# SQL Server Disaster Recovery with Compellent Storage Center

Solution Guide



## **Document revision**

Date	Revision	Comments		
11/14/2011	A	Initial Draft		

THIS BEST PRACTICES GUIDE IS FOR INFORMATIONAL PURPOSES ONLY, AND MAY CONTAIN TYPOGRAPHICAL ERRORS AND TECHNICAL INACCURACIES. THE CONTENT IS PROVIDED AS IS, WITHOUT EXPRESS OR IMPLIED WARRANTIES OF ANY KIND.

© 2011 Dell Inc. All rights reserved. Reproduction of this material in any manner whatsoever without the express written permission of Dell Inc. is strictly forbidden. For more information, contact Dell.

*Dell*, the *DELL* logo, the *DELL* badge, and Compellent are trademarks of Dell Inc. Other trademarks and trade names may be used in this document to refer to either the entities claiming the marks and names or their products. Dell Inc. disclaims any proprietary interest in trademarks and trade names other than its own.

## Contents

Document revision
Contents
General syntax
Conventions
Preface
Audience6
Purposes
Customer support
Introduction7
High Availability and DR for SQL Server using Dell Compellent Replication7
Pre-requisites and Tools for Replication and SQL Server7
Replication Deployment and Set up
Scenario Background8
Environment and Servers
Production Site
DR Site
Set-up Process
Setting up Database Replays (Snapshots)9
Setting up target server/volume folders on DR Storage Center
Setting up Replication of SQL Databases (volumes)
Pre-defining Disaster Recovery Site 14
Monitoring Replication
Replication Administration
DR Drill - Test activating DR 19
Failing over to DR site
Pausing/Removing Replication
Powershell Automation

## Figures

Figure 1: Enterprise Manager provides a single pane of glass for managing multiple Compellent storage	
systems, including replication of storage volumes for SQL Server	7
Figure 2: Taking a Replay using Replay Manager1	0
Figure 3: Setting up Target volumes/server on Compellent Storage Center 1	1
Figure 4: Enterprise Manager - Storage Management 1	2
Figure 5: Enterprise Manager client - Predefining DR site1	5
Figure 6: Enterprise Manager - Setting up Replication Monitoring	7
Figure 7: Enterprise Manager - DR Test Activation 20	0
Figure 8: Disk part - Listing volumes	3
Figure 9: Disk part - Selecting volumes	4
Figure 10: Disk part - View volume attributes	4
Figure 10: Disk part - Clear volume attributes 2	5
Figure 11: SQL Server Management studio - Attaching a database	6
Figure 12: Enterprise Manager - DR failover	7
Figure 13: Enterprise Manager client - Pausing/Deleting volume Replication	5

## General syntax

#### Table 1.Document syntax

Item	Convention
Menu items, dialog box titles, field names, keys	Bold
Mouse click required	Click:
User Input	Monospace Font
User typing required	Туре:
Website addresses	http://www.compellent.com
Email addresses	info@compellent.com

## Conventions



Notes are used to convey special information or instructions.



Timesavers are tips specifically designed to save time or reduce the number of steps.



Caution indicates the potential for risk including system or data damage.



Warning indicates that failure to follow directions could result in bodily harm.

## Preface

## Audience

The audience for this document is System Administrators who are responsible for the setup and maintenance of SQL servers and associated storage. Readers should have a working knowledge of Windows, SQL Server, and the Dell Compellent Storage Center.

## Purposes

This document provides an overview of Dell Compellent storage replication and how it can be used to provide high availability and disaster recovery solutions for using SQL Server on Dell Compellent Storage Center.

#### **Customer support**

Dell Compellent provides live support 1-866-EZSTORE (866.397.8673), 24 hours a day, 7 days a week, 365 days a year. For additional support, email Dell Compellent at <a href="mailto:support@compellent.com">support@compellent.com</a>. Dell Compellent responds to emails during normal business hours.

## Introduction

## High Availability and DR for SQL Server using Dell Compellent Replication

With Dell Compellent, organizations of all sizes can protect business-critical applications like SQL Server against downtime and disaster. Compellent's Enterprise Manager and Replay Manager software enable administrators to deploy a robust disaster recovery (DR) plan with multi-site failover.

Enterprise Manager features an intuitive, point-and-click interface for managing any number of Compellent systems at primary and remote sites. The software, which includes wizards that guide administrators through setup and configuration, provides a comprehensive view of all connected storage. Other functionality includes monitoring, alerting, trending, analysis and reporting. Setting up and optimizing replication of SQL Server data is quick and easy, and it doesn't require any server-side agents that may complicate the process. In fact, administrators can activate a DR site with a single mouse click.



Figure 1: Enterprise Manager provides a single pane of glass for managing multiple Compellent storage systems, including replication of storage volumes for SQL Server.

### Pre-requisites and Tools for Replication and SQL Server

Setting up Dell Compellent Replication for SQL Server disaster recovery has the following prerequisites:

- SQL Server 2000 or above version installed on both Production and DR site.
- $\circ$  Dell Compellent Replay Manager services installed on both Production and DR site.
- Dell Compellent Enterprise Manager Data Collection Manager Installed and configured.
- o Dell Compellent Enterprise Manager client on any machine for administration.
- Dell Compellent Replay Manager Explorer on any machine for administration.
- Dell Compellent Storage Center Command Set snap-in installed on both Production and DR site [to use Powershell].
- Dell Compellent Replay Manager Command Set snap-in installed on both Production and DR site [to use Powershell].

## **Replication Deployment and Setup**

### Scenario Background

Microsoft SQL Server was deployed with named instance at the production site in a lab environment with 3 databases namely adventureworks2008r2, adventureworksdw2008r2, and AW\_VLDB, a500 gb database. The over-all goal of the exercise is to establish a DR Site which is in a different building than my production site. In order to achieve the goal, Compellent Asynchronous replication was utilized to provide near-instantaneous recovery with minimal transaction lag.

This exercise will demonstrate how to:

- Establish an easily implemented process for setting up replication, activating the DR site and Reactivating the production site.
- Replicate SQL Server data with minimal impact on servers and applications
- Meet the required recovery point objective in event of a production site failure of the entire environment once back online.

