

EMC Backup and Recovery for SAP Enabled by EMC Celerra with SnapSure, EMC NetWorker, and EMC Replication Manager

A Detailed Review

EMC Information Infrastructure Solutions

Abstract

The white paper demonstrates how EMC[®] Replication Manager[®] backs up and recovers SAP ERP data within an EMC Celerra[®] storage array using SnapSure[™] snaps and storing backups in low-cost SATA disk drives.

July 2010

Copyright © 2010 EMC Corporation. All rights reserved.

EMC believes the information in this publication is accurate as of its publication date. The information is subject to change without notice.

THE INFORMATION IN THIS PUBLICATION IS PROVIDED “AS IS.” EMC CORPORATION MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WITH RESPECT TO THE INFORMATION IN THIS PUBLICATION, AND SPECIFICALLY DISCLAIMS IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Use, copying, and distribution of any EMC software described in this publication requires an applicable software license.

For the most up-to-date listing of EMC product names, see EMC Corporation Trademarks on EMC.com

All other trademarks used herein are the property of their respective owners.

Part number: H7043

Table of Contents

Executive summary.....	5
Business case.....	5
Product solution.....	5
Benefits.....	5
Introduction.....	6
Purpose.....	6
Audience.....	6
Key components.....	7
Introduction.....	7
EMC Celerra.....	7
VMware ESX.....	7
SAP ERP 6.0.....	7
EMC Celerra SnapSure.....	7
EMC Replication Manager.....	8
EMC NetWorker.....	8
EMC NetWorker Module for SAP.....	8
Physical architecture.....	9
Architecture diagram.....	9
Environment profile.....	11
Hardware resources.....	11
Software resources.....	11
Installation and configuration.....	12
Introduction.....	12
Configuring EMC Celerra NFS.....	12
SAP system installation considerations.....	12
Installing EMC Replication Manager.....	12
Configuring EMC Replication Manager.....	13
Installing EMC NetWorker.....	15
Configuring EMC NetWorker.....	16
Configuration with EMC NetWorker parameter files.....	16
Configuration with the EMC NetWorker GUI.....	16
Design and validation.....	18
Introduction.....	18
EMC Replication Manager Snapshots considerations.....	18
Scenario 1 Backup considerations.....	18
Scenario 2 Backup considerations.....	19
Scenario 1 Recovery considerations.....	19
Scenario 2 Recovery consideration.....	20
Conclusion.....	21

Summary	21
Benefits.....	21
References	22
White paper.....	22
Product documentation.....	22

Executive summary

Business case When planning for backup and recovery, it is crucial to design a solution that is cost-effective and easily maintained to protect critical SAP information.

SAP customers face the challenges of restoring production operations in a data loss event, and bringing SAP applications online with minimal business disruption in accordance with agreed service levels.

These challenges demand a solution that offers effective, affordable, and efficient data protection for critical SAP business functions.

Product solution

SAP BR*Tools and EMC® Replication Manager are used in this solution to manage the online creation and mounting of replica volumes that can then be used as a source for backup. This eliminates the need to develop and maintain custom scripts and offloads the backup process from the production SAP server.

In this solution, EMC Replication Manager with EMC Celerra® Network File Systems (NFS) creates snapshots of SAP ERP production data within the EMC Celerra storage array, which allows the SAP administrator to initiate the following operations:

- Online backup operations without system downtime.
- Recovery operations with minimal business disruption.

The solution uses EMC NetWorker® with the NetWorker Module for SAP to further automate the online backup and recovery of the SAP Oracle database. The solution also supports the use of EMC Celerra SATA disks as backup targets to be an effective alternative to the cost and complexity of physical tape backup procedures and equipment.

In addition, due to the increasing deployment of virtualized servers to consolidate data center equipment and increase efficiencies, this solution also includes the use of a VMware ESX server with a virtual machine mount host and illustrates how to restore the SAP system from a physical to a virtual environment.

For SAP administrators and database administrators (DBAs), this solution results in an easier, faster, and safer backup and recovery processes for SAP systems, with increased flexibility and reduced costs.

Benefits

This white paper demonstrates the benefits of this solution, including:

- Eliminate the need to create and maintain complex scripts for backup.
- Eliminate any production downtime during backups.
- Reduce storage utilization and recovery time by using array-based snaps as source for backups.
- Reduce power and cooling costs by using high density, lower power, SATA drives.

