

EMC Business Continuity for SAP – Restart Enabled by EMC Celerra Replicator

A Detailed Review

EMC Global Solutions

Abstract

The white paper demonstrates how EMC[®] Celerra Replicator[™] replicates SAP ERP production data between two remotely located EMC Celerra[®] storage arrays, so that business operations can be restarted on the secondary site in the event of unplanned events or disasters.

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Table of Contents

Executive summary..... 4
Introduction 5
Key components 6
Physical architecture 7
Environment profile 8
Installation and configuration 9
Design and validation..... 11
Conclusion 14
References..... 15

Executive summary

Business case SAP customers face the challenges of restoring production operations in the event of a disaster, and bringing the SAP applications online with minimal business disruption and in accordance with promised service levels.

When planning for data center disaster protection, it is crucial to design a solution that is cost-effective and easily maintained to protect critical SAP information.

These challenges demand a solution that offers effective, affordable, and efficient disaster recovery (DR) protection for critical SAP business functions.

Product solution The EMC Business Continuity for SAP – Restart solution leverages EMC® Celerra Replicator™ to protect SAP environments against unplanned events, such as a natural disaster or a disaster caused by human errors.

In this solution, EMC Celerra Replicator replicates SAP ERP production data between two EMC Celerra® storage arrays, which allows SAP administrators to quickly restart the business on the secondary site in the event of a disaster.

In addition, EMC Celerra Replicator allows you to set the desired recovery point objective (RPO) for each replication session and optimize the replication sessions continually.

Furthermore, due to the increasing deployment of virtualized servers to consolidate data center equipment and increase efficiencies, this solution also includes the use of a virtual machine on top of the VMware ESX server at the secondary site and illustrates performing a failover from a physical to a virtual environment.

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

Benefits This white paper demonstrates the following benefits:

- Eliminates any production downtime during replications.
 - Allows you to set the desired RPO flexibly through EMC Celerra Replicator.
 - Simplifies business restart at the remote site for both planned and unplanned events.
 - Allows you to leverage the remote site while performing scheduled maintenance events, such as operating system patches, on the primary server.
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Introduction

Purpose

This white paper details the architecture, installation, configuration, and validation test procedures for the EMC Business Continuity for SAP - Restart enabled by EMC Celerra Replicator solution. The purpose of the solution is to:

- Show how the SAP production environment can be replicated to a remote disaster recovery site with EMC Celerra Replicator.
 - Describe the process of failing over and restarting the SAP system on the secondary site as a production system.
 - Describe the process of failing back to the original production site after a failover.
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Audience

This white paper is intended for customers, partners, and EMC employees, including 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	This section briefly describes the key solution components. For details on all of the components that make up this solution, see the “Environment profile” section in this document.
EMC Celerra	The EMC Celerra family delivers best-in-class availability, scalability, and performance. A Celerra unified storage platform (NX4, NS-120, NS-480, or NS-960) is the best choice for customers who want multi-protocol connectivity (NAS, iSCSI, and Multi-Path File System) for specific applications, departments, or locations. Advanced, scalable management software makes it easy for customers to access, manage, and optimize an entire IP storage infrastructure from a single console.
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	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.
EMC Celerra Replicator	EMC Celerra Replicator provides efficient, snapshot-based, asynchronous data replication over IP networks. With Celerra Replicator, you can create local or remote copies of file systems, or iSCSI LUNs.

