



EMC Business Continuity for SAP Disaster Recovery

Enabled by EMC CLARiiON CX4,
EMC RecoverPoint, and
VMware vCenter Site Recovery Manager

Proven Solution Guide

EMC Global Solutions



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Chapter 1: About this Document

Overview

Introduction

This Proven Solution Guide summarizes a series of best practices that were discovered, validated, or otherwise encountered during the validation of an EMC Business Continuity for SAP - Disaster Recovery solution using EMC® CLARiiON® CX4, EMC RecoverPoint, and VMware® vCenter Site Recovery Manager.

EMC's commitment to consistently maintain and improve quality is led by the Total Customer Experience (TCE) program, which is driven by Six Sigma methodologies. As a result, EMC has built Customer Integration Labs in its Global Solutions Centers to reflect real-world deployments in which TCE use cases are developed and executed. These use cases provide EMC with an insight into the challenges currently facing its customers.

Use case definition

A use case reflects a defined set of tests that validates the reference architecture for a customer environment. This validated architecture can then be used as a reference point for a Proven Solution.

Contents

The content of this chapter includes the following topics.

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Audience and purpose

Audience The intended audience for the Proven Solution Guide is

- internal EMC personnel
 - EMC partners, and
 - customers
-

Purpose This document details the reference architecture, installation, configuration, and validation test procedures for the EMC Business Continuity for SAP - Disaster Recovery Enabled by EMC CLARiiON CX4, EMC RecoverPoint, and VMware vCenter Site Recovery Manager use case.

The purpose of the proven solution is to:

- Show how mission-critical SAP virtual environments can be replicated to remote disaster recovery (DR) sites with EMC RecoverPoint.
 - Show the integration of VMware vCenter Site Recovery Manager (SRM) with EMC RecoverPoint that simplifies and automates site failovers and disaster recovery.
 - Demonstrate the ability to nondisruptively rehearse the failover process to provide assurances that the process will work correctly during an actual disaster.
 - Describe the process of failing back to the original production site after a failover.
-

Scope

Scope

The scope of this validated solution includes SAP ERP 6.0, EMC RecoverPoint 3.1 SP2, VMware ESX Server 3.5 U3, vCenter Server 2.5 U1, and VMware vCenter Site Recovery Manager 1.0 U1 patch 3.

This solution is intended to test the functionality and integration of its components in an SAP environment. It is not intended to test or validate performance or availability requirements.

The following three disaster recovery operations have been validated:

- Nondisruptive DR plan test operations
 - Failover operations
 - Failback operations
-

Not in scope

The information contained in this document is not intended to replace existing, detailed product implementation guides or presale site evaluations. The steps outlined during each stage are high level in nature and should be read in conjunction with the documentation referenced throughout this guide. The setup of this environment simulates an enterprise environment. The actual customer configurations will be different.

Business challenge

Overview

In today's world, customers face the challenges of restoring production operations in the event of a disaster, and bringing the SAP applications online quickly with little or no data loss. Validating that a disaster recovery solution actually works without disruption of the production system can be very difficult. Additionally, many companies are now subject to audits focusing on process and procedures regarding their recovery plans and capabilities.

Many companies have, or plan to, consolidate and virtualize their critical SAP applications in order to maximize their data center efficiency. This process adds additional complexity in the disaster recovery plans.

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

Technology solution

Overview

The EMC Business Continuity for SAP - Disaster Recovery solution integrates EMC and VMware products to protect SAP environments against disasters.

The solution integrates VMware vCenter Site Recovery Manager with EMC RecoverPoint continuous remote replication (CRR) and CLARiiON CX4 storage for an SAP ERP system running on VMware Infrastructure 3.

VMware vCenter Site Recovery Manager automates the failover process of an SAP production environment from the primary site to a secondary disaster recovery (DR) site. VMware vCenter SRM manages the recovery of the virtual machines from the primary site to the secondary site and also integrates with EMC RecoverPoint to ensure that data replicated to the DR site is available to the restarted production servers.

Objectives

The following table provides detailed information of the use case objectives.

Objective	Details
Automate the execution of the live nondisruptive DR validation test plan (DR Rehearsal).	On the DR site: <ol style="list-style-type: none"> 1. Configure SRM. 2. Create a recovery plan. 3. Execute testing of the recovery plan while production is applying an SAP patch or other batch job. 4. Successfully bring up SAP on the DR site without any disruption on the production site. 5. Shut down SAP on the DR site.
Simplify the process for executing a production SAP failover test.	<ol style="list-style-type: none"> 1. Run the recovery plan. 2. Wait for VMware vCenter SRM to execute the recovery plan and recover SAP on the DR site. 3. Successfully bring up SAP on the DR site.
Simplify the process for executing an SAP failback test.	On the production site: <ol style="list-style-type: none"> 1. Configure VMware vCenter SRM. 2. Create a recovery plan. 3. Execute testing of the recovery plan. 4. Run the recovery plan. 5. Successfully bring up SAP on the production site.

The benefits

The use case provides the following benefits:

- Simplifies and automates the disaster recovery of a virtual SAP landscape to a recovery site.
 - Provides integration of the server and storage management tools to provide unified control of the recovery plans of the SAP applications.
 - Eliminates complex manual recovery procedures.
 - Provides central management of a recovery plan.
 - Allows nondisruptive rehearsal of the disaster recovery plan with detailed logs to support audit requirements.
 - Reduces the time required for a full recovery.
-

Reference Architecture

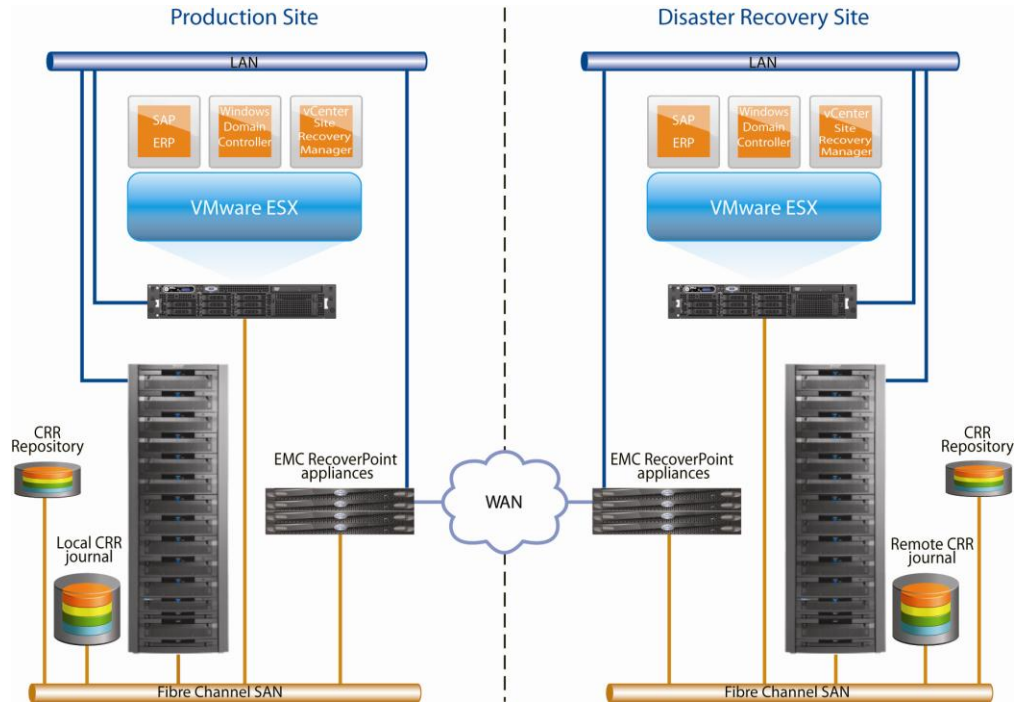
Corresponding Reference Architecture

This use case has a corresponding Reference Architecture document that is available on Powerlink® and EMC.com. Refer to the *EMC Business Continuity for SAP - Disaster Recovery Enabled by EMC CLARiiON CX4, EMC RecoverPoint, and VMware vCenter Site Recovery Manager — Reference Architecture* for details.

If you do not have access to this content, contact your EMC representative.

Reference Architecture diagram

The following diagram depicts the overall physical architecture of the use case. The diagram shows that the production site and the DR site each with EMC RecoverPoint appliances are connected via a WAN link. VMware ESX Server contains virtual machines (VMs) for SAP ERP along with other VMs for management purposes. EMC CLARiiON CX4 provides the storage that is continually replicated to the disaster recovery site.



Environment architecture

Solution components

The EMC Business Continuity for SAP - Disaster Recovery Enabled by EMC CLARiiON CX4, EMC RecoverPoint, and VMware vCenter Site Recovery Manager solution utilizes EMC, VMware, Microsoft, and SAP technologies, including:

- EMC CLARiiON CX4 storage
- EMC RecoverPoint
- VMware ESX
- VMware vCenter
- VMware vCenter SRM
- Microsoft Windows and SQL Server
- SAP NetWeaver

For details on all of the components that make up the solution, see the “Hardware and software resources” topic in this chapter.

Hardware and software resources

Hardware

The hardware used to validate the use case is listed below.

Equipment	Quantity	Configuration
Storage arrays	2	EMC CLARiiON CX4-480 146 GB FC drives 300 GB FC drives
Fibre Channel switch	1	Cisco MDS 9509 - 64 ports
Network switch	1	Cisco 3460G - 64 ports
VMware ESX servers	2	HP ProLiant DL 580 G5 Four Intel quad-core CPUs 16 GB RAM
RecoverPoint appliances (RPA)	4	2 for the primary (production) site 2 for the secondary (DR) site
SAP ERP server	1	HP ProLiant DL580 G5
VMware vCenter server/SRM servers	2	VMs on each ESX server on both sites

Software The software used to validate the use case is listed below.

Software	Version	Comment
VMware ESX	3.5 U3	
SAP application	ERP 6.0 SR2 IDES	ABAP Stack only
Java JDK	1.4.2.19	Installed on an SAP production server for SAPInst
MS SQL Server	2005 SP2 X64	Part of SAP installation on the production site
Microsoft Windows Server 2003	Enterprise Edition R2 SP2 64-bit	Guest OS for SAP installation
EMC RecoverPoint	3.1 SP2	Installed on each RPA
EMC RecoverPoint Replication Adapter for SRM (SRA)	1.0.2.1	Installed on each SRM server
EMC CX splitter	04.28.006.6.003	Installed on both CX4-480 local and remote
EMC Navisphere® CLI	6.28.10.3.11	Installed on all VMs connected to CLARiiON
EMC Navisphere Agent	6.28.10.3.11	Installed on the ESX servers at the Service Console
EMC Solutions Enabler	6.5.2.5	Installed on all VMs connected to CLARiiON
VMware ESX Server	3.5 U3	Enterprise Edition
VMware vCenter Server	2.5 U1	Installed on both production and DR sites
VMware vCenter Site Recovery Manager	1.0.1 U3	Installed on VMware vCenter servers on both production and DR sites

Validated scenarios

Introduction This use case was validated by building an SAP environment and configuring the VMware vCenter SRM and EMC RecoverPoint components. The disaster recovery scenarios were rehearsed using the recovery plan testing functionality of VMware vCenter SRM, and then executed in the environment as in the case of an actual disaster at the production site. VMware vCenter SRM integrated with EMC RecoverPoint managed the failover of the VMware virtual machines and its storage. The SAP system was started and verified to be operational and consistent on the DR site after the failover.

The virtual machines were also failed back to the primary site to complete the process of moving back to the original location, after the damages caused by the disaster were repaired.

Scenario 1 ***Nondisruptive DR plan test***

This scenario validated the rehearsal feature of VMware vCenter SRM that allows administrators to nondisruptively practice a disaster failover to ensure that the system is configured and ready to use in the event of a real disaster.

