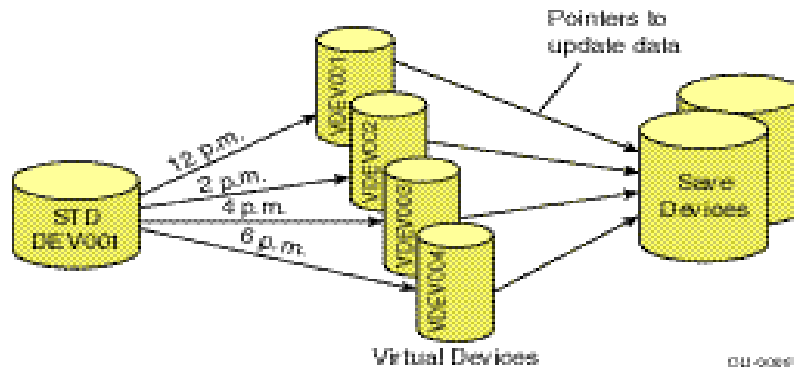


Figure 3. Virtual devices as PiT copies

## EMC NetWorker

The NetWorker software comprises a high-capacity, easy-to-use data storage management solution that protects and helps to manage data across an entire network. NetWorker simplifies the storage management process and reduces the administrative burden by automating and centralizing data storage operations. The NetWorker software enables a user to:

- Perform automated backups during nonpeak hours.
- Administer, configure, monitor, and control NetWorker functions from any computer on a network.
- Centralize and automate data management operations.
- Increase backup performance by simultaneously sending more than one save stream to a single device.
- Optimize performance by using parallel save streams to multiple backup devices or storage nodes.

## EMC NetWorker PowerSnap

The PowerSnap Module enhances NetWorker by allowing continuous snapshot-based data protection and availability during backups for the Symmetrix storage system. The backup is virtually instantaneous, despite the size of the volume. The PowerSnap Module software enables frequent backups with little impact to the network or application server to provide nondisruptive backups of large databases or data stored in file systems.

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The PowerSnap Module solution provides high-performance block level (image) as well as traditional file- and operating system-based backup technology. Traditional backups are often called conventional backups. Block level (image) backups are similar to traditional NetWorker backups, but when the file data is saved, the file system and volume manager are circumvented, and the data is read from the disk directly. The index format on tape is exactly the same as that of a traditional backup index format. The advantage of block level or image backups is that they are faster than conventional backups, that is, if the file or raw volume size is predominately over 2 MB.

PowerSnap is a seamless integration of snapshot technology with NetWorker software. Moreover, PowerSnap features are configured through NetWorker. The application server with the PowerSnap Module communicates with the NetWorker server to back up a volume or file system belonging to a client. The group of files, volumes, or file systems from a single client, describing the collection of data for which a PiT copy is created on an external disk subsystem, such as a storage array, is referred to as a snap set.

For instant backups, the PowerSnap Module software creates a PiT copy, or snapshot, of the snap set and stores the copy on the Symmetrix array as a snapshot session. This is known as an instant backup, which is a snapshot that is not written to tape but has some metadata that is written to tape.

All backups can be performed with a second-host proxy client (data mover), which results in better performance because the load (CPU and memory utilization) is shared with the proxy host. An instant backup, for non-image backups, of the data is created from the application server, but the proxy client moves the actual data to the tape or disk medium. The proxy client is specified in the client resource of the NetWorker Management Console interface.

## EMC NetWorker Module for SAP R/3 on Oracle

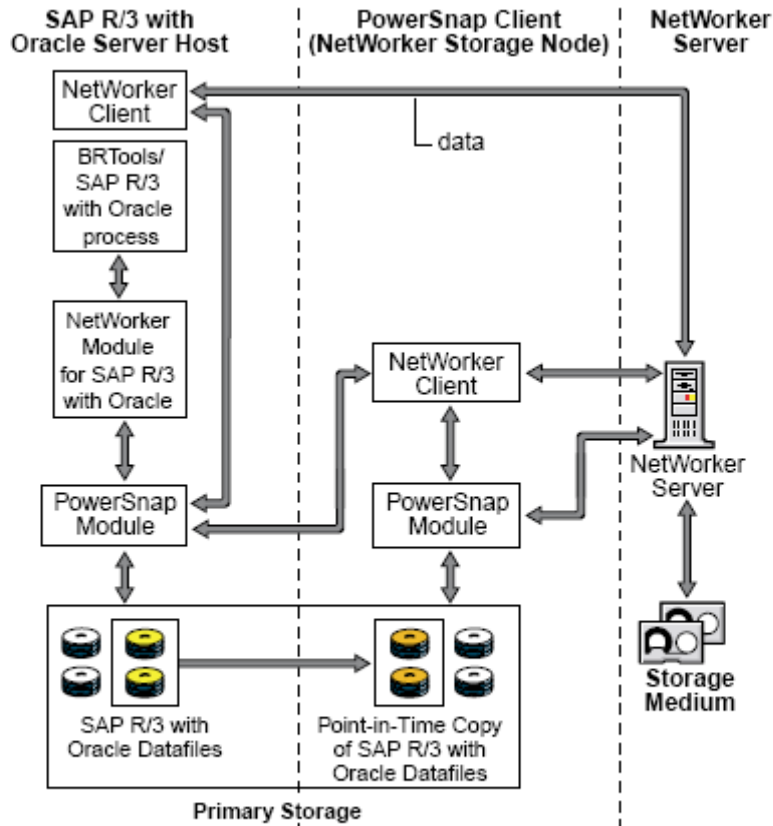
The NMSAP software is an add-on module for NetWorker client software and provides a backup and restore interface between the SAP BRTools program and the NetWorker server. The main component of the NMSAP software is the **backint** program. These programs provide backup, inquiry, and restore processes for all Oracle and SAP files.