### **Environment and Servers**

#### **Production Site**

<u>SQL Server Name</u>: PG-SQL2K8R2-CL2N2\Prod <u>SQL Version</u>: SQL Server 2008R2 <u>OS</u>: Windows 2008R2 <u>Replay Manager</u>: 6.0.2 services <u>Volume Layout</u>: C: (Used for boot volume), F: (Used for storing SQL Data files for user databases), G: (Used for storing SQL Log files for user databases), H: (Used for storing tempdb data & log files), T: (Used for storing Native SQL Backups)

#### **DR Site**

<u>SQL Server Name</u>: PG-SQL2K8R2-CL2N1\Dev <u>SQL Version</u>: SQL Server 2008R2 <u>OS</u>: Windows 2008R2 <u>Replay Manager</u> 6.0.2 services <u>Volume Layout</u>: C: (Used for boot volume), F: (Used for storing SQL Data files for user databases), G: (Used for storing SQL Log files for user databases), H: (Used for storing tempdb data & log files), T: (Used for storing Native SQL Backups).

Replay Manager Explorer, Enterprise Manager client and Storage Center client were installed on alaptop. The replication set-up and configuration will be done using this laptop.

A "dual fabric" was implemented for the FC infrastructure. This configuration provided redundancy for the communications without affecting the functionality of the overall solution. For the storage infrastructure, the Compellent Storage Center SAN was Installed at each site. After creating the active disks to be used by the cluster, the disks were mapped and connected to the cluster from the production site.

### Set-up Process

The set up process consists of the following steps:

- Setting up Database Replays on production site using Replay Manager.
- Setting up target server/volume folders on DR Storage Center using storage center client.
- Setting up Replication of Database volumes using enterprise manager client.
- Pre-defining disaster recovery site.

See details of all the above 4 steps below:

#### Setting up Database Replays (Snapshots)

The first step before setting up replication for the databases is to set up replays of each database on the production site. Replays can be set up using either of the following 2 applications:

- a. <u>Replay Manager for SQL Server</u>: Replay manager is used to take application consistent replays of all the databases involved in replication. This is the recommended way of taking database volume replays as it guarantees consistency of the database. In order to learn how to use Replay manager to take SQL Database replays, please refer to the Replay Manager User guide (http://kcint.compellent.com/Published%20Documents/680-008-007.pdf).
- b. <u>Storage Center</u>: Storage Center can also be used to take replays, however it is strongly recommended to use Replay Manager to take replays of the SQL Server databases. If it is decided to use Storage Center to take a replay, it is highly recommended to group all the SQL volumes (Data and Logs) into a consistency groups and take a replay. In order to learn how to use Storage Center to take replays and create consistency groups, please refer to the Storage Center User guide (<u>http://kcint.compellent.com/Published%20Documents/680-019-009.pdf</u>).

For the scenario above, using Replay Manager Explorer installed on the laptop,

- a. A connection to the production Server PG-SQL-CL2N2 was made and a new job named "UserDB Backup Hourly" was created under SQL Database extension of Replay Manager.
- b. This job was scheduled to run every hour and create a Replay of the 3 user databases.

As indicated earlier, the User database files are hosted on F-Drive and G-Drive. Hence the replay generated out of this job consists of these 2 volumes.



#### SQL Server Disaster Recovery with Compellent Storage Center

Figure 2: Taking a Replay using Replay Manager

#### Setting up target server/volume folders on DR Storage Center

- a. Add the DR SQL Server as a server object on the DR SAN using Storage Center application.
- b. Set up appropriate Volume folder where the replicated volumes will reside. This can also be done using either Storage Center application.

For the scenario above, using Storage Center client installed on the laptop,

- a. The Storage Center on the DR site was connected and a new server object named PG-SQL-CL2N1 was created (DR server name).
- b. A new Volume Folder named "Repl of PG-SQL-CL2N2" was created. This is the volume folder where all the production volume replicas would be housed.



Figure 3: Setting up Target volumes/server on Compellent Storage Center

#### Setting up Replication of SQL Databases (volumes)

Once replays are set up, replication of all the database volumes from primary site to DR site would be set up. Follow are the steps to be followed to set up replication.

a. <u>Identify Database Volumes:</u> Identify all the database volumes that need to be replicated. This consists of all the volumes, where SQL Data files, SQL Log files, SQL System database files, and SQL Server backup volumes reside.

For the scenario above, the following 4 volumes were replicated from Prod to DR site:

F:\ -> SQL Data, G:\ -> SQL Logs, H:\ -> SQL TempDB, I:\ -> SQL Instance Root, T:\ -> SQL Backups

For each of the volume that needs to be replicated, steps (b) through (d) were followed

 b. <u>Start Replication wizard</u>: Using the Enterprise Manager client, Connect to the Production Storage Center and browse to the volume folder where all the source volumes to be replicated are housed. Right click on the appropriate volume and select "Replicate Volume".



Figure 4: Enterprise Manager - Storage Management

c. Select Target Storage center

Selecting "Replicate Volume" in previous step will pop up a new window where the destination storage center (DR) needs to be selected.

For the scenario above, volumes were replicated to SC12 (Storage Center on DR site)

Create Replication [Source: Technical Solutions - SC	25]			
Name	Host	IP Address	Serial Number	
🚱 SC3	SC3.techsol.beer	172.16.2.103	910	
😡 Technical Solutions - SC12	sc12.techsol.local	172.16.2.112	697	
G Technical Solutions SC4	sc4.techsol.local	172.16.2.104	862	
Help			Cancel	

d. Select Replication attributes in the screen below.

For the scenario above, the configuration was selected as per best practices for SQL Replication as below:

- a. Asynchronous replication
- b. Replicate Active Replay
- c. Change the Folder location of the destination volume and point it to the folder that was created
- in previous step.

All the other options were kept to default.

Create Replication [Sour	rce: Technical Solutions - SC5]		×				
Replication Att	ributes						
Replication Type	e: 💿 Asynchronous 🛛 💿 Synchronou	us					
Replicate Active	e Replay						
Deduplication (optimizes copy of replay history - resource intensive)							
QoS Definition:	🗱 FC - 4 GBPS 🛛 👻						
Destination Vo	lume Attributes						
Name:	Repl of SQL Backup						
Create Volume's	Folder Path on Destination						
Folder:	Repl of PG-SQL-CL2N2	🛸 <u>Change</u>					
storage type:	Assigned - Redundant - 2.00 MB 👻						
Read Cache Er	nabled						
Allow the Stora	ge Center to automatically determine t	the best Controller to activate Vo	lume on				
Elles en Evisting )							
Use an Existing V	/olume						
Save Restore Point	ts						
Help			Cancel 🔒 🖓 OK				

#### Pre-defining Disaster Recovery Site

Once all the required volumes are replicating successfully, the disaster site can be pre-defined. Doing this will enable quick recovery in time of disaster. Although not mandatory, this is a highly recommended step.