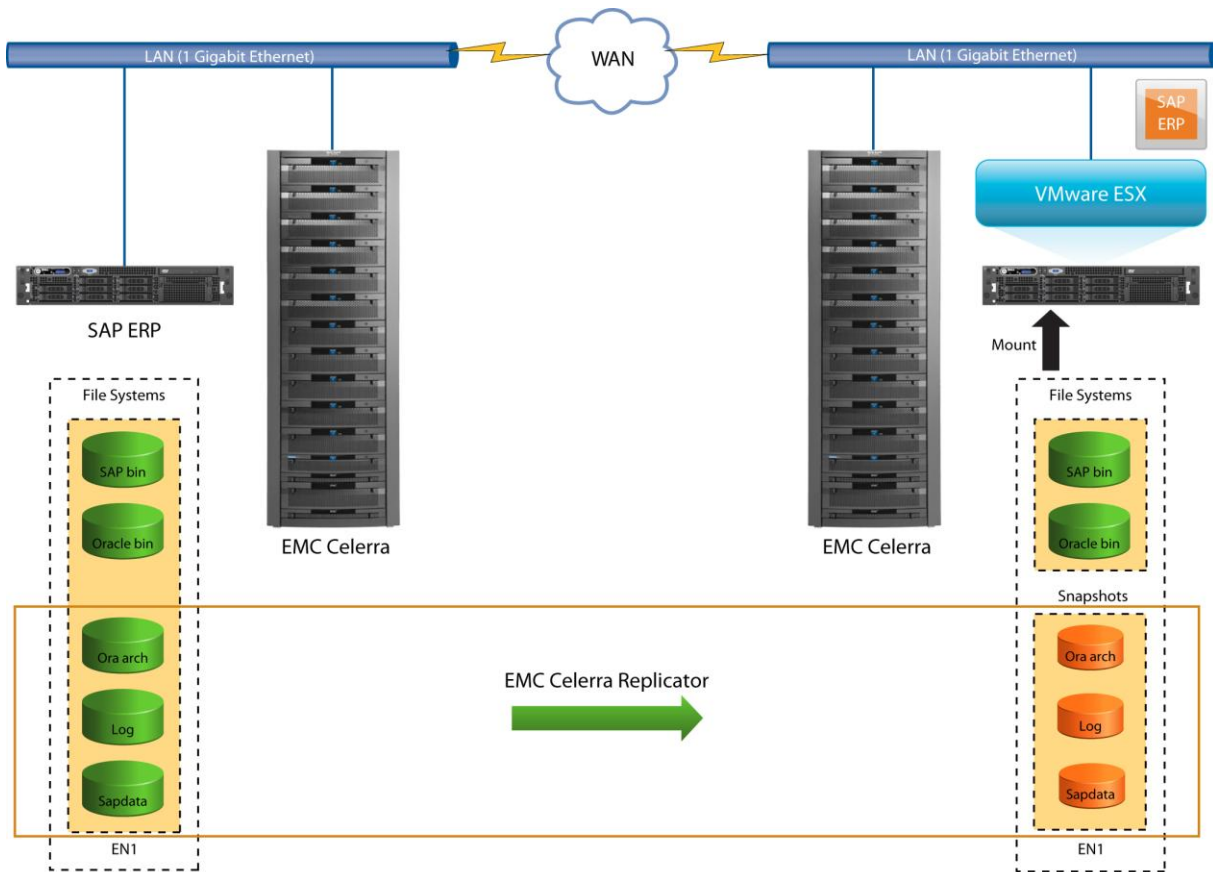
Physical architecture

Architecture diagram

The following illustration depicts the physical architecture of the solution.

In this solution, Network File Systems (NFS) of the EMC Celerra are mounted on the production SAP ERP server to hold database files. Those NFS are replicated to the secondary EMC Celerra storage using EMC Celerra Replicator.

When the SAP production system becomes unavailable, it is failed over to the file systems on the secondary site and mounted on a virtual SAP ERP machine that becomes the production SAP system.



GEN-001265

Environment profile

Hardware resources

The hardware used in the use case is listed below.

Equipment	Quantity	Configuration
Storage array	2	EMC Celerra NS-480 (DART 5.6.43-8) 30 x 300 GB FC drives 15 x 1 TB SATA drives EMC Celerra NS-120 (DART 5.6.43-8) 30 x 300 GB FC drives 15 x 1 TB SATA drives
SAP servers	2	(1) Production server – 4 CPUs, 16 GB RAM (2) Target server – ESX server VM – 2 CPUs, 16 GB RAM

Software resources

The software used in the use case is listed below.

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	10.2.0.2	
VMware ESX Server	3.5 U3	Enterprise Edition
EMC Celerra Replicator	5.6.48-8	

Installation and configuration

Introduction

This section provides procedures and guidelines for installing and configuring 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	Configuring RAID
2	Configuring EMC Celerra volumes and storage pools
3	Creating file systems (at the primary site only)
4	Exporting mount points to the production and mount hosts from the EMC Celerra to make the file systems visible to the server
5	Adding mount points to the <i>/etc/fstab</i> entries (Optional)
6	Mounting 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

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

To start an SAP system on a mount host, SAP and Oracle binaries are required to be installed on the mount host. In this solution, the SAP and Oracle binaries were installed on the EMC Celerra NFS. However, for the purpose of the replication, it is not necessary for those file systems to be EMC Celerra NFS file systems.