-
- Reduce backup runtime with multi-streaming capability.
 - Use a centralized backup tool to manage SAP and non-SAP backups for multiple systems.
-

Introduction

Purpose

This document describes the architecture, installation, configuration, and validation test procedures for the solution. The purpose of this solution is to:

- Show how the SAP production environment can be backed up using SAP BR*Tools and EMC Replication Manager with EMC Celerra SnapSure™ technology.
 - Show how EMC NetWorker can be used to facilitate the BR*Tools backup process.
 - Describe the processes of restoring the backup copies to the production system.
-

Audience

This white paper is intended for customers, partners, and EMC employees. The audience includes IT planners, storage architects, SAP BASIS administrators, and any others involved in evaluating, acquiring, managing, operating, or designing an SAP landscape's infrastructure.

Key components

Introduction	<p>This section briefly describes the key solution components. For details about all of the components that are introduced in this solution, refer to the Environment profile section. The key components of this solution are:</p> <ul style="list-style-type: none">• EMC Celerra• VMware ESX• SAP ERP 6.0• EMC Celerra SnapSure• EMC Replication Manager• EMC NetWorker• EMC NetWorker Module for SAP on Oracle
EMC Celerra	<p>The EMC Celerra unified storage system brings advanced clustering availability to multi-protocol environments. The EMC Celerra unified storage system delivers a single-box block and file solution offering a centralized point of management for distributed environments. This enables you to dynamically grow, share, and cost-effectively manage multi-protocol file systems as well as provide multi-protocol block access.</p>
VMware ESX	<p>VMware ESX is the foundation for a dynamic, self-optimizing IT infrastructure. VMware ESX is a robust, production-proven virtualization layer that abstracts processor, memory, storage, and networking resources into multiple virtual machines.</p> <p>VMware ESX allows enterprises to dramatically reduce hardware and operating costs by sharing resources across a virtual environment.</p>
SAP ERP 6.0	<p>SAP ERP 6.0 is a world-class, fully integrated solution that fulfills the core business needs of midsize and large organizations across all industries and market sectors. Together with SAP NetWeaver and a repository of enterprise services, SAP ERP 6.0 can serve as a solid business process platform that supports continued growth, innovation, and operational excellence.</p>
EMC Celerra SnapSure	<p>EMC SnapSure software creates copies of file systems for backups and quick recovery of deleted files or file systems. SnapSure permits as many snapshots of file systems as the space allocated for this function allows.</p>

**EMC
Replication
Manager**

EMC Replication Manager automates and simplifies management of disk-based and NFS-based replication processes. It orchestrates critical business applications, middleware, and underlying EMC replication technologies to create and manage replicas at the application level for a variety of purposes, including operational recovery, backup, restore, development, simulation, and repurposing.

EMC NetWorker

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

**EMC NetWorker
Module for SAP**

The EMC NetWorker Module for SAP (NMSAP) is an SAP-certified add-on module for EMC NetWorker client software and provides a backup and restore interface between the SAP BR*Tool programs and the NetWorker server.