For the Scenario above using Enterprise Manager Client, Select the following menu option: Replication Recovery -> Predefine Disaster Recovery Site.

#### SQL Server Disaster Recovery with Compellent Storage Center

Management Replication R	Recovery  Storage Center View 🌔 St	orage Center Tasks  ī Help	🗲 Storage Cer	iter Manager 😰
Storage 🖓 Save Rest	tore Points Portore Points	Storage Management		
SC3	Postart Volumes to Original Storage Cont		🛞 Set Update Frequency 🔍 F	roperties 📫 Re
Technical S	Disector Disector City	11/22/2011 16:06:06	6	2 🔅 🔪
Technical S	vate Disaster Recovery Site			
Technical S 🛞 Predefine	e Disaster Recovery Site est DR Activated Volumes	Free Disk Space Used Disk Space	ce: 34 j1 TB (84.40%) I	
	P         Storage Threshold         15           P         FE IO Threshold         80           P         FE KB Threshold         720	rent Error Warning % Used [Not Set] 3 IO/Sec [Not Set] 4 KB/Sec [Not Set]	#Alerts     # Alerts       Current Alerts     2     7       P Storage Alerts     0     7       P Storage Alerts     0     7       P Bick Alerts     0     7       P Hardware Alerts     0     7       P Hardware Alerts     0     7	
/iewers	C Storage History as of 11/	22/2011 00:02:03 - Upda	Connectivity Alerts     0     P Replication Restore Point Alerts     0	2 🔅 🗙
Viewers Multi Storage Center	C Storage History as of 11/	22/2011 00:02:03 - Upda	Connectivity Alerts     0     P Replication Restore Point Alerts     0	
Viewers Multi Storage Center Current Alerts	C Storage History as of 11/ 40,000 35,000	22/2011 00:02:03 - Upda	Connectivity Alerts  Connecti	2:**
Viewers Multi Storage Center Current Alerts Replications	C Storage History as of 11/	22/2011 00:02:03 - Upda	Connectivity Alerts  Connecti	
Viewers Multi Storage Center Current Alerts Replications Reports	C Storage History as of 11/ 40,000 35,000 35,000 35,000 35,000 35,000 35,000 35,000 35,000 35,000	22/2011 00:02:03 - Upda		2 • •
Viewers Multi Storage Center Current Alerts Replications Reports Chargeback	C Storage History as of 11/	22/2011 00:02:03 - Upda		
Viewers Multi Storage Center Current Alerts Replications Reports Chargeback Threshold Alerts	C Storage History as of 11/ 40,000 36,000 8,000 9,000 15,000 10,000 5,000	22/2011 00:02:03 - Upda	Connectivity Alerts  Connecti	
Viewers Multi Storage Center Current Alerts Replications Reports Chargeback Threshold Alerts Servers	C Storage History as of 11/ 40,000 35,000 25,000 25,000 10,000 5,000 0 8-Oct 10-Oct 12-Oct 1	22/2011 00:02:03 - Upda	Connectivity Alerts     0      P Replication Restore Point Alerts     0      Inted Daily      Inted Da	P ***

Figure 5: Enterprise Manager Client - Predefining DR site

Select the source and target Storage Center. In the case above, the source system is SC5 and target system is SC12 and click Next. On Screen after, select each volume and click on "edit selected" on the screen below.

Predefine Activate Destination (DR Site	e) Volumes				
Set attributes on volumes that	t need to be rectared:				
Source Volume	Destination Volume	Server	Replay Profile	Use Active Replay	
SQL Backup	Repl of SQL Backup	PG-SQL-CL2N1		No	
📕 SQL Data	SQL Data	PG-SQL-CL2N1		Yes	
SQL InstanceRoot	SQL InstanceRoot	PG-SQL-CL2N1		Yes	
🥃 SQL Logs	SQL Logs	PG-SQL-CL2N1		Yes	
Help Cancel				🔷 Back	合 Save

On the screen below make sure to select the correct destination DR server by clicking on the change button. In the scenario above, the server named PG-SQL-CL2N1 (DR server) was selected.

Predefine Activate Destination (DR Sit	e) Volumes			
Set attributes on volumes that	t need to be restored:			
Source Volume	Destination Volume	Server	Replay Profile	Use Active Replay
🛢 SQL Backup	Repl of SQL Backup	🖳 PG-SQL-CL2N1		Yes
🥃 SQL Data	SQL Data	PG-SQL-CL2N1		Yes
🥃 SQL InstanceRoot	SQL InstanceRoot	PG-SQL-CL2N1		Yes
🥃 SQL Logs	SQL Logs	PG-SQL-CL2N1		Yes
Edit Selected Export De	efinitions 1 Import Definitions			
Help Cancel				🔷 Back 🛛 🔷 S

## **Monitoring Replication**

After configuring replication, information about the status of all the volumes involved in replication can be monitored. Using Enterprise manager, replication threshold alerts can be set up. These thresholds can be set up and customized for each volume being replicated.