Configuring EMC Celerra Replicator

Create replication sessions

EMC Celerra Replicator enables you to perform file system replication to produce a read-only, point-in-time copy of an established source file system and periodically update this copy, making it consistent with the source file system.

Each replication contains a single file system that needs to be identical between source and target EMC Celerra file systems. For the initial configuration, you specify the source file systems at the primary site and the storage pools at the secondary site. EMC Celerra will then create the identical file systems from the specified storage pool at the secondary site.

RPO considerations (“Time Out of Sync”)

Each replication session can specify the desired elapsed time window within which the system attempts to keep the data at the destination site synchronized with the data on the source. The default value is 10 minutes, but it is easy to change as the requirement changes.

EMC Celerra Manager - Advanced Edition v 5.6

EMC Powerlink

nasadmin@10.241.13.204

Replication Properties

Replication ID: 118_APM00090600557_0000_179_APM00090600504_0000

Replication Name: SAP_data

Replication Role: source

Source Data Mover: server_2

Source File System: Oracle_data_EN1

Source Interface: 10.241.13.213

Celerra Network Server: sap-ns120

Data Mover Interconnect: sap

Peer Data Mover Interconnect: sap

Destination Data Mover: server_2

Destination File System: Oracle_data_EN1

Destination Interface: 10.241.13.148

Source Status: OK

Destination Status: OK

Network Status: OK

Update Policy: Time Out of Sync Manual Refresh

Time Out of Sync: 10 Minutes

In this solution, four replication sessions are created, and the file systems are replicated between two EMC Celerra storage arrays every 10 minutes. Refer to the topic “Replication considerations” in the section “Design and validation” for more information about the replication sessions.

EMC Celerra Manager - Advanced Edition

nasadmin

Replications

Replications: Celerra Network Servers Data Mover Interconnects

Show Replications for: All Data Movers

Show Replications for Type: All Replications

Select a Data Mover Interconnect: All Data Mover Interconnects

Name	Local Object	Local Data Mover	Data Mover Interconnect	Celerra Network Server	Status	Last Sync Time
ARCH	ARCH_EN1	server_2	sap	sap-ns120	OK	Wed Nov 25 13:21...
LOGA	LogA_EN1	server_2	sap	sap-ns120	OK	Wed Nov 25 13:15...
LOGB	LogB_EN1	server_2	sap	sap-ns120	OK	Wed Nov 25 13:15...
SAP_data	Oracle_data_EN1	server_2	sap	sap-ns120	OK	Wed Nov 25 13:23...

Refer to the *Celerra Network Server- Using EMC Celerra Replicator (V2)* technical module for detailed information about configuring EMC Celerra Replicator.

Design and validation

Introduction This solution integrates the EMC Celerra unified storage system with EMC Celerra Replicator for NFS to allow SAP administrators to easily restart their production systems at the secondary site.

Replication considerations To bring the SAP system online on the secondary site, the following files should be replicated:

- SAP data files
- Archive log files
- Control files

In the default installation of an SAP system, not all control files reside on the replicated file systems (for example, one of the control files is located under the redo log file directory). Therefore, you need to take one of the following actions to replicate the control files to the secondary site.

Option	Description
1	Include the control files into the replicated file system(s) as an initial SAP installation.
2	Change the location of control files to the replicated file system(s).
3	Replicate the file systems in which the control files reside.

The third option was used during this validation, and the file systems shown in the following table are the replicated file systems created and exported on the EMC Celerra, and mounted on the SAP production server.