Scenario 2 ***Failover***

This scenario validated the proper integration of VMware vCenter SRM and EMC RecoverPoint by performing an actual failover and verifying that the SAP production system could be brought up at the recovery site.

Scenario 3 ***Failback***

This scenario validated the process to reconfigure VMware vCenter SRM to enable the failback of the production system from the recovery site to the original production site.

Note For additional information about the requirements and features of SAP disaster recovery and VMware vCenter SRM, refer to the documentation at the following websites:

- http://www.vmware.com/support/pubs/srm_pubs.html
 - <https://support.emc.com/products/recoverpoint>
 - <https://websmp207.sap-ag.de/~sapidb/011000358700011083472001E>
 - Document 084: *Business Continuity Management for SAP System Landscapes*
 - Document 085: *Emergency Handling for Recovery of SAP System Landscapes*
-

Prerequisites and supporting documentation

Technology

It is assumed the reader has a general knowledge of the following EMC, SAP, and VMware products.

- EMC CLARiiON CX4
 - EMC RecoverPoint 3.x
 - EMC RecoverPoint Replication Adapter for SRM (SRA) 1.0
 - SAP Business Suite
 - VMware ESX 3.5
 - VMware vCenter 2.5
 - VMware vCenter Site Recovery Manager 1.0.1
-

Supporting documents

The following documents, located on Powerlink.com, provide additional, relevant information. Access to these documents is based on your login credentials. If you do not have access to the following content, contact your EMC representative.

- *EMC Engineering White Paper – CLARiiON Integration with VMware ESX Server*
 - *EMC TechBook - VMware ESX Server Using EMC CLARiiON Storage Systems*
 - *EMC eLab Support Matrix*
 - *EMC RecoverPoint Support Matrix*
 - *EMC RecoverPoint Replicating VMware ESX Technical Notes*
 - *EMC RecoverPoint 3.1 Installation Guide*
 - *EMC RecoverPoint Adapter for VMware Site Recovery Manager Release Notes*
-

Related VMware documents

The following VMware documents provide additional, relevant information:

- *VMware ESX Server 3 Configuration Guide*
 - *VMware ESX 3.5 Basic System Administration Guide*
 - *VMware Fibre Channel SAN Configuration Guide*
 - *VMware SAN System Design and Deployment Guide*
 - *Best Practice Guidelines for SAP Solutions on VMware Infrastructure* white paper
 - *VMware and SAP Software Solutions Deployment Guide* white paper
 - *VMware Storage/SAN Compatibility Guide for ESX Server 3.5 and 3i*
 - *VMware Storage I/O Compatibility Guide for ESX Server 3.5 and 3i*
 - *VMware ESX Server Using EMC CLARiiON Storage Systems TechBook*
 - *VMware Virtual Machine File System: Technical Overview and Best Practices* white paper
 - *VMware Performance Study – Characterization of VMFS and RDM using a SAN ESX Server 3.5*
 - *VMware Site Recovery Manager Administration Guide*
-

Third-party documents

The following third-party documents provide additional, relevant information:

- *SAP Master Guide Support Release 3 - SAP ERP 6.0 Using SAP NetWeaver 7.0*
 - *SAP Planning Guide - Technical Infrastructure Guide - SAP NetWeaver 7.0*
 - *SAP Installation Guide SAP NetWeaver 7.0 SR2 ABAP on Windows: SQL*
 - *SAP SDN – Virtualizing SAP Applications on Windows*
 - *SAP Installation Guide ERP 6.0 SR2 ABAP on Windows: MS SQL Server*
 - *Business Continuity Management for SAP System Landscapes*
 - *Emergency Handling for Recovery of SAP System Landscapes*
-

EMC support

EMC can help accelerate assessment, design, implementation, and management while lowering the implementation risks and cost of disaster recovery environment for an SAP running on VMware ESX 3.5 and protected by EMC RecoverPoint continuous remote replication (CRR) along with the CLARiiON storage splitter and VMware vCenter Site Recovery Manager (SRM).

Chapter 2: Storage Design

Overview

Introduction Storage design, virtualization, application, and database requirements are key design considerations that need to be addressed to ensure the successful development of an SAP solution scenario.

Contents This chapter contains the following topics:

Topic	See Page
Storage design guidelines	17
Storage configuration	18

Storage design guidelines

Supporting documents

The practices described in the following documents form the basis of this use case.

- *SAP Installation Guide ERP 6.0 SR2 MS Windows SQL* (document version 1.10, March 28, 2008, pages 24 to 27)
- *VMware ESX Server Using EMC CLARiiON Storage Systems TechBook*
- *VMware SAN System Design and Deployment Guide 2nd Edition* (August 2008)
- *Fibre Channel SAN Configuration Guide* (revision 20080725 item EN-000034-00)
- *VMware Storage/SAN Compatibility Guide for ESX Server 3.5 and 3i*
- *VMware Storage I/O Compatibility Guide for ESX Server 3.5 and 3i*

For a complete list of all related documents to the solution, refer to the topic “Prerequisites and supporting documentation” in Chapter 1.

Design guidelines

To determine the optimum storage design, follow the guidelines listed below.

- Determine the application needs (RAID groups, file systems, and so on) according to the SAP Installation Guide.
 - Determine the size of the application, database, and log LUNs to be used.
 - Determine all the disk space, I/O bandwidth, and redundancy required for the LUNs.
-

Storage configuration

Main configuration

The storage design for the use case includes the following components :

- EMC CLARiiON CX4-480 – Navisphere® FLARE® 4.28.000.5.003
- EMC RecoverPoint splitter – 4.28.006.6.003
- Type of RAID groups used for the use case – RAID 1/0 (log) and RAID 5 (data)
- Number and type of hosts connected to the storage:
 - 2 physical VMware ESX 3.5 hosts – SAPESX09 and SAPESX10
- Storage groups created for the use case:
 - SAPESX09: VMware ESX 3.5 – Production Site
 - SAPESX10: VMware ESX 3.5 – DR Site
- Applications and databases used in the use case:
 - SAP ERP 6.0 Core SR2 IDES
 - Microsoft SQL Server 2005 Enterprise SR2

Refer to the *EMC CLARiiON Best Practices for Performance and Availability: Release 28.5 Firmware Update – Applied Best Practices* for more information about CLARiiON design recommendations.

Configured LUNs

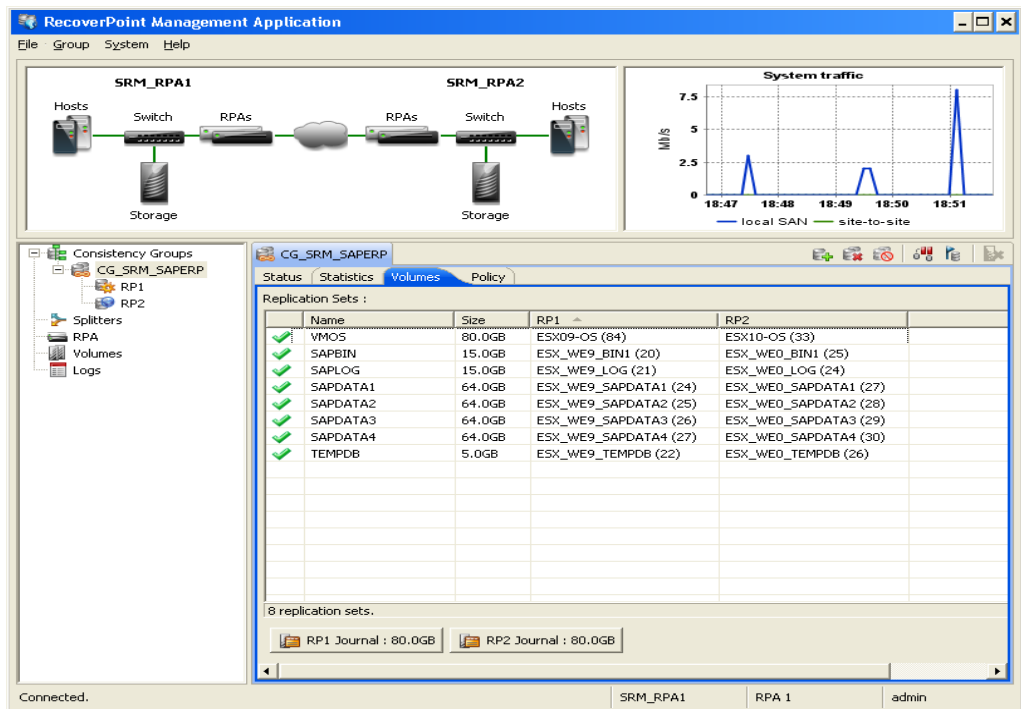
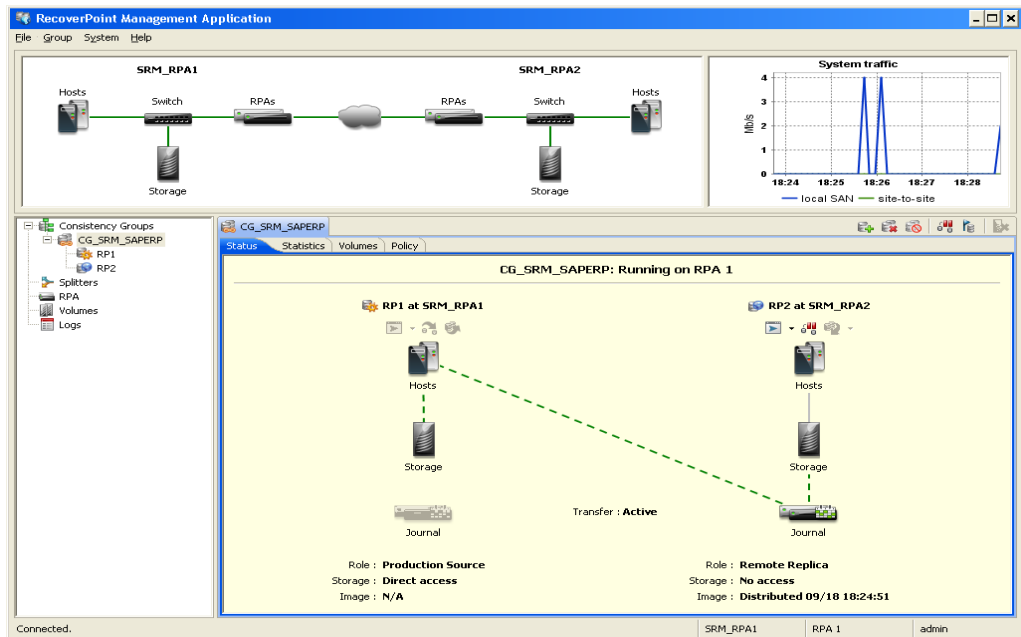
LUNs defined for SAP ERP and SQL Server 2005 were created on the storage for each VMware ESX virtual machine. Below is a sample configuration for an SAP IDES system.

RAID type	LUN size	Purpose
1/0	80 GB	OS+SWAP+MS SQL Server binaries+EMC software
1/0	15 GB	SAP Kernel binaries, instance logs (E:\usr\sap\<SID>\...)
1/0	15 GB	Microsoft SQL 2005 Temp Database (F:\TEMPDB.)
1/0	15 GB	Microsoft SQL 2005 Transaction Logs (G:\<SID>LOG1)
5	64 GB	Microsoft SQL 2005 Server Database files (H:\<SID>DATA1)
5	64 GB	Microsoft SQL 2005 Server Database files (I:\<SID>DATA2)
5	64 GB	Microsoft SQL 2005 Server Database files (J:\<SID>DATA3)
5	64 GB	Microsoft SQL 2005 Server Database files (K:\<SID>DATA4)

Note: <SID> means SAP System Identification, which is a unique identification of the SAP instance.