 Select the "Replication" option on bottom left pane of EM Client. This will show a list of all volumes being replicated on the right top pane. For each of the volume, right click and select "Threshold Alert properties"

#### SQL Server Disaster Recovery with Compellent Storage Center

TSEM01: Compellent Enterpri	se Manager: Replications	·	10 A		÷	_ 1	1.2		_	-			l	- 0	<b>X</b>
🚯 Management 🛛 🕀 Replication R	ecovery 🔅 Help													ľ	? Help
Storage Contore	Last Update: 11/17/2	011 11:30:41							🌏 Sa	ave Restor	re Points 🍓 Va	lidate Restore P	oints 🥵 U	pdate 🏥 /	Refresh
Storage Centers	All Replications			_									🐺 Set	Update Fre	equency
C SC3	Replications														
Technical Solutions - SC12	Source S	rage Center		Destination :	Storage Center			1			CMM Attributes			[	
	Name	Volume	Name		Volume	Restor	re Time	Type	State		Replay	CMM Left	Finished	Type	
Technical Solutions - SC5	Technical Solutions - SC.	DEMO-lun30-sql-storage	Technical Solutions - SC13	Repl of DEM	10-lun30-sql-sto	11/17/2011 1	11:00:04 an	Mirror	Synced Synced	Active		0 MB	100%	Async	Up 🔺
Technical Solutions SC4	Technical Solutions - SC	lun80	Technical Solutions - SC13	Repl of 🎯	Edit Settings		01:09 an	Mirror	Synced	Active		0 MB	100%	Async	Up
	Technical Solutions - SC Technical Solutions - SC	lun90	Technical Solutions - SC13	Repl of	Create Replay		01:06 an	Mirror	Synced	Active		0 MB	100%	Async	Up
	Technical Solutions - SC Technical Solutions - SC	rdm100	Technical Solutions - SC13	Repl of	Threshold Alert	Properties	01:00 an	Mirror	Synced	Active		0 MB	100 %	Async	Up +
	•		III		Source Volume		,								F
	C Source Stor	ne Center	C Destinatio	n Sto	Destination Vol	ume	•								
	Name:	Technical Solutions	- SC12 Name:	1010	o connución y on	unic	13								
	Volume:	lun40	Volume:		Pause		10								
	State:	Up	Restore Time	×	Delete										
	CMM Attribute		Storage Cent	er Serve	r: Storage Cer	iler. 697	- /								
	Type:	Mirror	Replication	Mapping	as										
	Replay:	Active	Controller Port 5000D3100002BB2	Server P 5000D310	00028913 6	Status									
Viewers	CMM Left:	0 MB	5000D3100002BB2	5000D310	00028920 6	Up									E
	Finished:	100 %	5000D3100002BB2	5000D310	00028909 6 00002891F 6	Up									
Multi Storage Center	Replication At	tributes	5000D3100002BB2	5000D310	00002B914 6	Up									
Current Alerts	Transport Type:	ASYNC FC	5000D3100002BB2	5000D310	00002B90A 6	Up									
	Amount Remaini	ng: 0 MB	5000D3100002BB2	5000D310	00028921 6 00028909 6	Up Up									
Replications	Async Behind:	0 KB	5000D3100002BB26	5000D310	00002B91F 6	Up									
Reports	Qos Node: Copy Active:	4GD FIDer No	5000D3100002BB2	5000D310	00002B910 6	Up									
	Deduplicate:	No	5000D3100002BB26 5000D3100002BB26	5000D310	00002B914 6 00002B922 6	Up Up									
Chargeback	Remote Disk:	lun40 external disk	5000D3100002BB2	5000D310	00002B90A 6	Up									
Threshold Alerts	Controller Cor	nectivity	@ Controller (	Connecti	vitv	op									
	Source Destination	Status	Source Destina	tion Statu	IS										
Servers	SN 697 SN 700	Up	SN 699 SN 697	Up											-
Remote Data Collector	Attributes     Replay:	Progress Reports   🛃 I	O Reports												

Figure 6: Enterprise Manager - Setting up Replication Monitoring

- 2. The above step will pop up a screen that lets us define threshold definitions. There are 2 options for setting up Replication Alerts. These thresholds can either be based on
  - a. Amount Remaining (GB)
  - b. Percent Complete.

Based on the criteria required for the threshold, click "change" on the screen below

<sup>1)</sup> Set Threshold Alert Defin	itions	_	-	_	-	X	ſ
Threshold Amount Remaining	Name	Error ld Definitio	Warning In Assigned	Inform	Assigned Object	Change	
Percent Complete	No Thresho	ld Definitio	n Assigned			Change	
						Cancel	

3. On the Threshold Alert Definition Configuration screen, Name the threshold and set up the threshold values for sending out Error/Warning and Information. The schedule of when alerts need to be sent can also be selected. While setting up schedule, certain days of the week or certain time of the day can

also be excluded for sending alerts.

Threshold Alert Definition Configurati	on	×						
Select Threshold Type: IO Usage Storage Usage	Replication Usage							
Select Threshold Class:								
Select Threshold Definition: Amount Remaining Perce	Select Threshold Definition: Amount Remaining  Percent Complete							
Select Threshold Attributes: Threshold Definition Name:	SQL Data- Alert							
Threshold Value: Send Email: Iterations Before Email:	ErrorWarningInform809095%Image: State of the state							
Select Threshold Schedule Settings:         Only check definition during certain times         Start Time:       08:00:00 AM () End Time:         Only check definition during certain days         SUNDAY       MONDAY         V SUNDAY       TUESDAY								
Help Cancel	Fin	ish						



All the alert definitions created above can be edited/delete using the "Threshold Alerts" option on left bottom pane.

## **Replication Administration**

### DR Drill - Test activating DR

Now that the database volume replication was all set up and DR site pre-defined, a DR drill (testing the DR solution) could easily be performed without really breaking the existing replication. This is one of the really cool features that differentiate from a traditional DR solution like SQL Log-shipping where testing DR solution would mean re-setting the entire set up after the test completes.

In order to test the DR solution in the scenario above, the Enterprise Manager Client was connected from the laptop and following option from menu was selected:

"Replication Recovery -> Test Activate Disaster Recovery Site" (please see the screen below)

#### SQL Server Disaster Recovery with Compellent Storage Center



#### Figure 7: Enterprise Manager - DR Test Activation

Select the source and destination Storage Centers.

Activate Destination (DR Site) replication	Volumes		
Select the original source and d	estination Storage Centers:		
Original Storage Center	Destination Storage Center	Saved Replication Restor	
C SC3	C Technical Solutions - SC5	2	
C Technical Solutions - SC12	C Technical Solutions SC4	1	
C Technical Solutions - SC5	C Technical Solutions - SC12	6	
C Technical Solutions SC4	C Technical Solutions - SC5	2	
C Technical Solutions SC4	C Technical Solutions - SC12	7	
Help Cancel			🔶 Back 🔷 Next

On the next screen, select "Test Activation of View Volumes on Destination" and click "Next" to see the next screen.