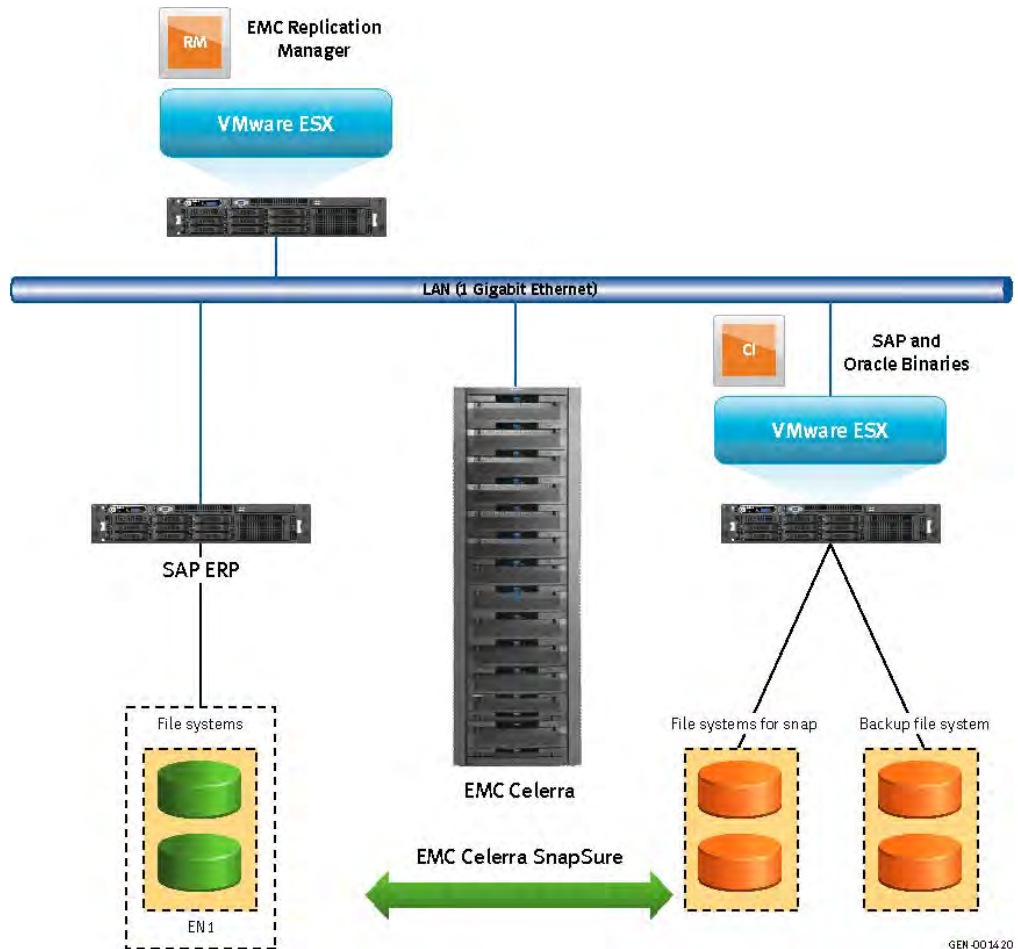
Physical architecture

Architecture diagram

In this solution, EMC Celerra NFS file systems are mounted on the production SAP ERP server to hold database files.

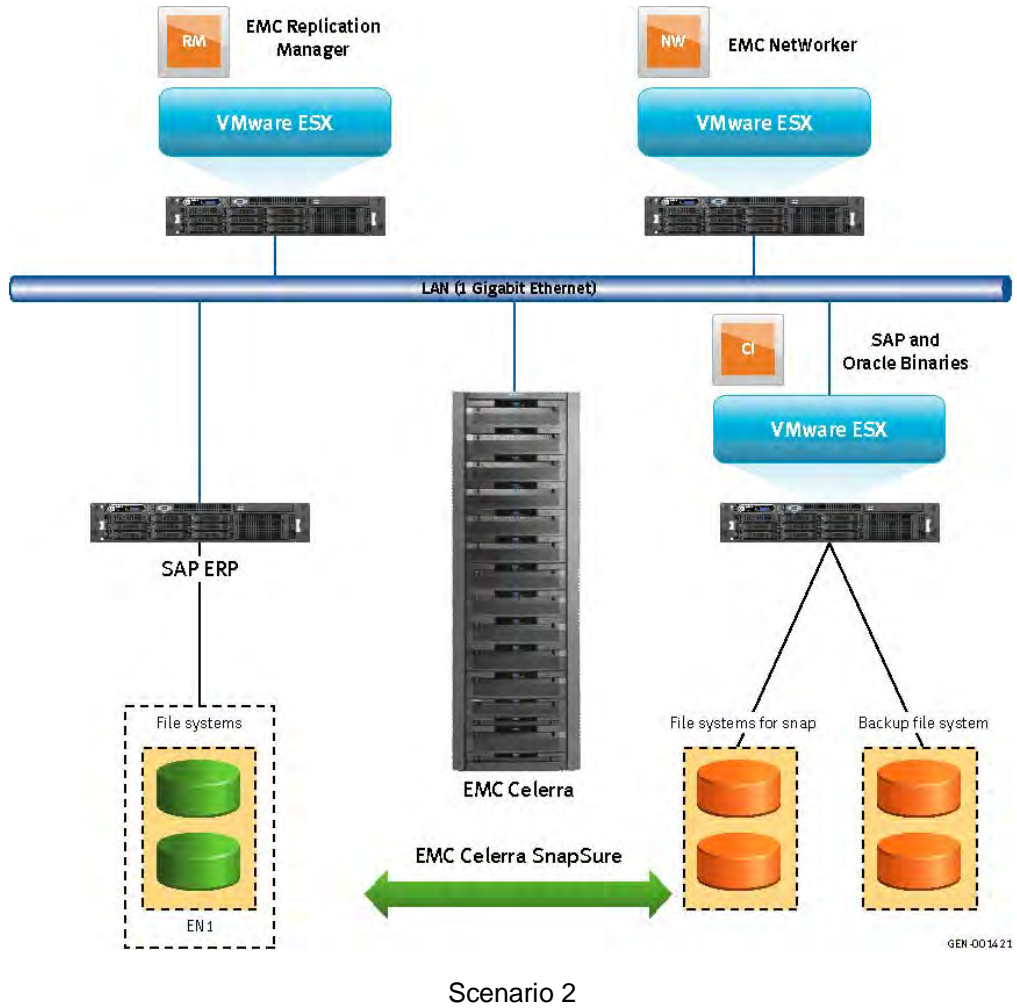
The following diagrams depict the physical architecture of the solution in two scenarios.