EMC RecoverPoint configuration

The LUNs that contain SAP application disks and the VMFS data stores were defined in the RecoverPoint consistency group. The replication was validated prior to the VMware vCenter Site Recovery Manager installation.



Note: CX splitter requires source and target LUNs to be the exact same size at the bit level.

Chapter 3: Fibre Channel, Network, and VMware Design

Overview

Introduction This chapter describes the aspects considered during the design of the Fibre Channel, network, and VMware components of the use case.

Contents This chapter contains the following topics:

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Network design	22
VMware Infrastructure design	25

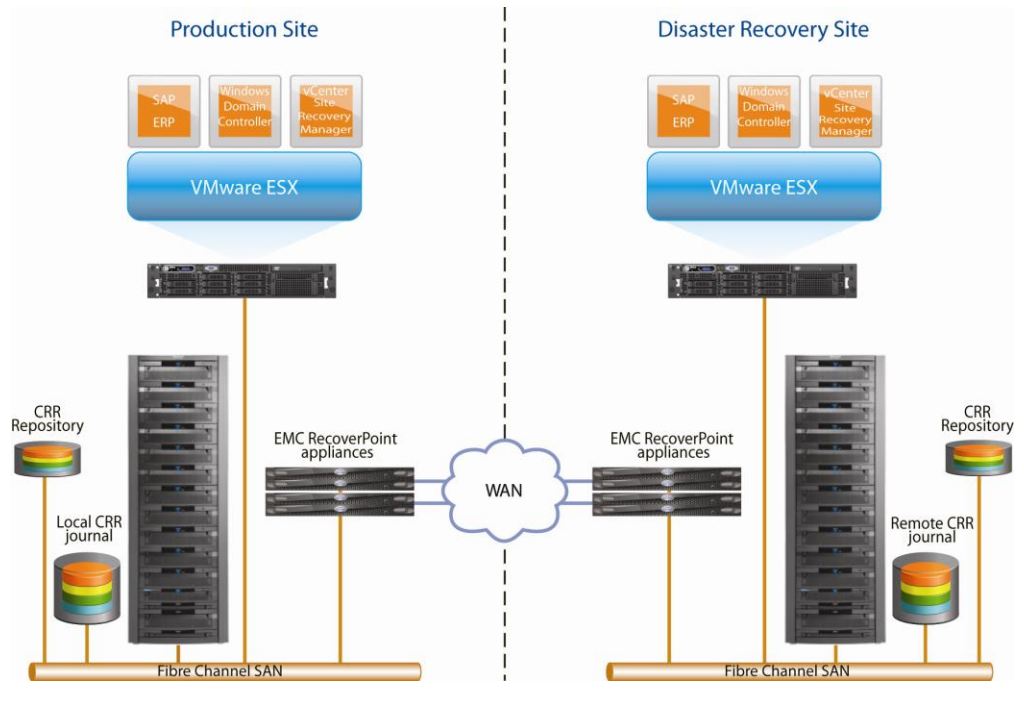
Fibre Channel design

Description This use case was built on a Fibre Channel storage area network (SAN). Details of the SAN design are described below.

SAN design considerations In this use case, the SAN consisted of Cisco MDS 9509 2 Gb/s, 64-port switches. The configuration used during the FC design is listed below.

- One switch was configured as a fabric at each site.
- The switches had four paths to the CLARiiON and two paths to each host.
- Each host HBA was zoned to the available CLARiiON path.
- No redundant SAN switches were used in the validated solution. The objective of the use case was to validate the functionality, not the performance or availability. In a customer environment, depending on the availability requirements of the SAN, redundant switches may be required to isolate the paths to the storage.

Figure: SAN topology The following diagram illustrates the SAN topology of the solution on each site.



Network design

Network design

The network design components listed below were selected for the validated scenario.

- Two Cisco MDS 3460 1 Gb/s 64-port network switches were configured.
 - No redundancy was configured in the validated solution. The objective of the solution was to validate the functionality, not the performance or availability. In a customer environment, depending on the availability requirements of the network, redundant network switches may be required to guarantee access from the production LAN.
-

Networks

The network was divided into two ranges of IP addresses, as per Microsoft's recommendations. This reduces overhead in TCP routing and broadcasts, and maximizes back-end network performance.

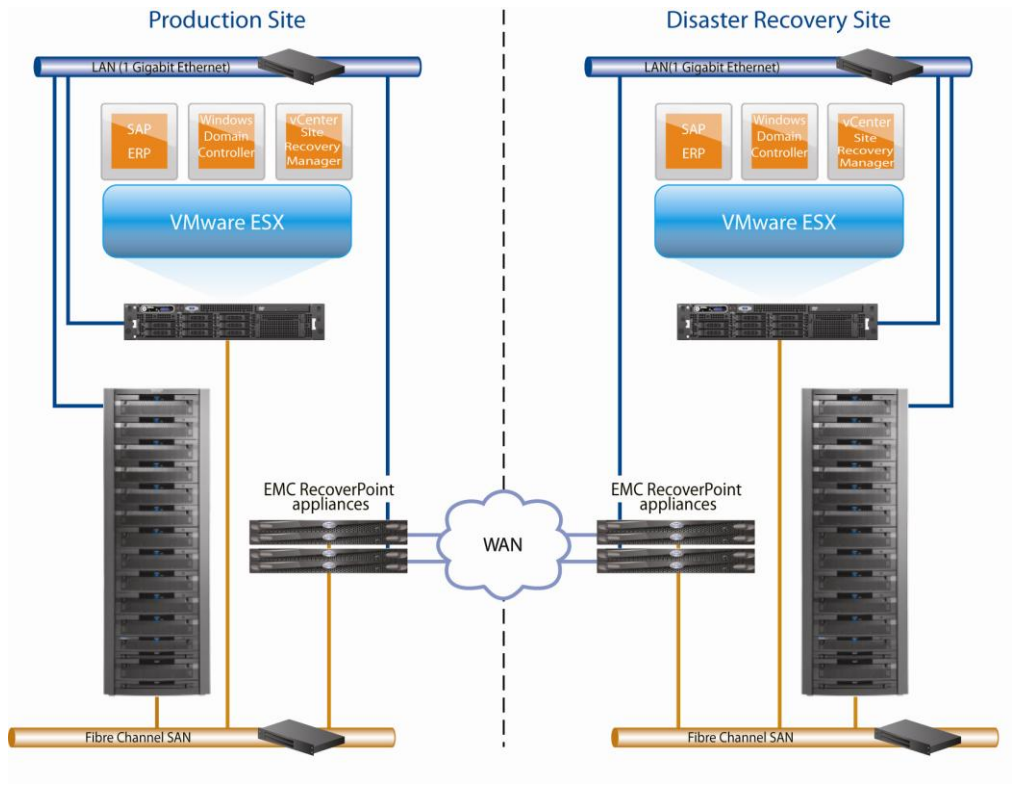
The table below describes the networks used for the solution.

Network	Description
VM Network	Internal network used for the vCenter/SRM hosts
Production	Used for the SAP system

Network topology

Both the physical and the virtual servers in the solution accept user connections on their public network. In this use case, the vSwitch named **Production** was used on the production site, while the vSwitch named **Production DR** was used on the DR site.

Figure: network topology The following diagram illustrates the network topology of the solution in each site.



References

- For information on how SAP ERP 6.0 uses the network and the respective protocols, do the following steps:

Step	Action
1	Go to http://service.sap.com/netweaver .
2	In the navigation pane, select SAP NetWeaver > SAP NetWeaver in Detail > Solution Life-Cycle Management > Hardware Sizing > Sizing Guidelines > Solution & Platform.
3	Look for the document <i>Front-End Network Requirements for SAP Business Solutions</i> .

- *SAP Infrastructure Security*
<https://www.sdn.sap.com/irj/sdn/security?rid=/webcontent/uuid/d0b7dbf5-ce3e-2a10-5590-990f7e4856b6#section2>
 - *TCP/IP Ports Used by SAP Applications*
<https://www.sdn.sap.com/irj/scn/go/portal/prtroot/docs/library/uuid/4e515a43-0e01-0010-2da1-9bcc452c280b>
 - *SAP NetWeaver Security Guide*
<https://websmp202.sap-ag.de/security> > Security in Detail
 - SAP Notes:
Note 0540379 - Ports and services used by SAP
Note 1100926 - FAQ: Network performance
Note 0164102 - Network load between application server and front end
Note 0679918 - The front-end network time
Note 0208632 - TCP/IP network protocol for MSSQL
-

VMware Infrastructure design

VMware hardware infrastructure

In the use case, the VMware hardware infrastructure consisted of two HP ProLiant DL580 G5 servers, each with:

- 4-socket 2.9 GHz Quad 7350 Xeon processors with 16 GB of DDR2 667 RAM,
 - 1 x dual-port QLogic QLA2432 PCI Express FC HBA, and
 - 1 x Broadcom NetXtreme II BCM5708 Dual PCI Express (two ports connected).
-

Hardware and operational factors

Configuration for the use case included the following:

- 2 x network interface card (NIC) ports on each ESX server.
 - The default swap size during ESX installation was set to 1600 MB, which improves management performance with VMware vCenter.
 - Each VM has an individual RAID 1/0 LUN for OS boot configured with VMFS.
 - Four paths to storage per ESX server.
-

Recommendations

The information below identifies some additional recommended factors for the infrastructure design and solution validation.

- Correctly adjust the alignment of the disks to the LUNs in the storage, before creating data stores from VMware vCenter. Refer to Article ID 104675 in the Knowledge Base on Powerlink for information on how to align partitions or volumes in Windows 2003 using DiskPart. This is caused by Intel's architecture use of the beginning of the disk; all the other operating systems using the Intel architecture are also affected.
 - If "Support Intel Hyperthreading in the ESX physical Servers BIOS" is enabled, disable it.
 - Ensure that the OS LUNs have enough space to contain the VM, the configured maximum memory size, OS swap, and all the additional EMC or third-party software to be installed.
-

vSwitch configuration

The standard configuration was implemented in this use case. Two vSwitches were configured for the two connected NICs:

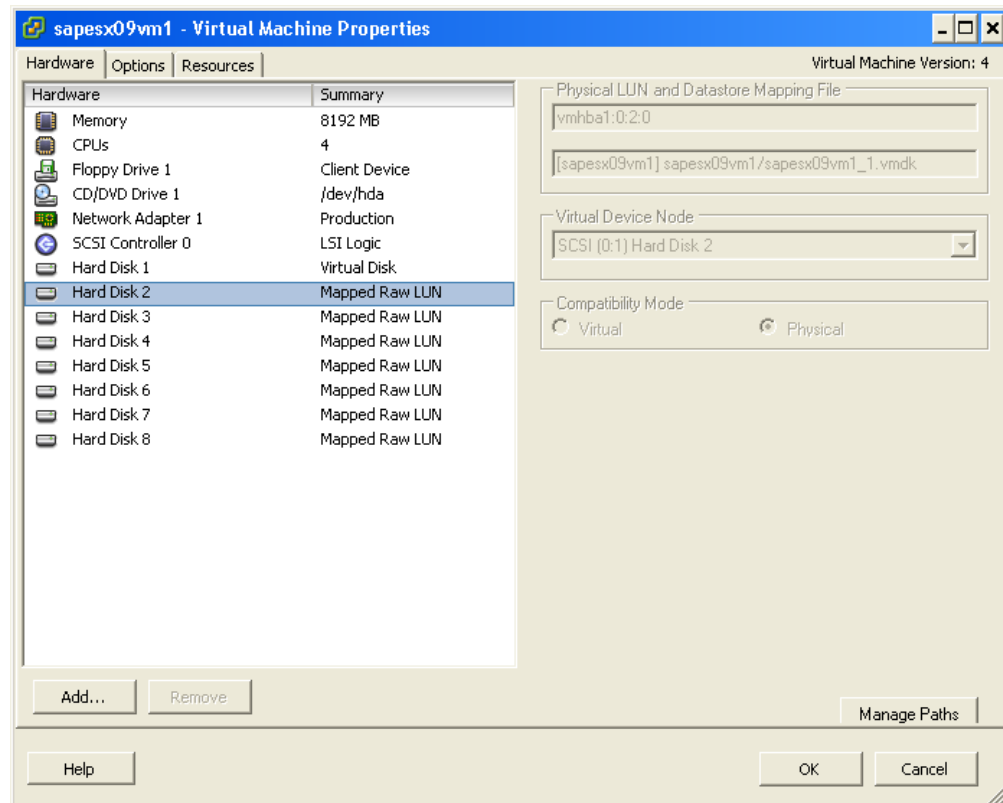
- Virtual Switch 0: named **VM Network** on the production and DR site
 - The VM Port group for the virtual machines was configured to the required IDs for the public VM network.
 - The Service Console port was configured on vswif0 in the same switch.
- Virtual Switch 1: named **Production** on the production site and **Production DR** on the DR site
 - The Virtual Machine port group was created to allow a public network for the ESX server.
 - During the Test Failover performed by VMware vCenter SRM, if the Auto setting is selected to each network of the VM in the Protection Group, SRM will automatically create a new virtual switch called **TestBubble** that does not assign to it any physical NIC, isolating this as a VMware Internal Switch, avoiding any conflicts when using the same IP address on two different servers in the same network.