The NMSAP software enables you to perform the following operations for SAP data on Oracle databases:

- Manual backups (on and offline)
- Scheduled backups
- Inquiry of backed up data
- Restores of backed up data
- Automated media management
- Backup archived redo logs
- Snapshot backup and recovery
- Backup cloning

### ***NetWorker Module for SAP R/3 on Oracle and PowerSnap***

Figure 4 illustrates the workflow and the interactions of different components of the NetWorker Module for SAP R/3 on Oracle, PowerSnap, and the NetWorker server.



**Figure 4. Backup/restore workflow of NMSAP and PowerSnap**

## Backup workflows

These are the PowerSnap backup workflows.

### Homogeneous workflow

For homogeneous workflow, the proxy client/data mover should be with the same operating system, hardware architecture, and storage stack as the application host for which it performs the backup or recovery.

The backups supported in this workflow are the following:

- PiT copy backup
- Serverless backup
- PiT + rollover backup

The restores supported in this workflow are the following:

- PiT copy restores
- Rollback restores
- Conventional restore

### Snapshot management

When a PiT copy is created, a unique save set ID is assigned. In addition, when the data from that PiT copy is backed up to a tape or disk medium, a different save set ID is assigned to that data. By having two unique

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save set IDs, the snapshots (PiT copies) can be handled separately from the backed up data. The copy of the data is removed only when all snapshots and backups of the data have been deleted.

### **Heterogeneous workflow**

For heterogeneous workflow, the proxy client/data mover is supported only on the Solaris platform for which it performs the backup and recovery. Under this workflow only file-logical image backup (FLIB) is supported. PiT copies cannot be retained. Once the PiT is created, the BCV/VDEV is split and the data is rolled over to secondary media on the NetWorker storage node.

The backups supported in this workflow are the following:

- Serverless backup (FLIB)

The restores supported in this workflow are the following:

- Conventional restores
- FLIR restores
- SC restores

Both the homogeneous and heterogeneous workflows are supported by NetWorker Module for SAP R/3 on Oracle and PowerSnap for the Oracle database backups.

## ***PowerSnap snapshot backup of NMSAP***

Both homogeneous and heterogeneous workflows are supported by the NetWorker Module for SAP R/3 on Oracle and PowerSnap for SAP database backups.

### **Configuring an SAP production host for snapshot backups**

Ensure that the NetWorker Module for SAP R/3 on Oracle (NMSAP) is installed on the production host and NetWorker scheduled non-PowerSnap backups are successful.

In the `initSID.utl` file, to enable PowerSnap, the parameters are to be configured as follows:

```
ps_backup_mode = yes
ps_archive_mode = no
ps_restore_mode = yes
ps_inquire_mode = yes
ps_exclude_backup_bi_run_nums = 2
ps_exclude_archive_bi_run_nums = 1;2
ps_opaque_pfilename = /nsr/res/nsrsapps.cfg
```

All the required PowerSnap variables are to be specified in `nsrsapps.cfg` file.

#### **Example**

- `NSR_DATA_MOVER = proxy host name`
- `SYMM_SNAP_TECH= BCV or SNAP`
- `NSR_PS_DEBUG_LEVEL= debug level`
- `NSR_IMAGE_SAVE = TRUE or FALSE`

## Configuring the Symmetrix Groups and Resource file

The `symm.res` file should be created by the user. The `symm.res` file has entries of the Symmetrix ID and the device ID of the standard device (STD) and the device ID of the BCV or VDEV based on the snapshot technology chosen by the user.

User should identify all the STDs where the database data is residing. For taking a snapshot backup of database, each disk should have a mapping to at least one BCV. (Also, ensure that the BCV that is mapped to the source STD is not paired with any other STD.)