	Destination Volume	Restore Time		Status/Reason
SOL Backup	SQL Backup	10/23/2011 18:22:34	DR site has already been activated	otatabjiteaboii
SOL TempDB	SOL TempDB	10/23/2011 18:22:34	DR site has already been activated	
lect volume(s) to activate or	destination (DR Site) Storage (	Center:		
Source Volume	Destination Volume	Restore Time		Status/Reason
🗑 SQL Backup	Repl of SQL Backup	11/14/2011 13:50:18	8 Source volume is still replicating	
🥃 SQL Data	SQL Data	11/22/2011 16:00:08	8 Source volume is still replicating	
SQL InstanceRoot	SQL InstanceRoot	11/22/2011 00:00:2	5 Source volume is still replicating	
📄 SQL Logs	SQL Logs	11/22/2011 16:00:00	7 Source volume is still replicating	

On the screen below, select all the volumes that need to be "test activated" and click Next

On the next screen, click start. Please make sure to see the correct DR server name under the column Server. If there are changes that need to be made for any volume, select the volume and make the changes using "Edit Selected" button and click on Start.

### SQL Server Disaster Recovery with Compellent Storage Center

Set attributes on volumes that need to be restored:						
Source Volume	Destination Volume	Restore Time	Server	Replay Profile		
SQL Backup	Repl of SQL Backup	Active	PG-SQL-CL2N1			
SQL Data	SQL Data	Active	PG-SQL-CL2N1			
SQL InstanceRoot	SQL InstanceRoot	> Active	PG-SQL-CL2N1			
SQL Logs	SQL Logs	Notive 💦	PG-SQL-CL2N1			
Edit Selected						

Wait till the next screen shows the "Restore Progress" state as "Restored" for all required volumes and click on "Finish" once done.

Activate Destination (D	OR Site) replicatio	n Volumes			
Postoro Prograss:					
Source Volume	State		Status		
SOL Backup	Restored	DR test volume has been activated			
SOL Data	Restored	DR test volume has been activated			
SOL InstanceRoot	Restored	DR test volume has been activated			
SQL Logs	Restored	DR test volume has been activated			
7 Help	ancel			<b>Back</b>	Finish

Once the DR Test Activation completes, connect to the DR server and within storage disk management, rescan the disks. Re-Scanning the disks will start showing up all the 4 disks. Online, Initialize the disks and assign appropriate drive letters to all these 4 disks. In the scenario above, the 4 volumes on DR server were named with drive letters J-> SQL Data, K -> SQL Logs, L -> SQL Instance Root and M -> SQL Backups.

After getting the volumes visible on the DR server, certain attributes on these volumes need to be cleared in order to recover the databases. This step is needed only when using the replays taken by Replay Manager which uses VSS (as compared to storage center). VSS assigns read-only, Hidden and Shadow-copy attributes to any volumes that have been created as a part of replay. It is important to clear these attributes for every volume being recovered. This activity can be automated using powershell or batch files. Please see below the process to clear the above attributes.

- A. Open command prompt on the DR server and type Diskpart. This will open the diskpart.exe command window.
- B. Type "List Volume" on the diskpart window. This command will list all the volumes that are shown up on this DR Server.

- [	C:\Windows\system32\diskpart.exe								
Microsoft DiskPart version 6.1.7601 Copyright (C) 1999-2008 Microsoft Corporation. On computer: PG-SQL-CL2N1									
	DISKPART> list volume								
	Volume ##	# Ltr	Label	Fs	Туре	Size	Status	Info	
	Volume 0 Volume 1 Volume 2 Volume 3 Volume 3 Volume 4 Volume 5 Volume 5 Volume 7 Volume 7 Volume 7 Volume 10 Volume 11 Volume 13 Volume 14	ДЕ ССОРНЦЕННУК <b>м</b>	ENU System Rese SQL Logs SQL Data SQL Logs SQL Instanc SQL Instanc SQL Data SQL TempDB SQL Backup SQL Data SQL Logs SQL Logs SQL Backup	CDFS NTFS NTFS NTFS NTFS NTFS NTFS NTFS NT	DUD-ROM DUD-ROM Partition Partition Partition Partition Partition Partition Partition Partition Partition Partition Partition Partition	0 B 4177 MB 100 MB 499 GB 1023 GB 19 GB 19 GB 19 GB 1023 GB 749 GB 999 GB 1023 GB 999 GB 499 GB	No Media Healthy Healthy Healthy Healthy Healthy Healthy Healthy Healthy Healthy Healthy Healthy Healthy Healthy	System Boot Hidden Hidden Hidden	
	DISKPART> _							-	

Figure 8: Disk part - Listing volumes

c. Select the volume for which attributes need to be changed. In the scenario above, the attributes of the J-drive (volume 12) were changed. The command to be used for the activity would be "Select vol 12"

	_								
🔜 C:\Windows\sy	stem32	2\diskpart.exe							
DISKPART> lis	t vol	ume					▲		
Volume ###	Ltr	Label	Fs	Туре	Size	Status	Info		
Volume Ø Volume 1 Volume 2 Volume 3 Volume 4 Volume 5 Volume 6 Volume 7 Volume 8 Volume 9 Volume 10 Volume 11	DE CGOPILFHT	ENU System Rese SQL Logs SQL Data SQL Instanc SQL Instanc SQL Instanc SQL Data SQL TempDB SQL Backup	CDFS NTFS NTFS NTFS NTFS NTFS NTFS NTFS NT	DUD-ROM DUD-ROM Partition Partition Partition Partition Partition Partition Partition Partition Partition	0 B 4177 MB 100 MB 499 GB 1023 GB 1923 GB 19 GB 19 GB 1023 GB 749 GB 749 GB 749 GB	No Media Healthy Healthy Healthy Healthy Healthy Healthy Healthy Healthy Healthy	System Boot Hidden		
Volume 12 Volume 13 Holume 14	M N	SQL Data SQL Logs SQL Backup	NTFS NTFS NTFS	Partition Partition Partition	1023 GB 499 GB 999 GB	Healthy Healthy Healthy	Hidden		
DISKPART> sel Volume 12 is DISKPART> _	DISKPART> select vol 12 Volume 12 is the selected volume. DISKPART>								

Figure 9: Disk part - Selecting volumes

d. Run the command below to confirm the attributes are set to Read-Only, Hidden and Shadow-Copy. The command is "Attribute vol"