In Scenario 1, SAP BRBACKUP starts the online backup process and calls EMC Replication Manager, which uses EMC Celerra SnapSure to create snapshot copies of the Oracle file systems. BRBACKUP then backs up snapshot files systems to the SATA disks of the EMC Celerra. See the Scenario 1 diagram as shown below.



Scenario 1

In Scenario 2, EMC NetWorker starts the online backup process with SAP BR*Tools. The SAP BRBACKUP calls EMC Replication Manager, which uses EMC Celerra SnapSure to create snapshot copies of the Oracle file systems. BRBACKUP then backs up snapshot file systems to the SATA disks of the EMC Celerra. See the Scenario 2 diagram as shown below.



Environment profile

Hardware resources

The hardware used to validate the solution is listed in the table.

Equipment	Quantity	Configuration
Storage array	1	EMC Celerra NS-480 (DART 5.6.43-8) 30x300 GB FC drives 15x1 TB SATA drives
Servers	2	(1) Production server – 4 CPUs, 16 GB RAM (2) Target server – ESX server VM – 2 CPUs, 16 GB RAM
EMC replication server	1	2 dual-core 4 CPUs; 6 GB memory
EMC NetWorker Server	1	2 dual-core 4 CPUs; 6 GB memory

Software resources

The software used to validate the solution is listed in the following table.

Software	Version	Configuration
SuSe Linux Enterprise Server	10 SP2 (x86_64)	On both source and target hosts
SAP Application	ERP 6.0 SR2	ABAP stack only
Oracle Database	10.2.0.4	
VMware ESX Server	3.5 U3	Enterprise Edition
EMC Celerra SnapSure	5.6.48-8	
EMC Replication Manager	5.2.3	Hotfix URM00069940 URM00069943
EMC NetWorker	7.6	
EMC NetWorker Module for SAP	4.0	
EMC Solutions Enabler	7.1	

Installation and configuration

Introduction

This section provides procedures and guidelines for configuring and installing the components of this solution.

Configuring EMC Celerra NFS

The configuration steps of EMC Celerra NFS within the context of this solution consist of:

Step	Action
1	Configure RAID
2	Configure EMC Celerra volumes and storage pools
3	Create file systems on the production host
4	Export mount points to the production and mount hosts from the EMC Celerra to make the file systems visible to the server
5	Add mount points to the <i>/etc/fstab</i> entries (Optional)
6	Mount the file systems on the production host

Refer to the relevant EMC Celerra administration manuals for detailed information about configuring EMC Celerra NFS.

SAP system installation considerations

To start an SAP BRBACKUP on a mount host, SAP and Oracle binaries must be installed on the mount host. In this solution, the SAP and Oracle binaries were installed on the EMC Celerra NFS.

Refer to the relevant SAP Installation manuals for detailed information about installing an SAP system on NFS.

Installing EMC Replication Manager

Installing Replication Manager within the context of this solution involves:

- Follow the procedures described in the *Replication Manager Product Guide* to install Replication Manager on the designated Windows server. Consult the support matrix to install the proper versions of associated software such as Solutions Enabler. Refer to the [Software resources](#) section for specific versions used.
 - After the RM server is installed, the Replication Manager agent software must be installed on the production server as well as the target system. Consult the support matrix to install the proper versions of associated software such as Solutions Enabler. Refer to the [Software resources](#) section for specific versions used.
-

Configuring EMC Replication Manager

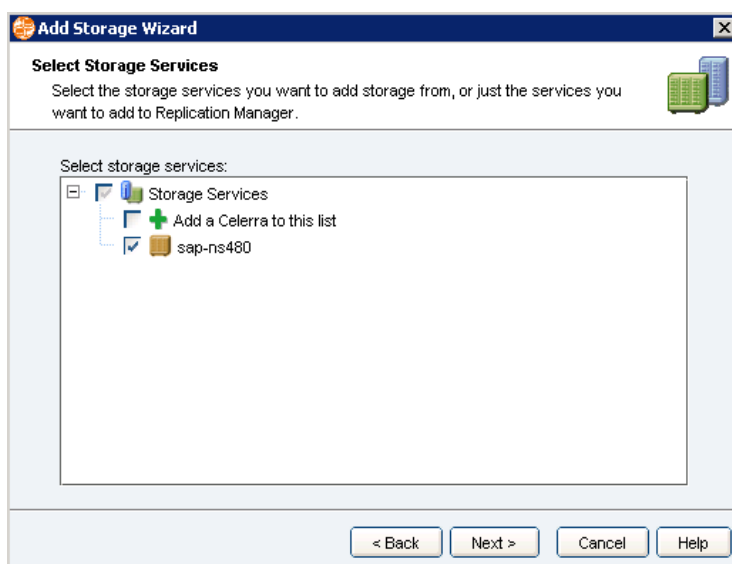
Follow the procedures described in the *Replication Manager Administrator's Guide* to configure an application set and a job.