The table below describes the vSwitch configuration :

vSwitch	Port group	Purpose
0	VM1	VM network for vCenter / SRM
0	VM2	Service Console
1	VM3	Production

Virtual machine configuration

This section describes the virtual machine configuration created for SAP ERP 6.0 in the production site. On the VMware vCenter Server, select the SAP VM; edit Settings to view the VM settings. Check the hard disks of the VM. The boot OS was created as a Virtual Disk VMFS and the other disks as RDMs in physical compatibility mode, using the Host ID related to the LUNs in the RecoverPoint consistency group shown below.



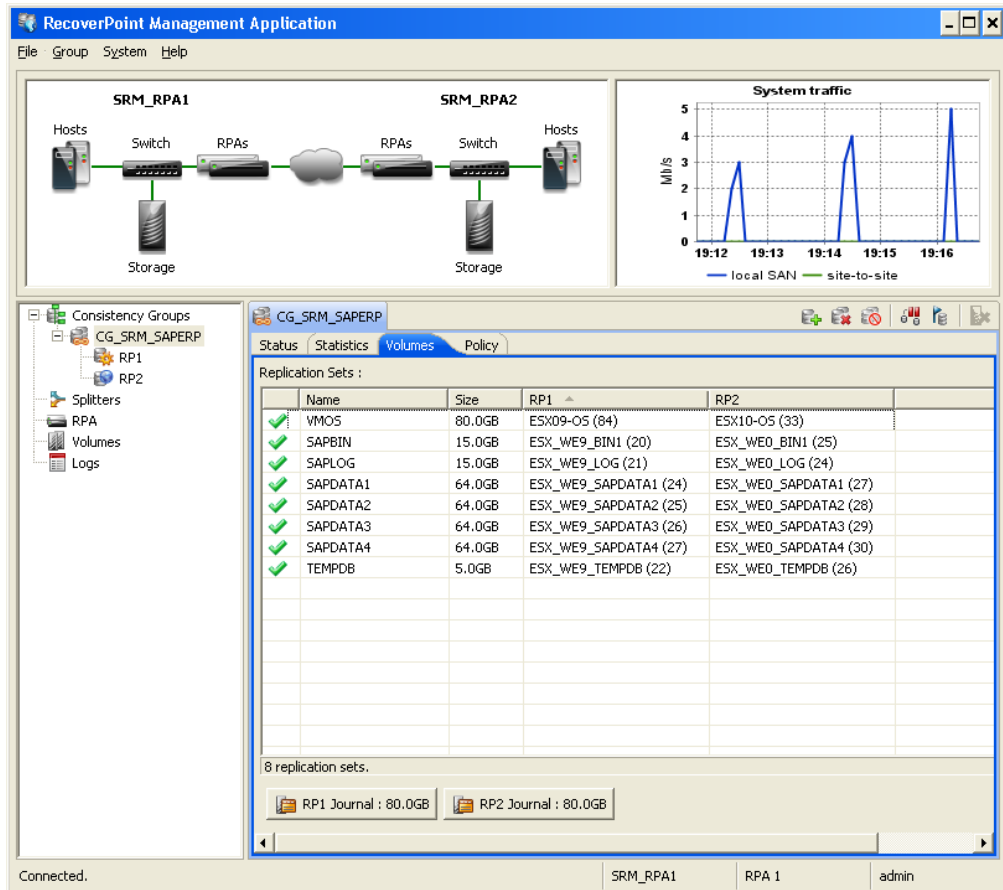
The screenshot above shows the VMware ESX VM hard disk IDs created with the assignment of the HLUNs, the Windows SCSI IDs, the data store, and the compatibility mode set assigned to disks.

SAP VM	Drive	Purpose	SCSI ID	VM HD ID	Disk Type	HLUN	PLUN
VM01	C:	Boot OS	0	H.Disk 1	VMFS	0	84
VM01	E:	Usr_Sap	1	H.Disk 2	RDMp	1	20
VM01	F:	TempDB	2	H.Disk 3	RDMp	2	22
VM01	G:	Trans. Log	3	H.Disk 4	RDMp	8	21
VM01	H:	SAPData1	4	H.Disk 5	RDMp	4	24
VM01	I:	SAPData2	5	H.Disk 6	RDMp	5	25
VM01	J:	SAPData3	6	H.Disk 7	RDMp	3	26
VM01	K:	SAPData4	8	H.Disk 8	RDMp	6	27

- **Note:** RDMp means RDM in physical compatibility mode.

With this table created, you will have a clear view of the relationship between the CLARiiON Navisphere LUNs, the RecoverPoint LUNs in the consistency groups, the VMware ESX HLUNs, the VMware VMs Hard Disks, the Windows SCSI IDs/Drives,

and to which virtual machine they were associated with. Later you can create another column in this table to record the disk sizes associated with each disk of the virtual machine to allow better coordination of the EMC RecoverPoint consistency group creation, maintenance, and execution. If the data store that holds SAP VM disks is not being replicated, vCenter SRM during the array manage configuration will not be able to discover these LUNs.



In this document, you will see the mechanism through which VMware vCenter Site Recovery Manager maps the disks to EMC RecoverPoint, using the EMC Storage Replication Adapter.

**References:
ESX design**

Refer to the VMware documents listed below to design a well-performing ESX farm.

- Access http://www.vmware.com/pdf/vi_performance_tuning.pdf
See the article entitled *Performance Tuning Best Practices for ESX3*.
 - Access http://www.vmware.com/pdf/vi3_35/esx_3/r35/vi3_35_25_san_cfg.pdf
See the document entitled *Fibre Channel SAN Configuration Guide*.
 - Access http://www.vmware.com/pdf/vi3_san_design_deploy.pdf
See the document entitled *SAN System Design and Deployment Guide*.
 - Access <http://www.vmware.com/pdf/vmfs-best-practices-wp.pdf>
See the document entitled *VMware Virtual Machine File System: Technical Overview and Best Practices*.
 - *Best Practice Guidelines for SAP Solutions on VMware Infrastructure* VMware white paper
 - *VMware and SAP Software Solutions Deployment Guide* white paper
-

**References:
SAP VM design**

- *SAP SDN – Virtualizing SAP Applications on Windows*
 - *SAP Note 1056052 - Windows: VMware ESX Server 3 config. guidelines*
-

Chapter 4: Application Design

Overview

Introduction This chapter describes the aspects considered during the application design of the components of the validated solution.

Contents This chapter contains the following topics:

Topic	See Page
SAP ERP 6.0	31
SQL Server 2005 Enterprise SP2	32
Windows 2003 x64 server enterprise R2 (SP2)	33
VMware vCenter Site Recovery Manager	34
EMC RecoverPoint	36
Disk types	37
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SAP ERP 6.0

Component SAP ERP 6.0 Core IDES (International Demo and Evaluation System) was used in this use case.

Software components The following table lists the critical software components and the patches used.

Product	Patch used on the solution
SAP ERP 6.0 Core	Service Release 2
SQL Server 2005	Service Pack 2
Windows 2003-x64-Enterprise Edition	R2 Service Pack 2

SAP system components

In an SAP system with MS SQL Server, the central components of the database are the SQL Server program files, tempdb files, SAP database data files, and SAP database transaction log files.

The log files record all the changes made to the database to enable restore and recovery. The tempdb file holds all temporary tables and stored procedures and is re-created every time the Microsoft SQL Server is restarted. The data files contain the data for the SAP system and are the larger components of the database.

SAP SQL database data files

The data files are created by default in the directories `\<SAPSID>DATA<N>`. The first data file is called `<SAPSID>DATA1.mdf` and the subsequent files are called `<SAPSID>DATA<N>.ndf`, where `<N>` denotes the number of the files.

For security reasons, locate the data files on a separate disk drive. The data files should not be included in the same disk system as the log files or other SQL Server program and database files. To ensure data redundancy, SAP recommends the use of RAID 5.

SAP SQL transaction log files

The transaction log of the database is created by default in the directory `\<SAPSID>LOG1`. The log file is named `<SAPSID>LOG1.ldf`. The transaction log file records all the changes made to the database and, if required, enables modifications to be redone or undone. It plays a crucial role when the database has to be restored or recovered. SAP recommends the use of RAID 1 or 1/0 which implements hardware-based mirroring.

SQL program files

These files are created in the subdirectories of `\Program Files\Microsoft SQL Server`, and include the SQL Server program files and the master, msdb, and tempdb database files. Locate these on separate, third disk drives and not on the same disks as the transaction log files or SAP SQL database data files.

For performance reasons, it is recommended to place the tempdb files on fast RAID 1/0 disks, because the tempdb is frequently accessed during SQL Server operations and could otherwise affect performance.

It is important to separate the SAP SQL database-related files in order to simplify the identification of the disks/LUNs that need to be replicated from the production system on the protected site to the target system in the DR site, to keep consistency between the source and the target systems and to follow SAP recommendations regarding performance.

The distribution described above is suitable for an average-size production system. Keep in mind that this example does not fit for all environments.

A further option to improve the performance is to place the Windows paging file on a separate, fast LUN based on RAID 1 or 1/0.

In this use case, the Windows swap file was created on the same LUN for the OS, SQL Server binaries, and master and msdb files. The tempdb was placed in a separate LUN in the storage.

- For additional information, refer to Section 2.3.1 “Distribution of Components to Disks” of the *SAP Installation Guide ERP 6.0 SR2 MS Windows SQL*.
- For more information about installing and configuring SAP ERP 6.0, refer to the SAP Master, Technical Infrastructure and Installation Guides that can be found at: <http://service.sap.com/installNW70>.

Note: In DR projects involving SAP production servers in VMware ESX virtual machines, plan carefully and in advance to guarantee that the number of LUNs allocated to the VMs being protected is supported. Refer to the table “SRM configuration maximums” in the “VMware vCenter Site Recovery Manager” section within this chapter before proceeding with the configuration.

SQL Server 2005 Enterprise SP2

Introduction

In an SAP ERP 6.0 system, you must use the Enterprise version of Microsoft SQL Server 2005. The recommended minimum Service Pack to be applied is SP2, otherwise the following problems will occur:

- severely degraded performance
- bugs in indexing

For all the SQL Server 2005 builds that were released after SQL Server 2005 Service Pack 2, check <http://support.microsoft.com/kb/937137>.