- Ensure that the appropriate version of Solutions Enabler (SymAPI) is installed on both the application server and on the proxy host. Refer to the *EMC Information Protection Software Compatibility Guide* for the most accurate and up-to-date information.
- Ensure that STD devices used by the Microsoft SQL Server database are visible to the application host.
- Ensure that all BCV devices that share the same exact size as the STD are visible to the proxy host (there could be up to eight BCV devices for each STD).
- On the application server and on the proxy host, run the command `symcfg list`.
- The `symcfg` command returns a list of available Symmetrix arrays visible to the host.

**C:\Documents and Settings\Administrator>symcfg list**

```

      S Y M M E T R I X
      Mcode  Cache  Num Phys  Num Symm
SymmID  Attachment Model  Version Size (MB) Devices  Devices
000187461273 Local    1000P-M2 5671    65536    17    2609
000387940030 Local    DMX800  5671    16384     4    2278
000187461276 Remote   1000P-M2 5670    65536     0    2265
  
```

Record the **SymmID** and compare it between the application server and the proxy host.

On the application host run the following `syminq` command.

The `syminq` command returns a list of all available Symmetrix drives visible to the host.

**C:\Documents and Settings\Administrator>syminq**

```

      Device          Product          Device
-----
Name      Type  Vendor  ID      Rev  Ser Num  Cap (KB)
-----
\\.\PHYSICALDRIVE0  DELL  PERC 5/i  1.03 N/A      N/A
\\.\PHYSICALDRIVE1  GK    EMC     SYMMETRIX 5671 730014B291 2880
\\.\PHYSICALDRIVE2  GK    EMC     SYMMETRIX 5671 730014C291 2880
\\.\PHYSICALDRIVE3  EMC   SYMMETRIX 5671 730014D291 5242560
\\.\PHYSICALDRIVE4  EMC   SYMMETRIX 5671 730014E291 5242560
\\.\PHYSICALDRIVE5  EMC   SYMMETRIX 5671 730014F291 5242560
\\.\PHYSICALDRIVE6  EMC   SYMMETRIX 5671 7300150291 5242560
\\.\PHYSICALDRIVE7  EMC   SYMMETRIX 5671 7300151291 5242560
\\.\PHYSICALDRIVE8  BCV   EMC     SYMMETRIX 5671 7300152291 5242560
\\.\PHYSICALDRIVE9  BCV   EMC     SYMMETRIX 5671 7300153291 5242560
\\.\PHYSICALDRIVE10 BCV   EMC     SYMMETRIX 5671 7300154291 5242560
  
```

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```

\\.\PHYSICALDRIVE11 BCV EMC SYMMETRIX 5671 7300155291 5242560
\\.\PHYSICALDRIVE12 BCV EMC SYMMETRIX 5671 7300156291 5242560

```

- Write down the Symmetrix device number that is used to hold the Microsoft SQL Server data. To identify the device number, look at the third, fourth, and fifth digits of the Ser Num.
- For Symmetrix DMX™, the Symmetrix device number will be a four-digit number and would be represented by the fourth, fifth, sixth, and seventh digits of the Ser Num. In the example above, device \\.\PHYSICALDRIVE5 is Symmetrix device number 014F.
- On the proxy host, run the **syminq** command and write down the BCV device number that you are planning to use.
- Ensure that the BCV device size is identical to the source device size. In our example, an option is to match Symmetrix device 014F with BCV device 015F as their sizes are identical.

**C:\Documents and Settings\Administrator>syminq**

Device		Product	Device			
Name	Type	Vendor	ID	Rev	Ser Num	Cap (KB)
\\.\PHYSICALDRIVE0		DELL	PERC 5/i	1.03	N/A	N/A
\\.\PHYSICALDRIVE1	GK	EMC	SYMMETRIX	5671	730015C291	2880
\\.\PHYSICALDRIVE2	GK	EMC	SYMMETRIX	5671	730015D291	2880
\\.\PHYSICALDRIVE3	BCV	EMC	SYMMETRIX	5671	730015E291	5242560
\\.\PHYSICALDRIVE4	BCV	EMC	SYMMETRIX	5671	730015F291	5242560
\\.\PHYSICALDRIVE5	BCV	EMC	SYMMETRIX	5671	7300160291	5242560
\\.\PHYSICALDRIVE6	BCV	EMC	SYMMETRIX	5671	7300161291	5242560
\\.\PHYSICALDRIVE7	BCV	EMC	SYMMETRIX	5671	7300162291	5242560
\\.\PHYSICALDRIVE8		EMC	SYMMETRIX	5671	7300163291	5242560
\\.\PHYSICALDRIVE9		EMC	SYMMETRIX	5671	7300164291	5242560
\\.\PHYSICALDRIVE10		EMC	SYMMETRIX	5671	7300165291	5242560
\\.\PHYSICALDRIVE11		EMC	SYMMETRIX	5671	7300166291	5242560
\\.\PHYSICALDRIVE12		EMC	SYMMETRIX	5671	7300167291	5242560

- Match standard Symmetrix devices with BCV devices.
1. Create a Symmetrix disk group (symdg).  
This group could be created either on the application and would be used by PowerSnap.

To create the device group, execute:

```
symdg create [group_name]
```

For example:

```
symdg create pctest
```

- a. Add the Symmetrix STD devices (the production devices) to the newly created group by executing:

```
symld -g [group_name] -sid [SymmId] add dev [dev#]
```

For example:

---

*symld -g pctest -sid 000387940030 add dev 014F.*

Repeat the **symld** command for all STD devices.

- b. Add the BCV devices to the group by executing:

*symbcv -g [group\_name] -sid [SymmId] associate dev [bcv\_dev\_#]*

For example:

*symbcv -g pctest -sid 000387940030 associate dev 015F*

Repeat the **symbcv** command for every BCV device you need to add.

2. Verify the configuration: C:\Documents and Settings\Administrator>symdg list

```
          D E V I C E   G R O U P S

Name          Type   Valid Symmetrix ID   Number of
                Devs   GKs  BCVs  VDEVs  TGTs

pctest        REGULAR Yes  000387940030   1   0   1   0   0
```

C:\Documents and Settings\Administrator>symld -g pctest list

```
Device Group (DG) Name: pctest
DG's Type           : REGULAR
DG's Symmetrix ID   : 000387940030
```

```
          Standard Device Name      Directors      Device
-----
          Logical  Physical      Sym  SA :P DA :IT  Cap
          Config      Att Sts  (MB)
-----
DEV001  DRIVE20      014F + 15C:1 01A:C0  Unprotected  RW
8192
```

Legend for STD devices:

(+): Paired with a BCV device that is associated with this dg.  
(-): Paired with a BCV device that is non-associated with this dg.

BCV Devices associated with this dg:

```
          BCV Device      Standard Device      Status
-----
```

---

<i>Logical</i>	<i>Inv. Sym</i>	<i>RDF Att.</i>	<i>Inv. Tracks</i>	<i>Logical</i>	<i>Sym</i>	<i>Tracks</i>	<i>BCV &lt;=&gt; STD</i>
<i>BCV001</i>	<i>015F</i>	<i>+</i>	<i>0</i>	<i>DEV001</i>	<i>014F</i>	<i>0</i>	<i>Split</i>
<i>Total</i>		<i>-----</i>		<i>-----</i>			
<i>MB(s)</i>		<i>0.0</i>		<i>0.0</i>			

*Legend for BCV devices:*

- (+): BCV is paired with a member STD device.*
- (-): BCV is paired with a non-member STD device.*

**C:\Documents and Settings\Administrator>**

**Example of the symm.res**

000387940030: 014F 015F

By default PowerSnap will look for the symm.res file at /nsr/res. The user can store the file in a non-default location and specify the path of the res file using the parameter SYMM\_PROVIDER\_DB=<absolute path of the symm.res file>. The variable should be mentioned in the Application Information of the NetWorker Client.

The user has to manually create the symd group and add the standard and the BCV or VDEV devices that are used for backup.

## Configuring the NetWorker server

For SAP backups, the NetWorker client should be configured as follows:

- Save set should be BACKINT: *SID:PS*.
- To access the database, the appropriate remote username and password should be mentioned.
- The backup command **nsrsapsv -f /absolute path/nsrsapsv.cfg** should be mentioned.

Figure 5 shows two screenshots of the client configuration for NMSAP backups.

**Backup**

Scheduled backup:

Directive:

Save set:

Group:  CPE  
 Default  
 FS  
 FS-CDP  
 NMO  
 NMSAP

Schedule:

**Access**

Remote user:

Password:

**Backup**

Backup command:

Save operations:

Ndmp:

NDMP array name:

Application information:

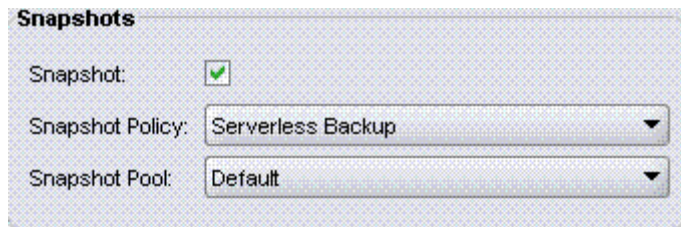
**Figure 5. Client configurations for NMSAP backup**

---

## Configuring the NetWorker client for heterogeneous workflows

In a homogeneous workflow, a user can retain single or multiple snapshots based on the necessity, and roll over the required snapshot to tape connected on the NetWorker storage node. The snapshot will then be deleted.

The Serverless Backup snapshot policy is the only supported snapshot policy for heterogeneous workflows. Figure 6 shows how to enable snapshot with Serverless Backup policy.



**Figure 6. To enable a snapshot with Serverless Backup policy**

For heterogeneous backup, the `nrsapps.cfg` file (mentioned in `init SID.utl` as `ps_opaque_pfilename = /nsr/res/nrsapps.cfg`) should be configured with the following parameters:

- `NSR_DATA_MOVER = proxy host name`
- `SYMM_SNAP_TECH = BCV or SNAP`
- `NSR_IMAGE_SAVE = TRUE`
- `NSR_PS_DEBUG_LEVEL=9` (optional)
- `SYMM_ON_DELETE=RELEASE_RESOURCE / RETAIN_RESOURCE` (optional)

For SAP backups in a heterogeneous workflow, the NetWorker client should be configured as shown in Figure 5.

### ***Recoveries supported in heterogeneous workflows***

All the SAP data recoveries will be done with the `brrestore` utility provided by SAP. Ensure that all the necessary environment variables are properly set while performing restore.

#### **Example**

`SAP_BIN` = Path of SAP binaries (EX: `brbackup`, `brrestore`...) and `backint`

`SAPBACKUP` = Path of SAP backup / restore log files

`SAPDATA_HOME` = Path of SAP Data Home

`ORACLE_HOME` = Path of Oracle Home directory

`ORACLE_SID` = Oracle SID

`LD_LIBRARY_PATH` = Oracle Library path (UNIX)

### ***Restore types***

The following restore types are supported by PowerSnap in heterogeneous workflows for SAP.

#### **FLIR**

For FLIR restores, the standard device (STD) should also be visible on the proxy client (data mover).

---

To perform a FLIR-type restore, the `nsrsapps.cfg` file (which is mentioned in `initSID.utl` as `ps_opaque_pfilename = /nsr/res/nsrsapps.cfg`) should be configured with the following parameters:

- `NSR_DATA_MOVER = proxy host name`
- `SYMM_SNAP_TECH = BCV or SNAP`
- `RESTORE_TYPE_ORDER = flir`
- `NSR_PS_DEBUG_LEVEL =9 (optional)`

### FLIR using a mirror (SC Restore)

FLIR using a mirror recovers to a BCV rather than to a STD device, and then synchronizes the BCV with the standard. Such recoveries do not go over the LAN, but instead the recovered data travels from the PowerSnap server to the Symmetrix storage array. Also, by performing a BCV recovery/rollback to the standard, the data is immediately available to the client and does not wait for the BCV recovery/rollback to complete. PowerSnap also supports performance of granular recoveries from tape to the BCV, and then initiate a full BCV rollback to the standard. The file system is unmounted by PowerSnap prior to recoveries.

To perform a FLIR-type restore, the `nsrsapps.cfg` file (which is mentioned in `initSID.utl` as `ps_opaque_pfilename = /nsr/res/nsrsapps.cfg`) should be configured with the following parameters:

- `NSR_DATA_MOVER = proxy host name`