Consider three key areas when configuring EMC Replication Manager for EMC Celerra NFS:

- Adding EMC Celerra storage
- Replication destination and technology
- Consistency method

Adding EMC Celerra storage

EMC Replication Manager will recognize the EMC Celerra storage array after you create the storage services with the user interface. You can use an IP address or hostname to identify the Celerra storage array but do not mix the use of the two.

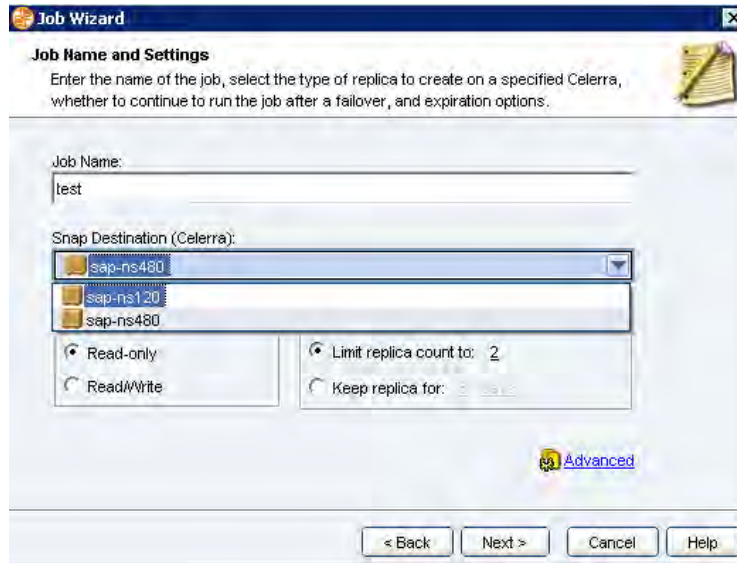


Replication destination and technology

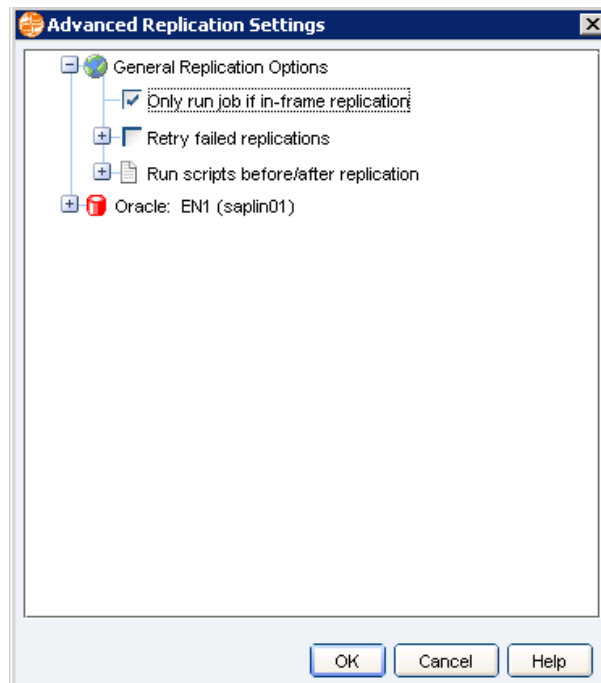
When creating a RM job for EMC Celerra, the destination of the snap needs to be selected. If you choose the same Celerra array as **Snap Destination**, the snap is created on the same storage with SnapSure technology. If another Celerra is selected, then Celerra Replicator technology is used for replication. In this solution, the snap is created on the same storage with SnapSure technology.

Replication Manager supports both read-only and read/write replicas of EMC Celerra. This solution uses a read/write snapshot so that this snapshot can be mounted in a non-production host to create a separate SAP system. Make sure to select the **Read/Write** snap type as shown in the following image.

Note EMC Celerra always creates read-only snaps. To create read/write snaps, EMC Celerra first creates read-only snaps, and read/write snaps are created from the read-only snaps.