C:\Windows\system	32\diskpart.exe					
Volume 2 Volume 3 C Volume 4 G Volume 5 O Volume 6 P	System Rese SQL Logs SQL Data SQL Logs	NTFS NTFS NTFS NTFS NTFS	Partition Partition Partition Partition Partition	100 MB 49 GB 499 GB 1023 GB 499 GB	Healthy Healthy Healthy Healthy Healthy Healthy	System A Boot
Volume 7 I Volume 8 L Volume 9 F Volume 10 H Volume 11 T	SQL Instanc SQL Instanc SQL Data SQL TempDB SQL Backun	NTFS NTFS NTFS NTFS NTFS	Partition Partition Partition Partition Partition	19 GB 19 GB 1023 GB 749 GB 999 GB	Healthy Healthy Healthy Healthy Healthy	Hidden
Volume 12 J Volume 13 K Volume 14 M	SQL Data SQL Logs SQL Backup	NTFS NTFS NTFS	Partition Partition Partition	1023 GB 499 GB 999 GB	Healthy Healthy Healthy	Hidden Hidden
DISKPART> select Volume 12 is the	vol 12 selected volum	ie.				
DISKPART> attribu	ite vol					
Hidden No Default Drive Shadow Copy DISKPART> _	: Yes Eetter: Yes : Yes					•

Figure 10: Disk part - View volume attributes

- e. Run the following 3 commands to clear all these attributes and set the value to False.
  - 1. Attributes volume clear readonly
  - 2. Attributes volume clear hidden

3. Attributes volume clear shadowcopy

After running all these commands, re-run "attributes vol" to confirm that the attributes have cleared.

C:\Windows\system32\diskpart.exe	- 🗆 ×	
DISKPART> attributes vol Read-only : Yes Hidden : Yes No Default Drive Letter: Yes		ĺ
Shadow Gopy . Tes DISKPART> attributes vol clear readonly Volume attributes cleared successfully.		
DISKPART> attributes vol clear hidden Volume attributes cleared successfully. DISKPART> attributes vol clear shadowcopy Volume attributes cleared successfully.		
DISKPART> attributes vol Read-only : No Hidden : No No Default Drive Letter: Yes Shadow Copy : No DISKPART> _	<b>_</b>	

Figure 10: Disk part - Clear volume attributes

After getting the volumes visible on the DR server and setting appropriate attributes to each volume, recovering a database is a fairly straight forward process. Using SQL Server Management studio, the database can be attached using GUI or a script just as if attaching a normal SQL Database with data and log files.

🧻 Attach Databases	
Select a page	Script - 🖪 Help
📑 General	
	Databases to attach:
	MDF File Location Database Attach As Owner Status Message
	J:\MSSQL\Data\Ad Adventure Adventure
	<u>A</u> dd <u>R</u> emove
	"AdventureWorks2008R2" database details:
	Original File Name File Type Current File Path Message
Connection	AdventureWorks20 Data J:\MSSQL\Data\Advent
Connection	AdventureWorks20 Log KtMSSQL\DATA\Adventur Not Found
Server: PG-SQL-CL2N1\DEV	
Connection:	
TEST\pgandhi	
View connection properties	
Progress	
Beadu	Add Latalog Hemove
incady.	
	OK Cancel

Figure 11: SQL Server Management studio - Attaching a database

## Failing over to DR site

Now that the database volume replication is all set up and DR site pre-defined, DR site fail over can easily be achieved, if need be.

In order to fail over to the DR server in the scenario above, Enterprise Manager Client was used. Select the following option from menu:

"Replication Recovery -> Activate Disaster Recovery Site" (please see the screen below)

### SQL Server Disaster Recovery with Compellent Storage Center

P TSEM01.techsol.local: Compellent Enterprise Manager: Technical Solution	15 - SC12	supplier has a fillent that	
🔅 Management 🛛 Replication Recovery 🧐 Storage Center View 🌔 Storage	Center Tasks 🚦 Help		🛟 Storage Center Manager 😰 Help
Storage Save Restore Points Validate Restore Points	Storage Mana ement ?X		👍 🖮 📰 🛄 🔍 Properties 🚳 Lindate 😷 Befrech
SC 18 🛞 Restore/Restart Volumes to Original Storage Center			🗸 🛶 🖬 👩 🗠 Hoperses 🗛 opdate 🎲 Keitesii
SC3 Anti-ate Disaster Personal Site		DR View of SQL Logs	
Test Activate Disaster Recovery Site		🥃 Summary 🥔 Mappings 🌌 Historical Usage 🔋 Statistics 🗼 Replays	
Predefine Disaster Recovery Site		A Map Volume to Server Z Remove Mappings 2 Modify Mapping	
🕥 Technical S 🕘 Delete Test DR Activated Volumes		Status Server LUN	Folder Path Mapped Via
Technical Solutions SC4	liz up a	🖉 Up 🔛 PG-SQL-QL2N1 3 /۸	ficrosoft/PG-Servers Server
		۲ سر سر سر سر سر می	,
👜 🥥 Recycle Bin		Status Type Volume	Server Co
Viewers		(2) up pour (in ten vilage ugs )	prospectari prosp
Multi Storage Center			
Current Alerts			
Replications Storage Center: 862			
Reports Disks			
Chargeback Assigned			
Threshold Alerts			
Servers Consistent-DB			
Remote Data Collector			,

Figure 12: Enterprise Manager - DR Failover

Select the source and destination Storage Centers. (SC5 to SC12 in the above scenario)

Activate Destination (DR Site) replication Vo	olumes			x
Select the original source and des	stination Storage Centers:			7
Original Storage Center	Destination Storage Center	Saved Replication Restor		
C SC18	C Technical Solutions - SC5	3		
C SC3	C Technical Solutions - SC5	2		
C Technical Solutions - SC12	C Technical Solutions SC4	1		
C Technical Solutions - SC5	C Technical Solutions - SC12	5		
C Technical Solutions SC4	C Technical Solutions - SC5	2		
C Technical Solutions SC4	C Technical Solutions - SC12	7		
Help Cancel			🔶 Back 🔷 Next	

On the next screen, select "Activate the Destination (DR Site) system", check the box "Only allow activation for source volumes that are not available or down" and click "Next" to see the next screen.