File system layout

File system	Content	Exports name	Mount points
<i>/Oracle_data_EN1</i>	Datafiles Control files	Oracle_data_EN1_sapdata1 Oracle_data_EN1_sapdata2 Oracle_data_EN1_sapdata3 Oracle_data_EN1_sapdata4	<i>/oracle/EN1/sapdata1</i> <i>/oracle/EN1/sapdata2</i> <i>/oracle/EN1/sapdata3</i> <i>/oracle/EN1/sapdata4</i>
<i>/ARCH_EN1</i>	Archive logs	oraarch_exp	<i>/oracle/EN1/oraarch</i>
<i>/LogA_EN1</i>	OriglogB MirrlogA Control files	ob ma	<i>/oracle/EN1/origlogB</i> <i>/oracle/EN1/mirrlogA</i>
<i>/LogB_EN1</i>	OrigligA MrrirlogB Control files	oa mb	<i>/oracle/EN1/origlogA</i> <i>/oracle/EN1/mirrlogB</i>

Additional replication consideration

If there is a demand for creating a remote replica at the secondary site, refer to the EMC white paper *EMC Management for SAP – Intelligent Cloning Enabled by EMC Celerra and EMC Replication Manager* for detailed information.

Failover considerations

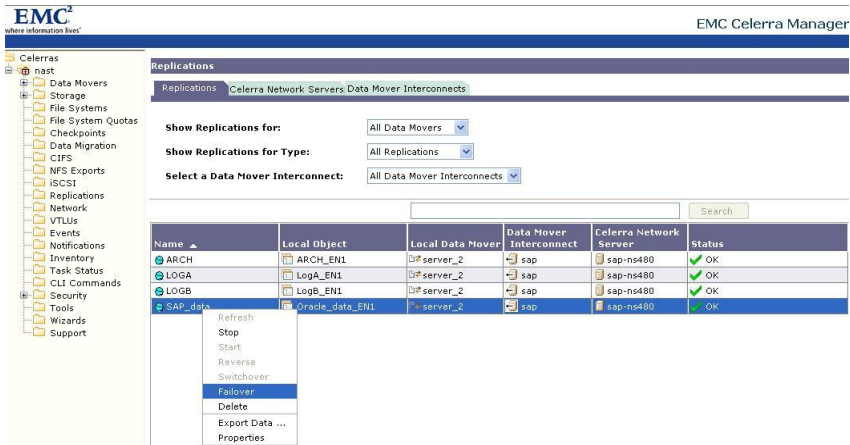
When the original production system is unavailable, the SAP production file systems can be failed over to the secondary site until the primary site becomes available.

Since EMC Celerra assumes that the failover is caused by the unavailability of the SAP production system, the failover is executed from the secondary EMC Celerra storage. If there is a transfer in progress, the failover operations also include terminating the data transfer, which characterizes a disaster situation.

If the primary site is still available, the file systems on the primary site alter the status from “read-write” to “read-only”. The status of the file systems on the secondary site becomes “read-write” with the failover.

Status	Primary	Secondary
Before a failover	Read-Write	Read-Only
After a failover	Read-Only	Read-Write

Follow the steps provided in the table below when performing failover operations:

Step	Action
1	<p>Log in to EMC Celerra Manager on the secondary site. Fail over the replication sessions you selected to the secondary site.</p>  <p>The screenshot shows the EMC Celerra Manager web interface. On the left is a navigation tree with categories like Data Movers, Storage, File Systems, etc. The main area displays a 'Replications' table with columns: Name, Local Object, Local Data Mover, Data Mover Interconnect, Celerra Network Server, and Status. The table contains four rows: ARCH, LOGA, LOGB, and SAP_data. The 'SAP_data' row is selected, and a context menu is open over it, with 'Failover' highlighted. Other menu items include Refresh, Stop, Start, Reverse, Switchover, Delete, Export Data..., and Properties.</p>
2	Mount the file systems on the secondary site.
3	Recover the Oracle database and start the SAP system on the secondary site.
4	Start replications for each file system on the secondary site.

Note: SAP servers are assumed to be up and running on the secondary site.