When you create a job for EMC Celerra, make sure to select the **Only run job if in-frame replication** entry as shown in the following image. With this option selected, the job only runs when the source and target file systems reside on the same Celerra. If you do not select it, Replication Manager attempts to create a snap on the remote storage. This feature is only available if you have a remote storage configured and selected it as a **Snap Destination**.



Consistency method

For an Oracle database with the EMC Celerra array, there are three options to ensure database consistency as shown in the following image:

- Online without hot backup mode
- Online using hot backup mode
- Offline by shutting down the database

Since the SAP BR*Tool that is used with this solution brings the database to hot backup mode, it is not necessary for EMC Replication Manager to bring the database to hot backup mode again. Therefore, the **Online without hot backup Mode** option is used for this solution as shown in the following image.



Note Archive logs need to be backed up outside EMC Replication Manager after releasing the hot backup mode.

Installing EMC NetWorker

The following components must be installed before configuring EMC NetWorker:

- NetWorker Agent on the mount host
- NetWorker Agent for SAP (NWSAP) on the mount host
- NetWorker Storage Node on the mount host
- Backup space (EMC Celerra SATA disk is used in this solution)

Refer to the *EMC NetWorker 7.6 Installation Guide* for detailed installation

instructions.

Configuring EMC NetWorker

Two methods of configuring EMC NetWorker are provided:

- Configuration with EMC NetWorker parameter files
- Configuration with the EMC NetWorker GUI

Refer to the *EMC NetWorker 7.6 Installation Guide* for detailed configuration instructions.

Configuration with EMC NetWorker parameter files

This method focuses on the modification of configuration files and file properties. The following EMC NetWorker files are needed for configuration.

- NWSAP files:
 - **init<SID>.utl** is the configuration file for the backint program that specifies the variables for manual backups and restores and changes the parameters.
 - **nsrsapsv.cfg** is the configuration file for the nsrsapsv program that invokes the appropriate BR*Tools.
- SAP configuration file:

init<SID>.sap is the utility profile for BR*Tool to specify how to and where to back up the SAP system.

Configuration with the EMC NetWorker GUI

The second method focuses on configuration tasks performed with the NetWorker graphical user interface (GUI). Configuring EMC NetWorker through the GUI within the context of this solution involves:

- Defining a backup job
- Defining a host
- Defining a backup disk

Defining a backup job

A backup job is called a Group in NetWorker terminology. Make sure to set the **Client retries** to zero; otherwise, if a backup fails, multiple log files are generated. Also, because multiple components are involved, manual intervention may be required. See the following image for configuration properties.

Configuration

Autorestart: Disabled

Restart window: 12:00

Success threshold: Warning

Client retries: 0

Defining a host

In this solution, a mount host is a backup source to NetWorker since split-mirror method is used with BR*Tools. Therefore, a mount host needs to be defined as a host to backup. In NetWorker terminology, it is called a Client.

Defining a backup disk

In this solution, SATA disk of EMC Celerra is used as a backup disk. In the Devices section, ensure that all devices are assigned to the Storage Node on the SAP server and that all devices are assigned to the same storage pool. Take the following image for example.

Devices						
St...	Device	Storage Node	...	Volume	Pool	Message
	rd=sap-nas-vm2:/DATA/CP	sap-nas-vm2		sapnasvm2.002	sapnasvm2	writing at 97 MB/s, 552 GB, 3 sessi
	rd=sap-nas-vm2:/RMC	sap-nas-vm2			sapnasvm2	unmounted sapnasvm2.006

Design and validation

Introduction

This solution integrates the EMC Celerra unified storage system with EMC Celerra SnapSure for NFS to allow SAP administrators to easily back up and recover the production systems.

In Scenario 1, SAP BRBACKUP starts the online backup process and works with EMC Replication Manager, which uses EMC Celerra SnapSure to create snapshot copies of the Oracle file systems. BRBACKUP then backs up snapshot file systems to the SATA disks of the EMC Celerra.

In Scenario 2, EMC NetWorker triggers to execute the SAP BRBACKUP, which starts the online backup process. The SAP BRBACKUP calls EMC Replication Manager, which uses EMC Celerra SnapSure to create snapshot copies of the Oracle file systems. BRBACKUP then backs up snapshot file systems to the SATA disks of the EMC Celerra.

EMC Replication Manager Snapshots considerations

EMC Replication Manager with EMC Celerra NFS uses SnapSure technology to perform the local replication. Replication Manager creates the snapshots on the same EMC Celerra storage pool where the source file systems reside. This is the default configuration of EMC Celerra. It is recommended to allocate enough space for the storage pool to create multiple snapshots.