- `SYMM_SNAP_TECH = BCV or SNAP`
- `RESTORE_TYPE_ORDER = flir`
- `NSR_PS_DEBUG_LEVEL =9 (optional)`
- `RESTORE_TO_MIRROR=TRUE`
- `SYNC_FROM_MIRROR=TRUE`

### Conventional restore

Conventional restores are performed from tape attached to the NetWorker storage node directly to the standard device (STD) on the application host.

To perform a FLIR-type restore, the `nsrsapps.cfg` file (which is mentioned in `initSID.utl` as `ps_opaque_pfilename = /nsr/res/nsrsapps.cfg`) should be configured with the following parameters:

- `NSR_DATA_MOVER = proxy host name`
- `SYMM_SNAP_TECH = BCV or SNAP`
- `RESTORE_TYPE_ORDER = conventional`
- `NSR_PS_DEBUG_LEVEL =9 (optional)`

## Configuring the NetWorker client for homogeneous workflows

In a homogeneous workflow, single or multiple snapshots can be retained based on necessity. A rollover can then be performed for the required snapshot to a tape device that is connected directly to a NetWorker storage node.

Only an instant backup can be performed, followed by a delayed rollover to tape by using the **`nsrsnapadmin`** command.

For a homogeneous backup, the `nsrsapps.cfg` file (mentioned in `init.SID.utl` as `ps_opaque_pfilename = /nsr/res/nsrsapps.cfg`) should be configured with the following parameters:

- `NSR_DATA_MOVER = proxy host name`

- 
- SYMM\_SNAP\_TECH = *BCV or SNAP*
  - NSR\_IMAGE\_SAVE = FALSE (optional as the default value is FALSE)
  - NSR\_PS\_DEBUG\_LEVEL=9 (optional)
  - SYMM\_ON\_DELETE=RELEASE\_RESOURCE / RETAIN\_RESOURCE (optional)

For a SAP backup in a homogeneous workflow, the NetWorker client should be configured as shown in Figure 5.

Create a snapshot policy and enable the snapshot flag for the group; assign the client to the group and run the backup.

### Example

A user has created a 1, 1, Day, All snapshot policy, meaning take one snapshot, retain 1 snapshot, roll over the snapshot to tape, with the retention for the snapshot being set to a day. Initially, one snapshot is created. Then, the BCV is mounted on the proxy client and the data is rolled over to a tape device that is connected to the NetWorker storage node.

## ***Recoveries supported in homogeneous workflows***

All SAP-related data recoveries will be done with the brrestore utility provided by SAP. Ensure that all of the necessary environment variables are properly set while performing a restore.

### Example

SAP\_BIN = Path of SAP binaries (EX: brbackup, brrestore...) and backint

SAPBACKUP = Path of SAP backup / restore log files

SAPDATA\_HOME = Path of SAP Data Home

ORACLE\_HOME = Path of Oracle Home directory

ORACLE\_SID = Oracle SID

LD\_LIBRARY\_PATH = Oracle Library path (UNIX)

The following recoveries are supported by PowerSnap in homogeneous workflow for SAP.

### Instant restore (PiT restore)

The restore will be performed from a PiT copy of the data. To perform a PiT restore, the nsrsapps.cfg file (mentioned in *initSID.utl* as *ps\_opaque\_pfilename = /nsr/res/nsrsapps.cfg*) should be configured with the following parameters:

- NSR\_DATA\_MOVER = *proxy host name*
- SYMM\_SNAP\_TECH = *BCV or SNAP*
- RESTORE\_TYPE\_ORDER = PiT
- NSR\_PS\_DEBUG\_LEVEL =9 (optional)

### Conventional restore

Conventional restores are performed from a tape device attached to the NetWorker storage node, which is attached directly to the standard device (STD) on the application host.

To perform a conventional restore, the nsrsapps.cfg file (mentioned in *initSID.utl* as *ps\_opaque\_pfilename = /nsr/res/nsrsapps.cfg*) should be configured with the following parameters:

- NSR\_DATA\_MOVER = *proxy host name*
- SYMM\_SNAP\_TECH = *BCV or SNAP*

- 
- RESTORE\_TYPE\_ORDER = conventional
  - NSR\_PS\_DEBUG\_LEVEL =9 (optional)

## Rollback restore

A rollback restore is a destructive restore. The psrollback.res must be manually configured to avoid the safety check on the rollback file systems.

To perform rollback restore, the nsrsapps.cfg file (mentioned in initSID.utl as ps\_opaque\_pfilename = /nsr/res/nsrsapps.cfg) should be configured with the following parameters:

- NSR\_DATA\_MOVER = *proxy host name*
- SYMM\_SNAP\_TECH = *BCV or SNAP*
- RESTORE\_TYPE\_ORDER = rollback
- NSR\_PS\_DEBUG\_LEVEL =9 (optional)

## PowerSnap safety check

PowerSnap applies the safety check rules during a rollback restore to avoid overwriting the source data accidentally. To allow the rollback restore to succeed without the safety check failure, manually add a list of the files in the powersnap.res file that are allowed to be overwritten. This file is located in C:\Progra~1\Legato\nsr\res.

In general terms, a safety check should complain about any object that would be affected by the rollback (not included within the object supplied for the rollback). An example of a Symmetrix disk with the following layout is presented below:

STD1