Refer to the following SAP Notes for additional details on the patches:

- *062988 – Support packages for Microsoft SQL Server*
 - *985137 – Service Pack Installation for SQL Server 2005*
-

Windows 2003 x64 server enterprise R2 (SP2)

Recommended x64 platform

EMC validated the use case with the Microsoft Windows Server 2003 Enterprise x64 platform with SAP ERP 6.0 SR2 and Microsoft SQL Server 2005 Enterprise SP2.

- The x64 platform offers far better memory management over 3 GB of physical memory. The improved memory management results in better scaling.
- If necessary, 32-bit and 64-bit operating systems can be mixed in the environment, as long as they run in separate virtual machines.
- SAP supports exclusively the 64-bit Windows operating system for the virtual machines (for AMD and Intel processors).
- Windows Server 2003 Service Pack 2 contains several performance-related fixes.

Note: Windows cumulative updates do not follow a strict timeline for release. Updates are released when Microsoft determines that the size and substance of the current list of open bug hotfixes demands the issuance of a single release.

Refer to *SAP Note 0674851 - Virtualization on Windows* for details.

Service pack or hotfix updates

Apply the service pack and the hotfixes listed below.

- Consider SP2 as the minimum level of service packs to install on all servers.
 - Apply the following hotfixes:
 - 940349 VSS fix
 - 931308 Paging problem
 - When updating service packs or hotfixes on servers, apply the update to all servers, starting with the test systems, to maintain interoperability across the entire infrastructure and to minimize any disruption to the system operation.
-

VMware vCenter Site Recovery Manager

VMware Infrastructure features

SRM is supported by the following VMware Infrastructure features:

- **Encapsulation:** Virtual machines are encapsulated into a group of files in shared storage.
 - **Boot from shared storage:** Replication of the shared storage means you have fully replicated hardware - independent virtual machines ready to power on as needed.
 - **VMware Distributed Resource Scheduler (DRS) and resource pools:** VMware DRS allocates and balances computing capacity across resource pools to match available IT resources. You do not need to determine the placement of recovery virtual machines in advance of a failover.
 - **Hardware independence:** Using virtual machines, recovery failures are nearly zero because any virtual machine can be rebooted from any piece of hardware without the need to fix drivers.
 - **Instant repurposing:** Without the constraint of system reinstallation, hardware can perform completely different work, perhaps on a completely different operating system, in a matter of minutes.
 - **Virtual Local Area Networks (VLANs):** Virtual LANs allow you to isolate network traffic for virtual machines, so testing can be nondisruptive.
 - **Change control and auditability:** The change control features of VMware Infrastructure help you manage your disaster recovery strategy. Task tracking allows you to view changes to SRM.
-

SRM limits

When you are selecting and configuring your virtual and physical equipment, you must not exceed certain limits imposed by SRM. The following table lists the limits for protected virtual machines, protection groups, and replicated LUNs supported by a single SRM server. SRM prevents you from exceeding the limits on protected virtual machines and protection groups when you create a new protection group. If a configuration created in an earlier version of SRM exceeds these limits, SRM displays a warning, but allows the configuration to operate. Reconfigure such configurations to bring them within supported limits as soon as possible. Limits on replicated LUNs and running recovery plans are advisory, but not enforced.

SRM configuration maximums

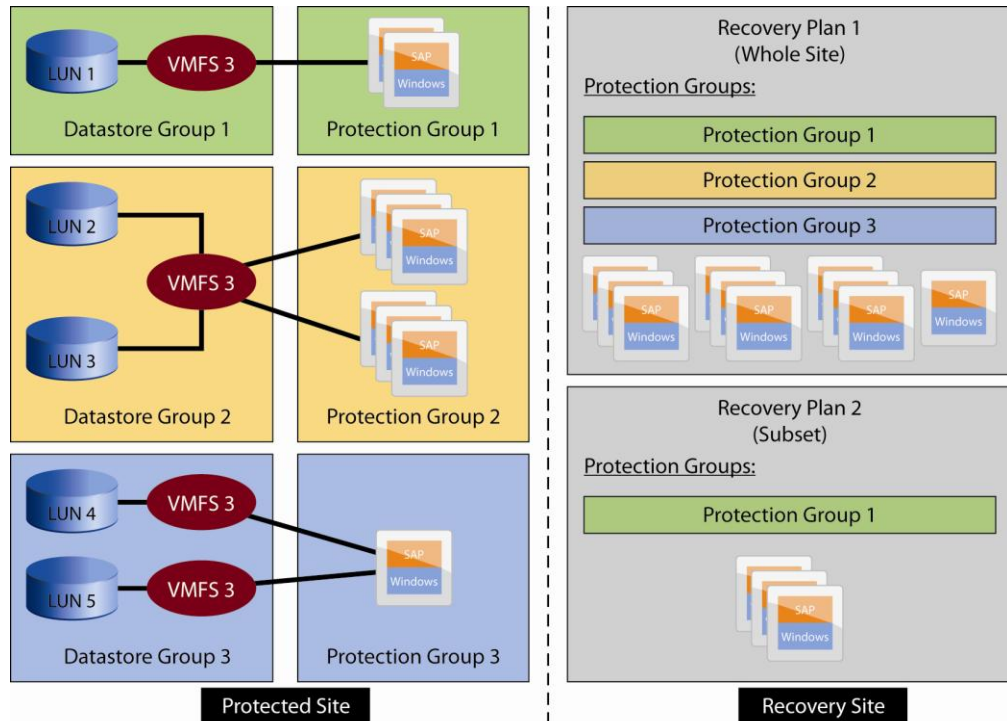
Item	Maximum
Protected virtual machines	500
Protection groups	150
Replicated LUNs	150
Running recovery plans	3

Based on the information provided in the table above, you should create your EMC RecoverPoint consistency groups carefully to protect your mission-critical SAP systems, such as ERP Production, BW Production, and any other SAP main systems or middleware necessary to be running on the protected site to allow the main SAP production systems to run with all their capabilities.

EMC Business Continuity for SAP - Disaster Recovery Enabled by EMC CLARiiON CX4, EMC RecoverPoint, and VMware vCenter Site Recovery Manager Proven Solution Guide

Considerations VMware vCenter SRM recognizes the RecoverPoint consistency groups through the VMware ESX data stores being used by the SAP VM. VMware vCenter SRM connects to the EMC Storage Replication Adapter (SRA) through the array managers configuration to retrieve LUNs being replicated by EMC RecoverPoint.

For example, if you have two SAP VMs using two different data stores and RDM disks, and you want to protect only one of them, the EMC RecoverPoint consistency groups must contain both data stores and all the RDMs for both SAP VMs, since it is the only way to guarantee that the protected SAP VM can be successfully recovered on the protected site.



GEN-001230

EMC RecoverPoint

Considerations The RecoverPoint release used in this use case was 3.1 SP2 as it was the one available at the time the use case lab was built. However, EMC RecoverPoint 3.2, released in the second quarter of 2009, introduces new features and enhancements, including dynamic synchronous replication, advanced management of VMware environments, and security features that will continue to differentiate the industry's best data protection solution.

The RecoverPoint 3.2 release includes the following features:

- Dynamic synchronous CRR
- VMware affinity monitoring and alerting
- Virtualization updates
- Up to 16 TB LUNs for the CX splitter
- GUI for nondisruptive upgrades from version 3.1 to 3.2
- Support and serviceability changes

For detailed information about EMC RecoverPoint 3.2, refer to the RecoverPoint Release Notes.

Make sure you check the RecoverPoint documentation for all versions available at the RecoverPoint Support Site.

Please carefully verify the network configuration of the RecoverPoint appliances according to Knowledgebase articles emc186737 and emc141560, to avoid any potential replication issues.

Release information

RecoverPoint release	Compatible RecoverPoint Adapter release	Host Attach to RecoverPoint replicated LUNs	Compatible VMware Site Recovery Manager release
3.0	1.0	FC	1.0 and 1.0 Update 1
3.0 SP1 3.0 SP1 P1	1.0 SP1	FC	1.0 and 1.0 Update 1
3.0 SP2	1.0 SP1 P2	FC	1.0 and 1.0 Update 1
3.1 3.1 SP1 3.1 SP2	1.0 SP2 P1 ^a	FC	1.0 and 1.0 Update 1
		iSCSI	1.0 Update 1 only
3.2 3.2 P1	1.0 SP2 P1, 1.0 SP3	FC	1.0 and 1.0 Update 1
		iSCSI	1.0 Update 1 only

a: RecoverPoint Adaptor 1.0 SP2 P1 has replaced 1.0 SP2.

Disk types

Supported disk types

EMC RecoverPoint can replicate VMware application data in the LUNs containing the disk types:

- VMware VMFS
- VMware Raw Device Mapping in physical mode (RDMp)

RecoverPoint supports replication of LUNs in the consistency groups between the production system on the protected site and the target system on the DR site.

VMware features supported by RecoverPoint, according to splitter type

feature / splitter	virtual-machine -based	Brocade	SANTap	CLARiiON
VM file system	not supported	supported	supported	supported
Raw Device Mapping in physical mode	supported	supported	supported	supported
High Availability (HA)	not available	supported	supported	supported
Distributed Resource Scheduler (DRS)	not available	supported	supported	supported
VMotion	not available	supported	supported	supported
Site Recovery Manager	not supported	supported	supported	supported

Refer to the *EMC RecoverPoint Support Matrix* for the latest information on supported disks.

For more information, refer to the *EMC RecoverPoint Replicating VMware ESX Technical Notes*.

Tips

Below you can find the information about the environment that was used in the validated scenarios:

- All hard disks of the SAP VMs were created as RDM disks with the exception of the OS boot LUN. The OS boot disk was configured as a VMFS disk. The RDM disks were configured in the physical compatibility mode (RDMp). The OS boot LUN was configured as a virtual disk to allow VMware snapshots to be created.
 - Both the production system and the Placeholder VM in the DR site use the same filesystem (VMFS) to allow the replication of the SAP VM files on them.
 - The SAP usr, transport, and kernel directories can be created as VMFS virtual disks to enable the use of the VMware snapshot feature. The VMware snapshot feature is only available for VMFS.
 - There are differences in performance when using VMFS and RDMs, and also between RDMs in virtual and physical compatibility mode. The performance of RDMs in physical compatibility mode is better than RDMs in virtual compatibility mode and VMFS in certain I/O types, conditions, and block sizes.
 - When planning the storage for an SAP VM, keep the ESX limit of 256 LUNs in mind. You might need to use VMFS formatted LUNs partitioned into a number of virtual disks for use as operating system and utility disks, for example, and use RDM LUNs for all other SAP-related file systems where they are needed for performance and/or other reasons.
-

Disk layout

Description The disk layouts for this use case were based on the SAP recommendations for SAP ERP 6.0 SR2, Microsoft Windows 2003, and SQL Server 2005 platforms.

Disk layout The following table describes the disk layout for the production server used as the source system in the DR process.