If you want to create the Celerra snaps to another pool, set an environment variable and restart the Replication Manager agent. The environment variable looks like this:

```
EMC_CELERRA_POOL_<jobname>=<pool name>
```

Where:

- *<jobname>* is the name of the Replication Manager job that creates the SAP database snaps on the Celerra.
- *<pool name>* is the name of the pool that will be used to store the snap session information.

In this solution, snaps are created in a different pool so that the snaps are placed on SATA disks of EMC Celerra.

Note To use this feature, apply the hotfix URM00069943 for RM 5.2.3. This feature is included for the future release, RM 5.2.4.

Scenario 1 Backup considerations

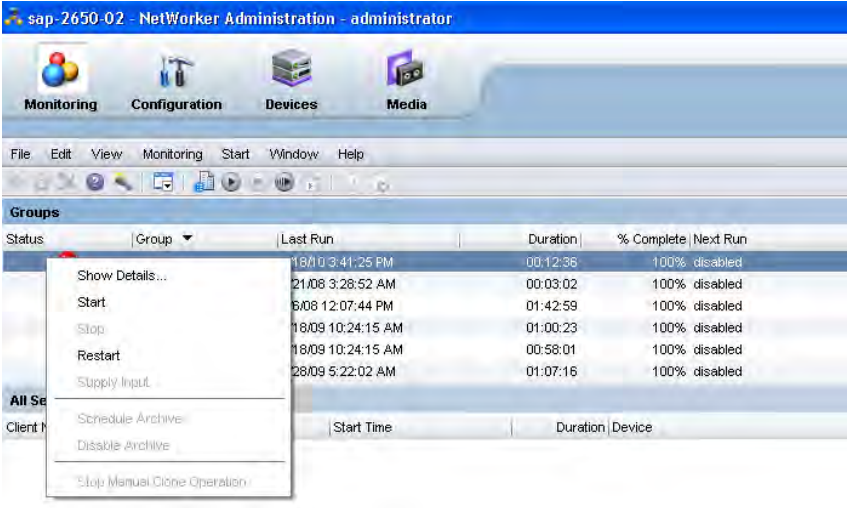
The following table describes the process for performing a backup in Scenario 1.

Stage	Description
1	The administrator initiates SAP BRBACKUP on the mount host.
2	BRBACKUP places the production database into hot backup mode and calls an EMC Replication Manager script.
3	EMC Replication Manager creates snapshots on EMC Celerra.

4	EMC Replication Manager mounts the snapshots on a mount host.
5	BRBACKUP takes the database off of hot backup mode.
6	BRBACKUP backs up the SAP system from the replica (snap) to SATA drives on the mount host.

**Scenario 2
Backup
considerations**

The following table describes the process for performing a backup in Scenario 2.

Step	Action																																										
1	<p>The Administrator initiates a backup job from the NetWorker GUI or runs BR*Tool from the mount host.</p>  <table border="1"> <thead> <tr> <th>Status</th> <th>Group</th> <th>Last Run</th> <th>Duration</th> <th>% Complete</th> <th>Next Run</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>18/10 3:41:25 PM</td> <td>00:12:38</td> <td>100%</td> <td>disabled</td> </tr> <tr> <td></td> <td></td> <td>21/08 3:28:52 AM</td> <td>00:03:02</td> <td>100%</td> <td>disabled</td> </tr> <tr> <td></td> <td></td> <td>6/08 12:07:44 PM</td> <td>01:42:59</td> <td>100%</td> <td>disabled</td> </tr> <tr> <td></td> <td></td> <td>18/09 10:24:15 AM</td> <td>01:00:23</td> <td>100%</td> <td>disabled</td> </tr> <tr> <td></td> <td></td> <td>18/09 10:24:15 AM</td> <td>00:58:01</td> <td>100%</td> <td>disabled</td> </tr> <tr> <td></td> <td></td> <td>28/09 5:22:02 AM</td> <td>01:07:16</td> <td>100%</td> <td>disabled</td> </tr> </tbody> </table>	Status	Group	Last Run	Duration	% Complete	Next Run			18/10 3:41:25 PM	00:12:38	100%	disabled			21/08 3:28:52 AM	00:03:02	100%	disabled			6/08 12:07:44 PM	01:42:59	100%	disabled			18/09 10:24:15 AM	01:00:23	100%	disabled			18/09 10:24:15 AM	00:58:01	100%	disabled			28/09 5:22:02 AM	01:07:16	100%	disabled
Status	Group	Last Run	Duration	% Complete	Next Run																																						
		18/10 3:41:25 PM	00:12:38	100%	disabled																																						
		21/08 3:28:52 AM	00:03:02	100%	disabled																																						
		6/08 12:07:44 PM	01:42:59	100%	disabled																																						
		18/09 10:24:15 AM	01:00:23	100%	disabled																																						
		18/09 10:24:15 AM	00:58:01	100%	disabled																																						
		28/09 5:22:02 AM	01:07:16	100%	disabled																																						
2	EMC NetWorker executes SAP BRBACKUP on the mount host.																																										
3	BRBACKUP places the production database into hot backup mode and calls an EMC Replication Manager script.																																										
4	EMC Replication Manager creates snapshots on EMC Celerra.																																										
5	EMC Replication Manager mounts the snapshots on a mount host.																																										
6	BRBACKUP takes the database off of hot backup mode.																																										
7	BRBACKUP backs up the SAP system from the replica to SATA drives on the mount host.																																										