```
- /fs1
  - datafile1
  - datafile2
  - dir1
    -datafile3
  -/fs2
  datafile4
```

When a snapshot is taken of any object on the STD, a snapshot is produced containing everything shown above. A rollback will result with fs1 and fs2 being reverted to their states at the time of the snapshot. The purpose of the safety check is to inform the PowerSnap user that there are objects outside the scope of what they have requested to be rolled back. The restore objects have a direct effect on whether or not the safety check will fail or pass.

If the following is added to the file system above, the following scenarios illustrate the expected behavior of the safety check:

```
/fs1/newdatafile5
/fs1/dir1/newdatafile6
/fs2/newdatefile7
```

### Case 1: Rollback requested for /fs1.

/fs2 would cause the safety check to fail. None of the new files affect the safety check. This is because the first two files are within the scope of the requested rollback (/fs1), and the third file is within the scope of /fs2.

---

**Case 2: Rollback requested for /fs1/dir1.**

/fs2 would cause a safety check failure. /fs1/newdatafile5 would cause a safety check failure. The other two new files do not fail the safety check. This is because /fs1/dir1/newdatafile6 is within the scope of the requested rollback, as is the last file of /fs2.

For example, a rollback of everything above is a snapshot of the following:

/fs1/datafile1

/fs1/datafile2

/fs1/dir1/datafile3

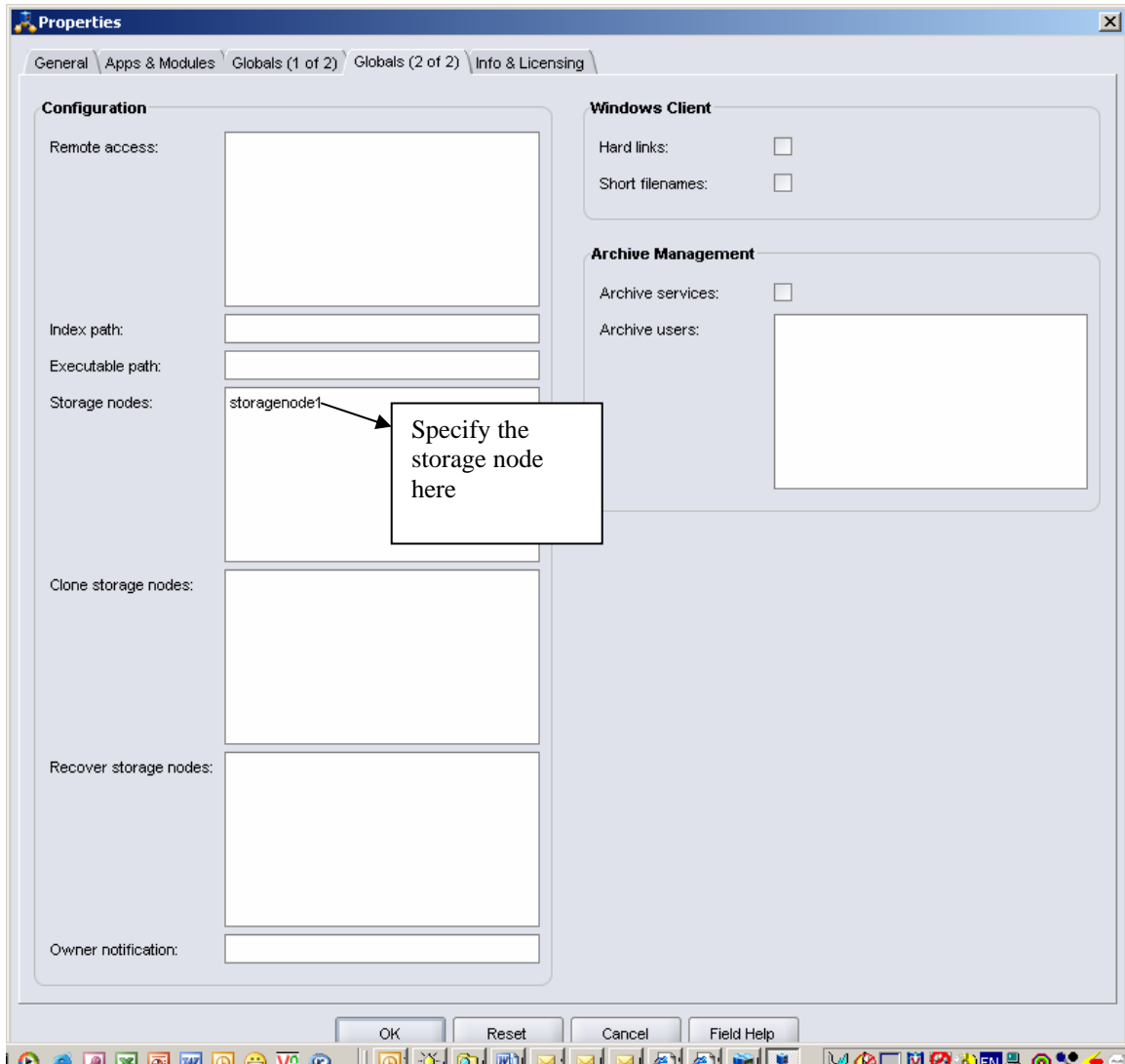
/fs2/datafile4

All three of the new files should cause a safety check failure because none of them are within the scope of NMSAP's rollback request.

## Selection of a remote storage node

NetWorker has a feature to specify the storage node to be used for backups, which will help in avoiding the data to be backed up over the network, thereby shortening the backup window. PowerSnap backups can gain from these features by installing the storage node on the datamover and directing the backups to the devices attached to this storage node.

PowerSnap can leverage NetWorker's remote storage node functionality by enabling the user to set the affinity of a client to a particular storage node. By default, all of the backups are directed to media devices attached to the NetWorker server's remote storage node. The benefit is flexibility: Backup data can be directed toward a particular storage node, which indirectly means to a set of devices belonging to that storage node. Figure 7 illustrates the settings for specifying the affinity for a storage node.



**Figure 7. Storage node specification**

Using this functionality, the affinity is set for different storage nodes. For instance, the remote host that has the remote storage area can be set with the storage node having affinity to itself (if it has the storage node installed), or to a different storage node, nearer to itself, in order to avert network traffic. By default, the storage node is set to “nrsrserverhost,” which means that the data is backed up to media devices connected directly to the NetWorker server.

A remote device is configured using this convention:

`rd=storagenode1:\\.\Tape0` or `rd=storgaenode1:/networkerdevice`

Where `storagenode1` uses the hostname of the remote storage node.

Figure 8 illustrates the NetWorker Management Console (NMC) displaying a remote media device configured on a NetWorker server.

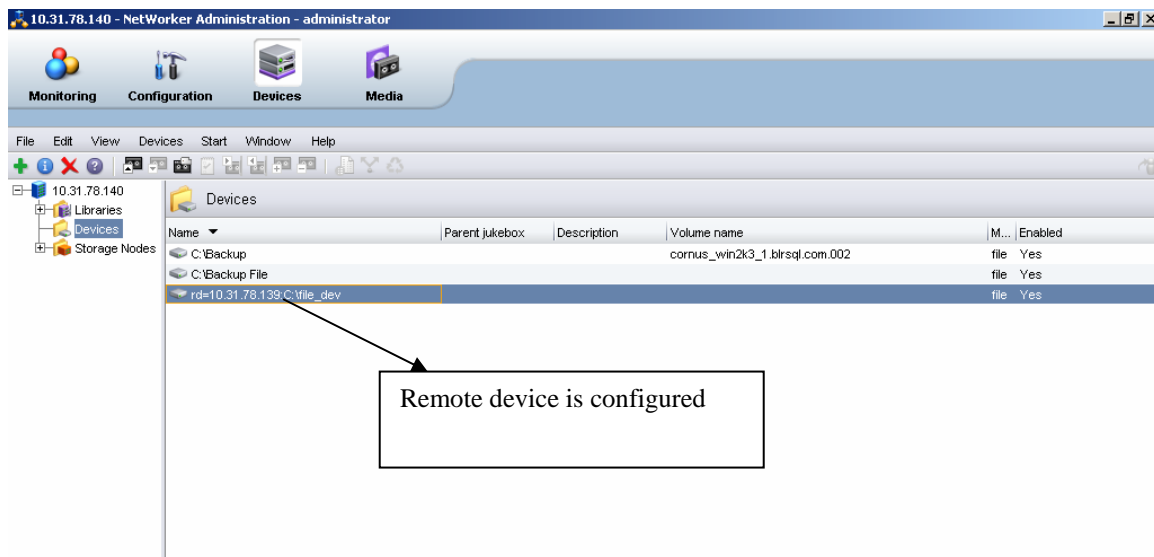


Figure 8. Remote device configured

## Troubleshooting tips

This section contains a couple of common error messages and their solutions.

### Error message #1