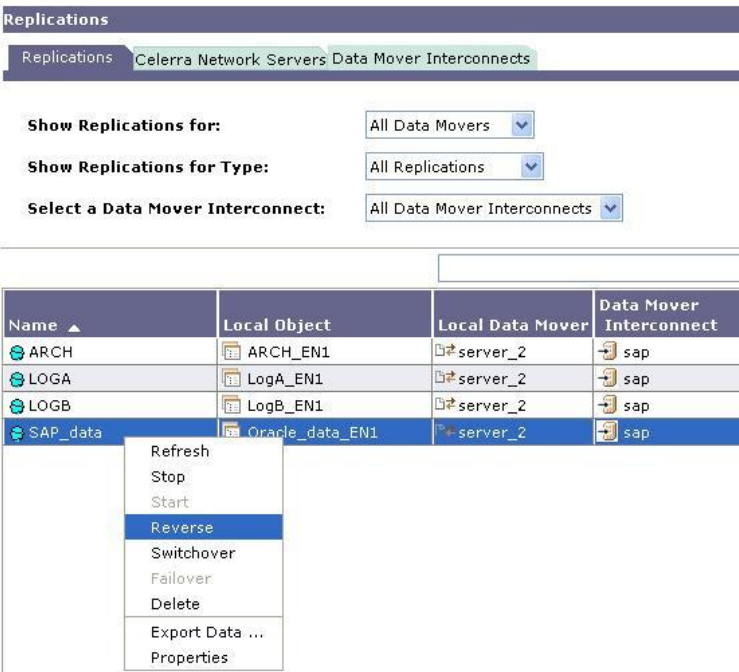
Failback considerations

To fail back to the original production site with EMC Celerra, the reverse operation is required to start the replication from the primary to the secondary sites. This can be done through changing the mount status of file systems at the original production site to be “read-write” and the status of file systems on the secondary site to be “read-only”. Then the replications are eventually started.

Status	Primary	Secondary
Before the reverse operation	Read-Only	Read-Write
After the reverse operation	Read-Write	Read-Only

You can start the replication from either the primary site or the secondary site for a failback. The only difference is that the failback from the primary site requires changing the file system status to “read-write” manually, while failing back from the secondary site does not need any manual changes. In this solution, failback operations are done from the secondary site.

Follow the steps provided in the table below to perform failback operations:

Step	Action
1	Stop the SAP system on the secondary site.
2	<p>Log in to EMC Celerra Manager on the secondary site. Fail back the replication sessions you selected to the primary site by clicking Reverse.</p>  <p>The screenshot shows the 'Replications' page in EMC Celerra Manager. It includes filters for 'Show Replications for:' (All Data Movers), 'Show Replications for Type:' (All Replications), and 'Select a Data Mover Interconnect:' (All Data Mover Interconnects). Below these is a table with columns: Name, Local Object, Local Data Mover, and Data Mover Interconnect. The table lists sessions: ARCH, LOGA, LOGB, and SAP_data. The 'SAP_data' session is selected, and a context menu is open over it, showing options: Refresh, Stop, Start, Reverse (highlighted), Switchover, Failover, Delete, Export Data ..., and Properties.</p>
3	Mount the file systems on the primary site.
4	Recover the Oracle database and start the SAP system on the primary site.

Conclusion

Summary

Building a replication for SAP systems is often complicated and expensive. This solution describes a simplified method using EMC Celerra Replicator to establish replication of SAP ERP production data between two EMC Celerra storage arrays. This provides a solution for managing SAP data failover to a secondary site due to unplanned events, scheduled infrastructure maintenance, or disasters.

Benefits

This solution provides the following benefits.

- Eliminates any production downtime during replications.
 - Allows you to set the desired RPO flexibly through EMC Celerra Replicator.
 - Simplifies business restart at the remote site for both planned and unplanned events.
 - Allows you to leverage the remote site while performing scheduled maintenance events, such as operating system patches, on the primary server.
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References

White papers

For additional information, see the white papers listed below.

- *EMC Intelligent Cloning for SAP Automated Replication for HP-UX and Oracle on Symmetrix DMX and CLARiiON CX3 UltraScale Series Reference Architecture*
 - *EMC Celerra Version 5.6 Technical Primer: SLA-Driven Replication with Celerra Replicator (V2)*
 - *EMC Celerra Version 5.6 Technical Primer: Business Continuity and Data Protection*
 - *White Paper: EMC Management for SAP – Intelligent Cloning Enabled by EMC Celerra and EMC Replication Manager*
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Product documentation

For additional information, see the product documents listed below.

- *Celerra Network Server- Using EMC Celerra Replicator (V2) technical module*
-