Production SAP Server SAPESX09VM1

Disk Type	Item	Configuration
VMFS	Volume 0 (Windows OS + Swap) Drive C:\	80 GB RAID 1/0
RDMp	Volume 1 (SAP Kernel Local dirs Drive E:\usr\sap\WE9\...)	15 GB RAID 1/0 - LUN
RDMp	Volume 2 (SQL tempdb Drive F:\TEMPDB)	05 GB RAID 1/0 - LUN
RDMp	Volume 3 (SQL Transact. Log files Drive G:\WE9LOG)	15 GB RAID 1/0 - LUN
RDMp	Volume 4 (SQL datafile Drive H:\WE9DATA1)	64 GB RAID 5 - LUN
RDMp	Volume 5 (SQL datafile Drive I:\WE9DATA2)	64 GB RAID 5 - LUN
RDMp	Volume 6 (SQL datafile Drive J:\WE9DATA3)	64 GB RAID 5 - LUN
RDMp	Volume 7 (SQL datafile Drive K:\WE9DATA4)	64 GB RAID 5 - LUN

Note: All the volumes and VMware data stores that hold all the VM files are LUNs stored in the CLARiiON in the production site. The LUNs are included in the RecoverPoint consistency group being replicated to the DR site and contain all SAP ERP 6.0 system storage. The LUN where a VM data store is located contains the OS boot drive of the VM.

SAP VM	Drive	Purpose	SCSI ID	VM HD ID	Disk Type	HLUN	PLUN
VM01	C:	Boot OS	0	H.Disk 1	VMFS	0	84
VM01	E:	Usr_Sap	1	H.Disk 2	RDMp	1	20
VM01	F:	TempDB	2	H.Disk 3	RDMp	2	22
VM01	G:	Trans. Log	3	H.Disk 4	RDMp	8	21
VM01	H:	SAPData1	4	H.Disk 5	RDMp	4	24
VM01	I:	SAPData2	5	H.Disk 6	RDMp	5	25
VM01	J:	SAPData3	6	H.Disk 7	RDMp	3	26
VM01	K:	SAPData4	8	H.Disk 8	RDMp	6	27

Chapter 5: Installation and Configuration

Overview

Introduction

This chapter provides procedures and guidelines for installing and configuring the components of this use case.

The installation and configuration instructions presented in this chapter apply to the specific revision levels of components used during the testing of the validated scenarios. Before attempting to implement any real-world solution based on these validated scenarios, gather the appropriate installation and configuration documentation for the revision levels of the hardware and software components. Version-specific release notes are especially important.

Contents

This chapter contains the following topics:

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Installation and configuration process overview	42
Install and configure EMC RecoverPoint	44
Install VMware vCenter Site Recovery Manager	45
Configure VMware vCenter Site Recovery Manager	47

Considerations

SAP environment

SAP ERP 6.0 Core SR2 IDES on Windows/SQL is installed on a Windows guest OS hosted by VMware ESX 3.5 connecting to the CLARiiON CX4 storage array.

The SAP SQL database drive letters reside on Raw Device Mapping (RDM) volumes in physical compatibility mode. The other drives for Windows OS, Swap, and SAP Kernel and Instance directories can be configured as VMFS file systems or RDMs in virtual compatibility mode to take advantage of the VMware snapshot functionality.

For more information about the SAP environment, refer to the following documents:

- *Best Practice Guidelines for SAP Solutions on VMware Infrastructure VMware white paper*
- *VMware and SAP Software Solutions Deployment Guide white paper*
- *VMware Performance Study – Characterization of VMFS and RDM using a SAN ESX Server 3.5*

VMware Infrastructure

VMware vCenter Server provides a scalable and extensible platform that forms the foundation for virtualization management. VMware vCenter Server, formerly VMware vCenter, centrally manages VMware ESX environments, allowing IT administrators to dramatically improve the control over the virtual environment compared to other management platforms.

ESX Server is the bare-metal hypervisor that is installed directly on the server and abstracts processor, memory, storage, and networking resources into multiple virtual machines, giving IT greater hardware utilization and flexibility.

In this validated solution, two VMware ESX servers are used to host the target SAP ERP systems running in a virtual machine in the DR site.

Installation and configuration process overview

Introduction The installation and configuration of the solution components must be performed in proper sequence and at the appropriate site or sites (protected site, DR site, or both).

Prerequisites Make sure the following prerequisites are met at both sites before performing the installation and configuration process:

- CX4 with the RecoverPoint write splitter enabled is up and running.
 - The physical networks and the routing in between are configured.
 - The Windows Domain Controllers/DNS are configured and synchronized.
 - The network connectivity between the two sites is verified via an OS “ping.”
 - RecoverPoint appliances are installed.
 - The CX LUNs defined in the RecoverPoint consistency group being replicated consistently to the DR site are tested and verified.
-

Main initial setup steps

Step	Action
1	Configure storage volumes/LUNs on Navisphere for an SAP system on the production site on the CX.
2	Add the LUNs created for the SAP system to the CLARiiON Storage Group of the VMware ESX server on the production site.
3	Open vCenter and rescan the new LUNs created.
4	Create a new LUN and define it as a data store for the SAP system that will be protected.
5	Create VMs on the production site and assign the datastore and LUNs created in the previous step.
6	Install SAP in VMs on the production site.

Installation and configuration process The following table summarizes the sequence of the solution installation and configuration process and indicates the site or sites at which each step in the sequence is performed.

Step	Action at protected site	Action at DR site
Initial requirements	<ul style="list-style-type: none"> VMware ESX Server is configured, up and running at the protected site. VMware VirtualCenter 2.5u1 is installed. RecoverPoint is configured with the CLARiiON storage splitter for remote replication synchronized. 	<ul style="list-style-type: none"> VMware ESX Server is configured, up and running at the DR site. VMware VirtualCenter 2.5u1 is installed. RecoverPoint is configured with the CLARiiON storage splitter for remote replication synchronized.
1	Map virtual machines to be protected to associated storage LUNs	
2		Verify available LUNs to act as a target for array replication
3	Using storage replication management tools, configure target array LUN replication from the protected site to the DR site	
4		Verify replication
5	Install VMware vCenter Site Recovery Manager (SRM) and EMC RecoverPoint Storage Replication Adapter on the VirtualCenter server	
6		Install VMware vCenter SRM and EMC RecoverPoint Storage Replication Adapter on the VirtualCenter server
7	Using VirtualCenter client, log in to the VirtualCenter server and configure a connection to the VirtualCenter server	
8		Using VirtualCenter client, log in to the VirtualCenter server and configure a connection to accept a pairing with the protected site
9	Using VirtualCenter client, log in to the VirtualCenter server and configure array managers, inventory mappings, and protection groups	
10		Using VirtualCenter client, log in to the VirtualCenter server and create a recovery plan
11		Test/execute the recovery plan

Install and configure EMC RecoverPoint

Installing EMC RecoverPoint

For detailed information about installing EMC RecoverPoint, refer to the following documents:

- *EMC RecoverPoint 3.1 Installation Guide*
 - *EMC RecoverPoint Replicating VMware ESX Technical Notes*
-

Prerequisites

Perform the following steps before installing EMC RecoverPoint:

- Enable CX splitter software on CLARiiON CX4 storage on both sites
 - Add the CX splitter to the RecoverPoint system
 - Using Navisphere, create a RecoverPoint storage group that includes:
 - RecoverPoint journal volumes
 - RecoverPoint repository volumes
 - RecoverPoint replication volumes
-

Note

VMware ESX 3.5 Update 4 brings enhancements to the detection of the changes to LUNs properties and attributes on the storage array.

For detailed information, refer to the VMware ESX 3.5 Update 4 documentation at:

http://www.vmware.com/support/vi3/doc/vi3_esx35u4_rel_notes.html#resolvedissues

Configuring replication

Prior to executing a DR test plan using SRM for ESX Server 3.5 virtual machines with an EMC RecoverPoint system, use the RecoverPoint Management Application (GUI) or CLI to configure RecoverPoint continuous remote replication as the steps below:

Step	Action
1	Create and configure consistency groups as described in Chapter 4, "Disk Layout".
2	Configure copies.
3	Add replication sets and journals.
4	Attach a volume to the CX splitter.
5	Enable groups.
6	Start replication.
7	Test/Validate replication.

For detailed information on configuring RecoverPoint replication, refer to the *EMC RecoverPoint 3.1 Administration Guide*.

Install VMware vCenter Site Recovery Manager

Introduction

After having performed a successful RecoverPoint replication between two sites, perform the following steps:

Step	Action
1	Synchronize RecoverPoint consistency groups between two sites.
2	Install the SRM Server.
3	Install and enable SRM plug-ins on VMware vCenter.
4	Install the RecoverPoint Storage Replication Adapter for SRM.

All the installation and configuration steps of VMware vCenter SRM were based on the standard procedure. The SAP VM created over the VMware ESX server used most of its disks as RDMs, which is slightly different from the basic recommendations from VMware.

For more information, including system requirements, refer to the *VMware Site Recovery Manager Administration Guide* and the *EMC RecoverPoint Adapter for VMware Site Recovery Manager Release Notes*.

Installing SRM

Run the VMware vCenter Site Recovery Manager executable to install the SRM and navigate through the installation wizard as the following major steps.

Note: Install this component on both the vCenter client connected to the protected site and the vCenter client connected to the DR site.

Step	Action
1	Run the VMware vCenter Site Recovery Manager executable.
2	Enter VC server information for SRM registration.
3	Select Certification Type (automatically generate a certificate).
4	Register the SRM extension.
5	Create an SRM SQL database.
6	Configure a database ODBC connection between vCenter and SRM.
7	Complete the SRM installation.

Installing SRM plug-ins

After installing SRM, perform the steps in the table below to install SRM plug-ins.

Note: Install these components on both the vCenter client connected to the protected site and the vCenter client connected to the DR site.

Step	Action
1	Select the Manage Plug-in from the plug-in on the vCenter client.
2	Download and install plug-ins.
3	Enable the SRM client.
4	Complete the SRM plug-in install.

Installing RecoverPoint SRA for VMware vCenter SRM

After installing the SRM plug-ins, launch the RecoverPoint Storage Replication Adapter installation wizard and perform the steps in the following table to install RecoverPoint SRA for SRM.

Note: Install this component on both the VMware vCenter client connected to the protected site and the vCenter client connected to the DR site.

Before the RecoverPoint Adapter is installed, a RecoverPoint system must be installed and configured. CRR consistency groups and their respective replication policies should be defined using the RecoverPoint Management Application (GUI) or Command Line Interface (CLI).

RecoverPoint Adapter version 1.0 is compatible with RecoverPoint version 3.0. Future RecoverPoint releases may require an upgrade of the RecoverPoint Adapter.

It is recommended to use the latest SRA for RecoverPoint. The version used in the use case lab was 1.0.2.1 and the latest available is 1.0.3. This latest version allows consistency groups to be configured with the RecoverPoint GUI and CLI to be managed solely by VMware vCenter SRM. For the latest information about RecoverPoint, refer to the section “Site Recovery Manager Reference” at the RecoverPoint support area on Powerlink.

The RecoverPoint Adapter requires Java Runtime Environment (JRE) to be installed on the VMware vCenter servers. If a compatible version is not installed, the Adapter installation will automatically invoke an installer of JRE, contained in the setup.exe file, to complete the Adapter installation.

Step	Action
1	Launch the RecoverPoint Storage Replication Adapter executable.
2	Install RecoverPoint Site Recovery Adapter.
3	Complete the RecoverPoint SRA for SRM installation.
4	Test and validate the installation by checking the existence of the RecoverPoint entry in the SRM array manager.

Configure VMware vCenter Site Recovery Manager

Introduction

After installing the RecoverPoint Storage Replication Adapter, perform the steps provided in the following table to configure VMware vCenter SRM:

Step	Action
1	Establish the connection between the production and DR sites.
2	Configure the array manager (EMC SRA for RP must be installed at this point).
3	Configure inventory mappings.
4	Manually remove any pre-existing placeholder VMs with the same name on the DR site in its local data store.
5	Create and configure protection groups.
6	Create a recovery plan.

For more information about configuring SRM, refer to the *VMware Site Recovery Manager Administration Guide* and the *EMC RecoverPoint Adapter for VMware Site Recovery Manager Release Notes*.