-	Activate Destination (DR Site) replication Volumes	x
	<ul> <li>Activate Replication Volumes on Destination (DR Site) System:</li> <li>Creates views and maps those views to a server on the destination system, for access to the volumes.</li> <li>Original source Storage Center:</li> <li>Technical Solutions - SC5</li> <li>Destination Storage Center:</li> <li>Technical Solutions - SC12</li> </ul>	
	<ul> <li>Test Activation of View Volumes on Destination</li> <li>Allows you to test DR site activation or view replication destination volumes</li> <li>Example: When you want to test if DR site activation will work properly</li> <li>Example: When you want to verify data is correct on destination side</li> <li>Activate the Destination (DR Site) System</li> <li>Allows you to activate a volume being replicated on the destination system</li> <li>Activation includes mapping the volume to a server and optionally selecting a replay template</li> <li>Only allow activation for source volumes that are not available or down</li> </ul>	
	Thep Cancel	ext

On the screen below, select all the volumes that need to be "Activated" and click "Next"

2	Activate Destination (DR Site) replication Volum	nes				X		
						-		
	Volumes that are still replicating or a	are not able to be restored:						
	Source Volume	Source Volume Destination Volume Restore Time						
	SOL TempDB	SOL TempDB	10/23/2011 18:22:34	DR site has already been activated				
	•	111						
	Select volume(s) to activate on desti	nation (DR Site) Storage Cer	nter:					
	Source Volume	Destination Volume	Restore Time		Status/Reason			
	🔽 🥃 SQL Backup	SQL Backup	11/22/2011 20:20:34	Source volume is still replicating		1		
	📝 🥃 SQL Data	SQL Data	11/30/2011 16:15:10	Source volume is still replicating		1		
	📝 闄 SQL InstanceRoot	SQL InstanceRoot	11/30/2011 00:00:36	Source volume is still replicating		1		
	📝 🥃 SQL Logs	SQL Logs	11/30/2011 16:15:08	Source volume is still replicating				
	٩ [	m						
					Unselect All Select All			
L	Help Cancel				Back 🔷 Next			

Select "Yes" for the warning below.

Activate	Destination Volume					
	At least one Volume to be activated still has an active source Volume.					
Activating this Volume will:						
	- Lose all information on the Volume that is not contained in the last whole replay that got replicated to the destination.					
	- All IO to source Volume will error out (make sure none is going on).					
	- Delete all mappings on the source Volume.					
	- Abort all replications from the source Volume.					
	See help for more information on activating a Volume on the DR Storage Center.					
	Do you want to continue?					
	Yes No					

On the next screen, click start. Please make sure to see the correct DR server name under the column Server. If there are changes that need to be made for any volume, select the volume and make the changes using "Edit Selected" button and click on Start.

Source Volume	Destination Volume	Restore Time	Server	Replay Profile
SQL Backup	SQL Backup	Active	PG-SQL-CL2N1	
SQL Data	SQL Data	Active	PG-SQL-CL2N1	
SQL InstanceRoot	SQL InstanceRoot	Active	PG-SQL-CL2N1	
SQL Logs	SQL Logs	Active	PG-SQL-CL2N1	
Fdit Selected				

Wait till the next screen shows the "Restore Progress" state as "Restored" for all required volumes and click on "Finish" once done.

Activate Destination (DF	R Site) replicatio	n Volumes	X
Restore Progress:			
Source Volume	State	Status	
SQL Backup	Restored	DR volume has been activated	-
🕝 SQL Data	Restored	DR volume has been activated	
SQL InstanceRoot	Restored	DR volume has been activated	
🥝 SQL Logs	Restored	DR volume has been activated	
💽 Help 🛛 🔀 Car	ncel		🔶 Back 🔒 Finish

Once the DR Activation completes, connect to the DR server and within storage disk management, rescan the disks. Re-Scanning the disks will start showing up all the 4 disks. Go ahead and Online, Initialize the disks and assign appropriate drive letters to all these 4 disks. In the scenario above, the 4 volumes on DR server were named with drive letters J-> SQL Data, K -> SQL Logs, L -> SQL Instance Root and M -> SQL Backups.

After getting the volumes visible on the DR server, certain attributes on these volumes needed to be cleared in order to recover the databases. This step is needed only when using the replays taken by Replay Manager which uses VSS (as compared to storage center). VSS assigns read-only, Hidden and Shadow-copy attributes to any volumes that have been created as a part of replay. It is important to clear these attributes for every volume being recovered. This activity can be automated using powershell or batch files. Please see below the process to clear the above attributes.

- C. Open command prompt on the DR server and type Diskpart. This will open the diskpart.exe command window.
- D. Type "List Volume" on the diskpart window. This command will list all the volumes that are shown up on this DR Server.

[	C:\Windows\system32\diskpart.exe									
Microsoft DiskPart version 6.1.7601 Copyright (C) 1999-2008 Microsoft Corporation. On computer: PG-SQL-CL2N1										
	DISKPART> list volume									
Т	Volume ###	Ltr	Label	Fs	Туре	Size	Status	Info		
	Volume Ø Volume 1 Volume 2 Volume 3 Volume 4 Volume 5 Volume 6 Volume 7 Volume 8	DE CGOPILF	ENU System Rese SQL Logs SQL Data SQL Logs SQL Instanc SQL Instanc SQL Instanc	CDFS NTFS NTFS NTFS NTFS NTFS NTFS NTFS NT	DUD-ROM DUD-ROM Partition Partition Partition Partition Partition Partition Partition	0 B 4177 MB 100 MB 49 GB 499 GB 1023 GB 499 GB 19 GB 19 GB 192 CB	No Media Healthy Healthy Healthy Healthy Healthy Healthy Healthy Healthy	System Boot Hidden		
1	Volume 9 Volume 10 Volume 11 Volume 12 Volume 13 Volume 14 DISKPART>	Р Н Ј К М	SQL Data SQL TempDB SQL Backup SQL Data SQL Logs SQL Backup	NTFS NTFS NTFS NTFS NTFS NTFS	Partition Partition Partition Partition Partition Partition	1023 GB 749 GB 999 GB 1023 GB 499 GB 999 GB	Healthy Healthy Healthy Healthy Healthy Healthy	Hidden Hidden ▼		

f. Select the volume for which attributes need to be changed. In the scenario above, the attributes of the J-drive (volume 12) were changed. The command to be used for the activity would be "Select vol 12"