**Scenario 1
Recovery
considerations**

Recovery operations are performed manually on an SAP Oracle host by using, for example, the SAP BR*Tool or the BRRESTORE and BRRECOVER commands.

The steps for how to recover the SAP system on the production host in Scenario 1 are provided in the following table.

Step	Action
1	The Administrator initiates a BR*tool on the mount host.
2	BRRESTORE initiates the restore of data from SATA disks to the replica on the mount host.
3	BRRECOVER initiates the recover the data from SATA disks to the replica on the mount host.
4	Unmount the replica from the mount host.
5	Restore the replica to the production host.
6	Start the SAP system on the production host.

The steps for how to recover the SAP system on the mount host in Scenario 1 are provided in the following table.

Step	Action
1	The Administrator initiates a BR*tool on the mount host ¹
2	BRRESTORE initiates the restore of data from SATA disks to the replica on the mount host
3	BRRECOVER initiates the recover of data from SATA disks to the replica on the mount host
4	Ensure that the database has opened successfully ²
5	Start the SAP system

Refer to the following SAP website for further details of SAP's backup and recovery with SAP BR*Tools:

http://help.sap.com/saphelp_nw70ehp1/helpdata/en/0c/cd271365debc42bef96ac7fd907787/frameset.htm

Notes:

1. Modify the hostname to the mount host in tnsnames.ora if you want to recover the SAP system at the mount host.
2. Make sure tempfiles exist in the PSAPTEMP tablespace. If the file does not exist, the tempfiles must be created.

**Scenario 2
Recovery
consideration**

In Scenario 2, EMC NetWorker triggers to execute the SAP BRBACKUP, which starts the online backup process. The SAP BRBACKUP calls EMC Replication Manager, which uses EMC Celerra SnapSure to create snapshot copies of the Oracle file systems. BRBACKUP then backs up snapshot file systems to the SATA disks of the EMC Celerra.

Conclusion

Summary

This solution describes a simplified method using EMC Replication Manager with EMC Celerra SnapSure to establish backup processes of SAP ERP production data to the EMC Celerra storage array.

For SAP administrators and database administrators (DBAs), this solution results in easier, faster, and safer backup and recovery processes for SAP systems, with increased flexibility and reduced costs.

Benefits

The benefits of this solution that are demonstrated in this white paper are:

- Eliminate the need to create and maintain complex scripts for backup.
 - Eliminate any production downtime during backups.
 - Reduce storage utilization and recovery time by using array-based snaps as a source for backups.
 - Reduce power and cooling costs by using high density, lower power, SATA drives.
 - Reduce backup runtime with multi-streaming capability.
 - Use a centralized backup tool to manage SAP and non-SAP backups for multiple systems.
-

References

White paper

For additional information, refer to the white paper listed below:

- *EMC Intelligent Cloning for SAP Replication of Java Stack-based SAP systems with Oracle Enabled by Symmetrix DMX-4 and EMC Replication Manager*
 - *EMC Celerra Version 5.6 Technical Primer: SLA-Driven Replication with Celerra Replicator*
 - *EMC Celerra Version 5.6 Technical Primer: Business Continuity and Data Protection*
 - *EMC Business Continuity for SAP- Restart Enabled by EMC Celerra Replicator*
-

Product documentation

For additional information, refer to the product documents listed below:

- *Celerra Network Server Technical Module - Using EMC Celerra Replicator (V2)*
 - *EMC NetWorker Module for SAP with Oracle Release 4.0 Administration Guide REV A01*
 - *EMC NetWorker Module for SAP with Oracle Release 4.0 Installation Guide REV A01*
 - *EMC NetWorker Release 7.6 Administration Guide REV A01*
 - *EMC NetWorker Release 7.6 Installation Guide REV A05*
 - *EMC Replication Manager Version 5.2.3 Administrator's Guide REV A01*
 - *EMC Replication Manager Version 5.2.3 Product Guide REV A01*
-