```
BR0051I BRBACKUP 6.40 (34)
BR0055I Start of database backup: bdqvlrfl.pnf 2005-09-13 18.33.29
BR0602E No valid SAP license found - please contact SAP

BR0056I End of database backup: bdqvlrfl.pnf 2005-09-13 18.33.30
BR0280I BRBACKUP time stamp: 2005-09-13 18.33.30
BR0054I BRBACKUP terminated with errors
```

**Solution:** Check the license for the amount of data it is authorized to back up.

### Error message #2

```
BACKINT:<SID>:PS: No full backups of this save set were found in the media
database; performing a full backup

BACKINT: <SID>:PS: Backup of [BACKINT:NMSAP:PS] failed

52051:nsrsnap:Printing savecmd=nsrsapsv after parsing

BACKINT: <SID>:PS nsrsapsv: Command not found
```

**Solution:** Install NMSAP software and copy the latest backint binary to the SAP BIN directory.

**Note:** If the backint binary already exists in the SAP BIN directory and the NMSAP software is not installed, this error message is displayed.

---

## Conclusion

The innovative technologies of EMC NetWorker PowerSnap and EMC Symmetrix storage arrays combine to provide key customer benefits within a NetWorker-protected SAP environment.

Organizations implementing such a solution are expected to see the following benefits:

- Seamless integration into an existing IT storage infrastructure with no impact to the SAP applications
- Instantaneous access to SAP database backups created with specific points in time, improving recovery time objectives over tape-based recovery solutions
- Reduced SAP database downtime due to the low overhead of creating snapshots with EMC NetWorker PowerSnap and EMC Symmetrix arrays
- Reduced backup and restore windows by using block-based backups

## References

- *EMC NetWorker PowerSnap Module for EMC Symmetrix DMX Installation Guide*
- *EMC NetWorker PowerSnap Module for EMC Symmetrix DMX Administration Guide*
- *EMC NetWorker PowerSnap Module for EMC Symmetrix DMX Release Notes*
- *EMC NetWorker Module for SAP with Oracle Multiplatform Version Installation Guide*
- *EMC NetWorker Module for SAP with Oracle Multiplatform Version Administration Guide*
- *EMC NetWorker Module for SAP with Oracle Multiplatform Version Release Notes*
- *EMC NetWorker Multiplatform Version Administration Guide*
- *EMC NetWorker Multiplatform Version Release Notes*
- *EMC Information Protection Software Compatibility Guide*
- *Configuring PowerSnap with Microsoft SQL Databases on EMC Symmetrix and EMC CLARiiON Systems Technical Note*

View EMC's proven solutions for data replication, data lifecycle management, disaster recovery and continuous data protection at <http://www.EMC.com>.

View detailed information on the EMC NetWorker family of products at <http://www.emc.com/products/detail/software/networker.htm>.