1								
ł	🔣 C:\Windows\sys	stem32	2\diskpart.exe					
ļ	DISKPART> list							
	Volume ###	Ltr	Labe l	Fs	Туре	Size	Status	Info
	Volume Ø Volume 1	D E	ENU	CDFS	DUD-ROM DUD-ROM	0 B 4177 MB	No Media Healthy	
	Volume 2 Volume 3 Volume 4	C	System Rese	NTFS NTFS NTFS	Partition Partition Partition	100 MB 49 GB	Healthy Healthy Healthy	System Boot
	Volume 5 Volume 6	0 P	SQL Data SQL Logs	NTFS	Partition Partition	1023 GB 499 GB	Healthy Healthy	
	Volume 7 Volume 8 Volume 9	I L F	SQL Instanc SQL Instanc SQL Data	NTFS NTFS NTFS	Partition Partition Partition	19 GB 19 GB 1023 GB	Healthy Healthy Healthu	Hidden
	Volume 10 Volume 11	Ĥ Ţ	SQL TempDB SQL Backup	NTFS	Partition Partition	749 GB 999 GB	Healthy Healthy	
	Volume 12 Volume 13 Volume 14	J K M	SQL Data SQL Logs SQL Backup	NTFS NTFS NTFS	Partition Partition Partition	1023 GB 499 GB 999 GB	Healthy Healthy Healthy	Hidden
Ι	DISKPART> sel	ect v	ol 12					
ļ	Volume 12 is 1 DISKPART> _	the s	elected volum	e.				-

g. Run the command below to confirm the attributes are set to Read-Only, Hidden and Shadow-Copy. The command is "Attribute vol"

🔜 C:\Windows\sys	tem3	2\diskpart.exe					
Volume 2 Volume 3 Volume 4 Volume 5 Volume 6 Volume 7 Volume 8 Volume 9 Volume 10 Volume 11 Volume 11 Volume 13 Volume 14	ССОРІІЕНТУК	System Rese SQL Logs SQL Data SQL Logs SQL Instanc SQL Instanc SQL Data SQL TempDB SQL Backup SQL Data SQL Logs SQL Backup	NTFS NTFS NTFS NTFS NTFS NTFS NTFS NTFS	Partition Partition Partition Partition Partition Partition Partition Partition Partition Partition Partition Partition	100 MB 49 GB 499 GB 1023 GB 19 GB 19 GB 1023 GB 749 GB 999 GB 1023 GB 499 GB 999 GB	Healthy Healthy Healthy Healthy Healthy Healthy Healthy Healthy Healthy Healthy Healthy Healthy	System Boot Hidden Hidden Hidden
DISKPART> sele Volume 12 is t	ect ( the s	vol 12 selected volum	e.				
DISKPART> atti	ibut	te vol					
Hidden No Default Dri Shadow Copy DISKPART>	ive ]	- 185 : Yes Letter: Yes : Yes					•

- h. Run the following 3 commands to clear all these attributes and set the value to False.
  - 4. Attributes volume clear readonly
  - 5. Attributes volume clear hidden
  - 6. Attributes volume clear shadowcopy

After running all these commands, re-run "attributes vol" to confirm that the attributes have cleared.

1	🔣 C:\Windows\system32\diskpart.exe	
	DISKPART> attributes vol Read-only : Yes Hidden : Yes No Default Drive Letter: Yes Shadow Copy : Yes	
	DISKPART> attributes vol clear readonly	
	Volume attributes cleared successfully.	
	DISKPART> attributes vol clear hidden	
	Volume attributes cleared successfully.	
	DISKPART> attributes vol clear shadowcopy	
V	Volume attributes cleared successfully.	
	DISKPART> attributes vol Read-only : No Hidden : No No Default Drive Letter: Yes Shadow Copy : No DISKPART>_	-

After getting the volumes visible on the DR server and setting appropriate attributes to each volume, recovering a database is a fairly straight forward process. Using SQL Server Management studio, the database can be attached using GUI or a script just as if attaching a normal SQL Database with data and log files.

🧧 Attach Databases										
Select a page	🛒 Script 👻 📑 Help									
🚰 General										
	Databases to attach:									
	MDF File Location	Dat	abase	Attach As	Owner	Status	Message			
	J:\MSSQL\DataV	۸d Adv	enture	Adventure	TEST\					
	1					1				
				<u>A</u>	ydd	<u>F</u>	<u>lemove</u>			
	"AdventureWorks2008R	12" database de	e <u>t</u> ails: ——							
	Original File Name	File Type	Current F	ïle Path	M	essage				
Connection	AdventureWorks20	Data	J:\MSS0	QL\Data\Adver	nt					
Commo	AdventureWorks20	Log	K‡\MSSC	QL\DATA\Adve	entur N	lot Found				
PG-SQL-CL2N1\DEV										
Connection:										
TEST\pgandhi										
View connection properties										
Progress				6.4.4.6	2-1-1	1				
Ready				Page 7	_atalog		nemove			
L										
						к	Cancel			

### **Pausing/Removing Replication**

If replication needs to be either paused or removed replication for a particular volume, it can be done using Enterprise Manager Client.

For the scenario above, using Enterprise Manager Client,

1. Logon to the Enterprise Manager client

- Click on "Replications" on the left bottom pane. This will populate a list of all the volumes that are being replicated on the right pane. In order to Narrow down, select the "Source storage center" (SC5) in my case. This will show all the volumes being replicated from SC5.
- 3. Right click the volume that needs to be paused or deleted and select "Pause" or "Delete" depending on the action needed.



#### Figure 13: Enterprise Manager Client - Pausing/Deleting volume Replication

#### **Powershell Automation**

Dell Compellent provides an extremely powerful Powershell Command set. Using this Command set, one can automate all the activities that were performed above. The powershell documentation can be downloaded (<u>http://kcint.compellent.com/Knowledge Center Documents/PSCS060100\_003A.zip</u>)

## Conclusion

Using Compellent storage level replication data can be quickly and efficiently replicated across various sites geographically separated with extreme ease. This storage level replication provides various benefits over traditional SQL HA/DR solutions like point in time recovery, DR drill capability without impacting actual DR process. It is extremely easy to fail over between DR sites and also to fail back.