Establishing connection between sites

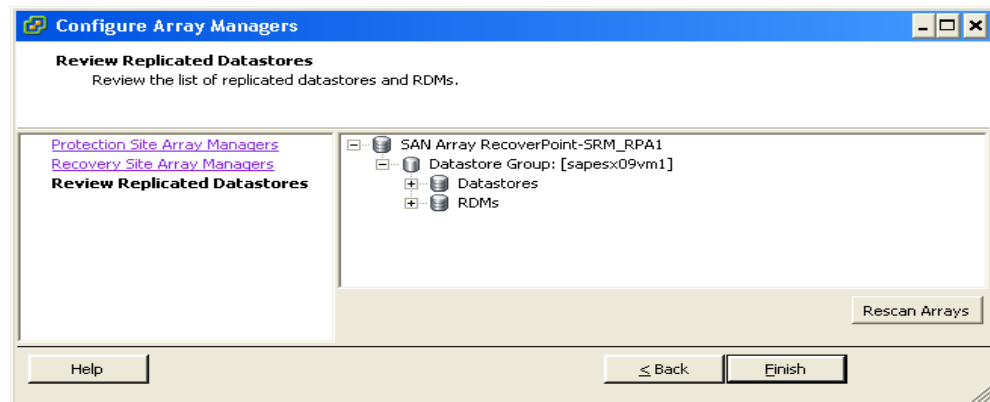
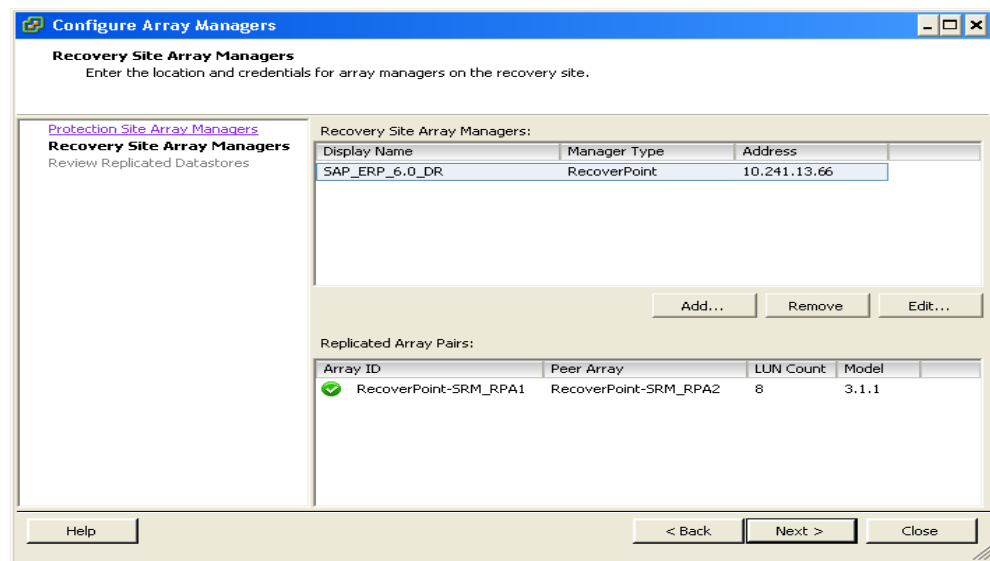
Perform the following steps to establish the connection between the production and DR sites.

Step	Action
1	Log in to the vCenter Client.
2	Click the Site Recovery button on the toolbar.
3	Click configure for connection on the Protected Setup.
4	Add the IP address of the vCenter client at the DR site to establish a connection.
5	Enter the remote vCenter user name and password.
6	Complete the connection.

Configuring array managers

Establish the connection between VMware vCenter SRM and RecoverPoint through SRA. If the SRA was installed correctly, you should be able to use the Continuous Replication Technology to support VMware vCenter SRM. Please note that the site where you configure the array manager is always the site where the SAP VM to be protected is actually running.

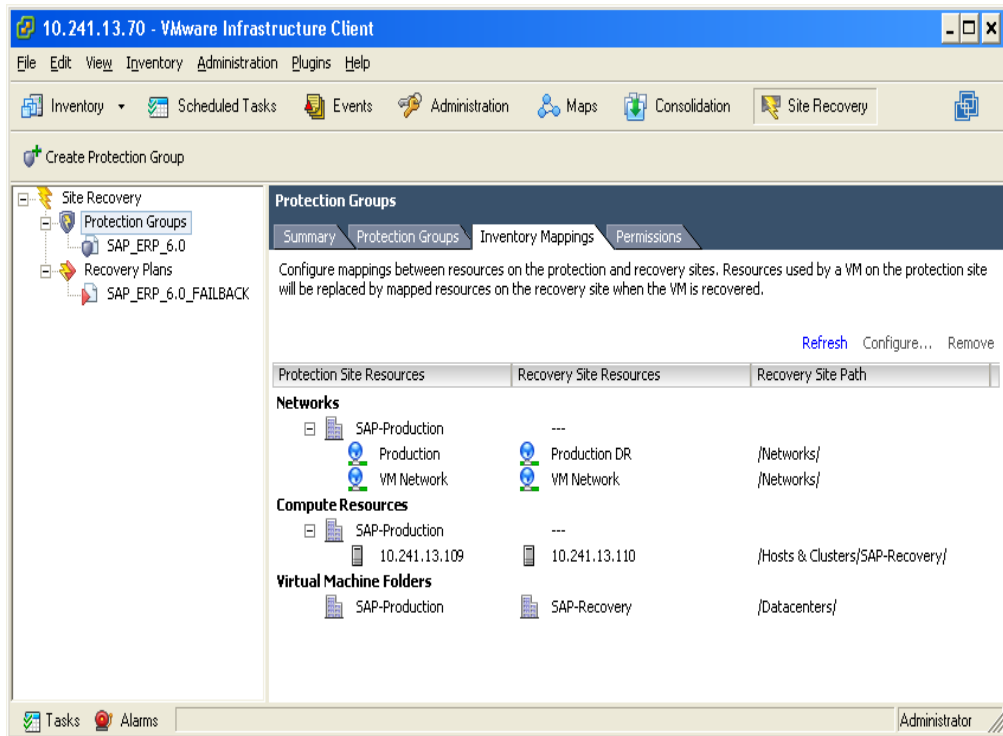
Step	Action
1	Click the Site Recovery button on the toolbar.
2	Click Configure Array Managers on the Protected Setup.
3	Add the protected site array manager to establish a connection between SRM and RecoverPoint through the SRA for the protected and DR sites, alternating the Names and IP addresses of the RPAs.
4	Enter a name for the RPA 1, the IP address, the username, password, and then click the Connect button.
5	Complete the connection.



Configuring inventory mappings

After configuring array managers, configure inventory mappings. This involves mapping resources from the production site to the recovery site.

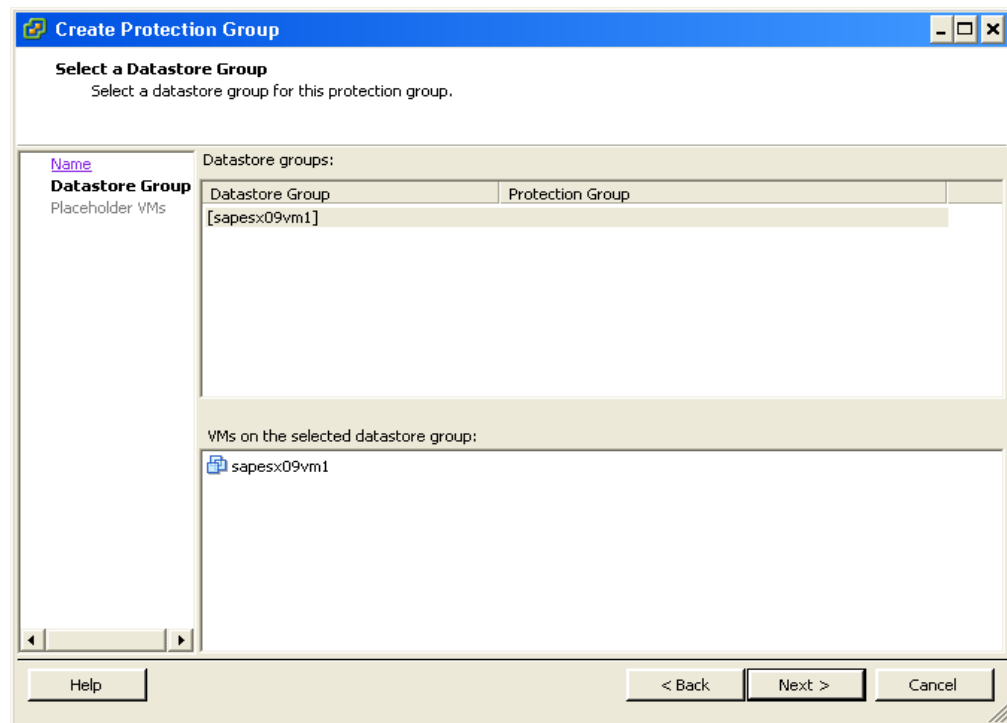
Step	Action
1	Click the Site Recovery button on the toolbar.
2	Click Configure Inventory Mappings .
3	Click each resource of the production site and assign in which resource of the DR site it should be assigned to in the event of a disaster.
4	Complete assignments.

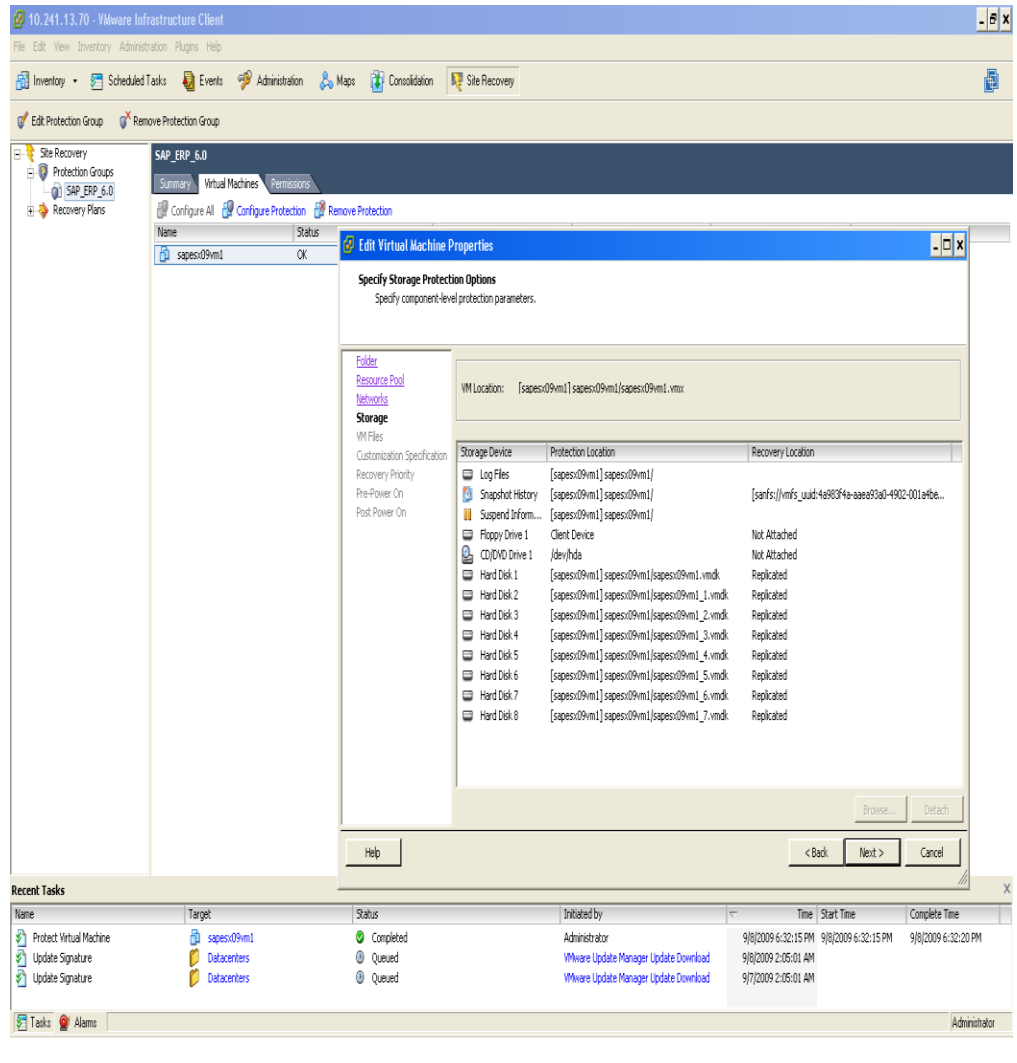


Configuring protection groups

A protection group defines the specific items you want to move from the production site to the DR site in the event of a disaster. Such items might include virtual machines (VMs), resource pools, data stores, and networks.

Step	Action
1	Click the Site Recovery button on the toolbar.
2	Click Configure Protection Groups .
3	Name it with a meaningful name, such as SAP_ERP_6.0_Prod.
4	Select the data store(s) where your VM is running, SRM will propose the existing ones automatically. Select the data store and SRM will show the VMs using that data store. Click Next to continue.
5	Select the DR Site, in which data store the Placeholder VM (basic VM setup information without disks) will reside temporarily until the failover.
6	Click Finish . VMware vCenter SRM will create a Placeholder VM with the same name of the existing one in the ESX servers in the DR site.
7	Click Protection Groups on the left and select the protection group you just created.
8	A Virtual Machines tab will appear on the right; select the VM name and click Configure Protection to review all the Protection setup details. You are going to configure several VM properties, including the Storage and the Recovery Priority.

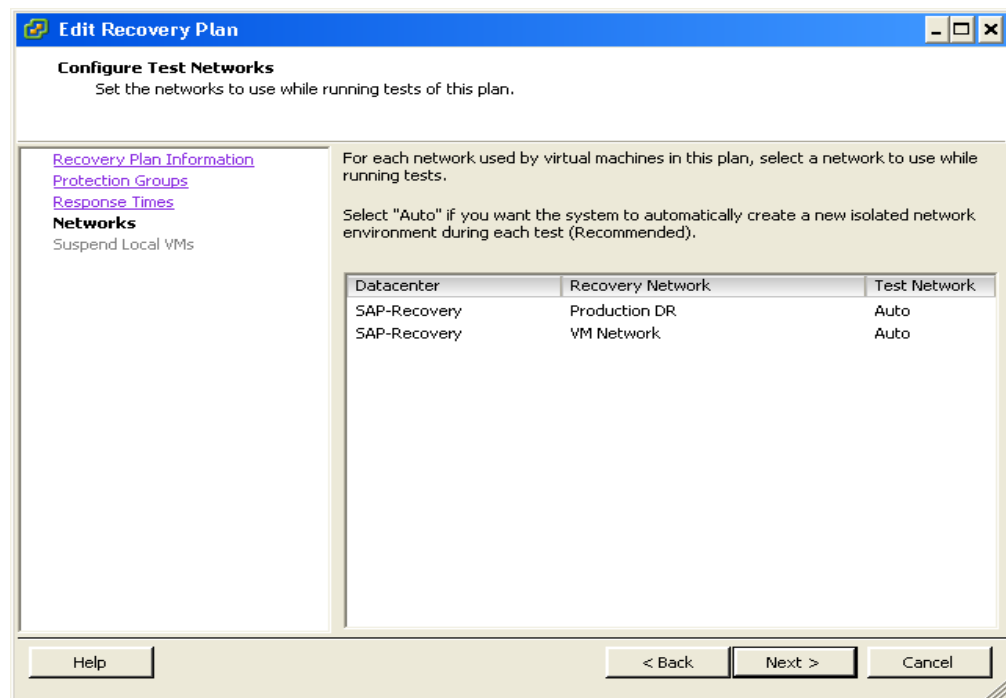




Configuring a recovery plan

Perform the following steps to configure the recovery plan. The steps can only be done on the DR site.

Step	Action
01	Log in to the vCenter Client.
02	Click the Site Recovery button on the toolbar.
03	Inform the username and password of the SRM.
04	Click Recovery Plans on the left.
05	Click Create a Recovery Plan .
06	Name the Recover Plan, for example, <i>FailOver SAP Prod ERP</i> .
07	Select the Protection Group you just created from the protected site.
08	Keep the VM Response Times above 500 ms to avoid timeout error.
09	Select the Networks to be used on the DR site by the SAP VM.
10	Optionally select any other local VMs on the DR site ESX to be suspended to guarantee that enough resources will be available on the DR site ESX server to run the SAP VM being recovered.



Chapter 6: Testing and Validation

Overview

Introduction This chapter describes detailed procedures on the validation of the three disaster recovery operations.

Contents This chapter contains the following topics:

Topic	See Page
Test a recovery plan	54
Execute a recovery plan	55
Failover operations	55
Failback operations	56

Test a recovery plan

Details

SRM enables you to test a recovery plan, which provides the following benefits:

- The DR site does not connect to the production site and does not shut down the production VMs.
- During a test, an isolated (test bubble) network is created at the DR site so that the infrastructure of the DR site is not affected. The test network is deleted at the conclusion of the test.

Note: Recovery plans are tested only from the vCenter client connected to the DR site.

After creating an SRM recovery plan, it's important to test the plan periodically to verify that the expected operations are being performed.

To test the recovery plan, follow the steps below:

Step	Action
1	Open the recovery plan created from the DR site's vCenter.
2	Click the Test button to execute the recovery plan in the test mode.
3	The following events occur: <ul style="list-style-type: none"> • RecoverPoint bookmark images are created and virtual access is enabled on the remote copy for the consistency group volumes. • SRM simulates the carry-over of all resources created within the SRM protection group to the recovery site. • The recovery VMs are powered on in the order defined within the recovery plan. • SRM pauses.
4	Open the SAP VM console at the DR site and verify that SAP is up and running (start SAP if is not started).
5	Click the Continue button to have SRM clean up the test and revert to the original production state.

Important: If the replication between the sites is paused or interrupted for some reason and a disaster strikes, the latest data from the production system will not be available on the DR site.

Important: Before testing a recovery plan, if the data transfer is paused, resume the transfer with the Image Access disabled.

For additional information about testing SRM recovery plans, refer to the *VMware Site Recovery Manager Administration Guide* available at <http://www.VMware.com>.

Execute a recovery plan

Details

Executing an SRM recovery plan is similar to testing a recovery plan. The differences are listed below:

Executing a recovery plan	Testing a recovery plan
Can be performed only once.	Can be performed for multiple times.
RecoverPoint consistency groups are failed over.	An image with virtual access is enabled instead.
The remote copy becomes the production copy, and vice versa.	Does not transfer production to the remote copy.
Manual steps are required to resume operations at the original production site after executing a recovery plan.	Requires no manual steps, because production is not transferred to the remote site.

Perform the following steps to execute the recovery plan:

Step	Action
1	Open the recovery plan created from the recovery site's vCenter.
2	Click the Run button to execute the recovery plan.

Important: Executing an SRM recovery plan should be done only in the event of a declared disaster to enable operations to be resumed at the DR site.

Failover operations

Details

The following failover operations were conducted as part of the validation:

- Failing over with replication on and data transfer enabled
- Failing over with data transfer paused, which characterizes a disaster situation

Note: Failover operations are initiated from the vCenter client connected to the DR site.

The tests performed in this use case verified that the test failover and test failback actually took longer than the actual failover and failback and none of them took more than 10 minutes, which is considered light speed compared to the manual and physical traditional disaster recover process. It is important to remember that the use case used a simple SAP ERP 6.0 IDES SR2 running in one VM only, which accelerated the execution of the recovery plan.

Failback operations

Details

The extent of a disaster determines whether recovery is performed to a newly provisioned site or to the original site. Thus, different steps are required depending on the scenario. However, the underlying technology and initialization of SRM are the same. SRM only fails over, which means goes one way. Therefore, you basically clean up and rebuild the system to swap the original personalities, and then do another failover to move the protected VM back to the original production site. Follow the steps provided in the table below to perform failback operations:

Note: Failback operations are initiated from the vCenter client connected to the production site.

Step	Action
1	Perform cleanup with vCenter. <ul style="list-style-type: none"> • Remove the VMs from inventory on the protected site. • Remove the failed-over recovery plan from the recovery site. • Remove the protection group or groups associated with the removed recovery plan from the protected site. (very important) • Refresh the ESX storage data stores and remove any pre-existing placeholder VMs.
2	SRM will automatically reverse RecoverPoint replication to perform replication in the opposite direction (from DR site to protected site). For instructions on addressing various failback scenarios with RecoverPoint, refer to the <i>EMC RecoverPoint Administrator's Guide</i> .
3	Configure SRM to fail back from the recovery site. Using SRM Array Manager, perform the following steps on both arrays: <ul style="list-style-type: none"> • Add the recovery array as the new protected site array (if not added). • Add the protected array as the new recovery site array (if not added). • (Optional) Remove the previous protected/recovery array configuration.
4	Rescan the arrays. The data sources to fail back should now be displayed.
5	Close and reopen the vCenter client.
6	Re-create the protection group or groups on the new protected array (previously the recovery array).
7	Re-create the recovery plan on the new recovery array (previously the protected array). Make sure to select the newly created Protection Group in the recovery site.
8	Test the recovery plan.
9	Initiate failover from the new protected array to the new recovery array.
10	Repeat steps 1 through 8 to revert the environment to SRM readiness.

For additional information about failover, refer to the *VMware Site Recovery Manager Administration Guide*.

Appendix A: SAP Reference Documents

Overview

Introduction The appendix lists the SAP reference documents used in this use case.

Contents This appendix contains the following topics:

Topic	See Page
SAP documents	58
SAP notes	58

SAP documents

For detailed information about SAP installation and virtualization support for VMware, refer to the following documents:

- *SAP Installation Guide ERP 6.0 SR2 ABAP on Windows: MS SQL Server*
 - *SAP SDN Virtualizing SAP Applications on Windows*
 - *Business Continuity Management for SAP System Landscapes*
 - *Emergency Handling for Recovery of SAP System Landscapes*
 - *SAP Master Guide Support Release 3 - SAP ERP 6.0 Using SAP NetWeaver 7.0*
 - *SAP Planning Guide – Technical Infrastructure Guide – SAP NetWeaver 7.0*
 - *SAP Installation Guide SAP NetWeaver 7.0 SR2 ABAP on Windows: SQL*
 - *SAP SDN – Virtualizing SAP Applications on Windows*
 - *SAP Installation Guide ERP 6.0 SR2 MS Windows SQL*
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SAP notes

Installation and configuration notes

For detailed information about configuring SAP systems in virtual environments, refer to the following documents:

- *SAP SDN Virtualizing SAP Applications on Windows*
 - *SAP Note 1056052, Windows: VMware ESX Server 3 configuration guidelines*
 - *SAP Note 1159490 - Virtualization on Windows. Monitoring on VMware ESX*
 - *SAP Note 1002587 - Flat Memory Model on Windows*
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Network-related notes

- *SAP Note 0540379 - Ports and services used by SAP*
 - *SAP Note 1100926 - FAQ: Network performance*
 - *SAP Note 0164102 - Network load between application server and front end*
 - *SAP Note 0679918 - The front-end network time*
 - *SAP Note 0208632 - TCP/IP network protocol for MSSQL*
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