## Document Revision

Table 1. Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/26/2011</td>
<td>A</td>
<td>Initial draft</td>
</tr>
<tr>
<td>04/24/2012</td>
<td>B</td>
<td>Content and format change</td>
</tr>
</tbody>
</table>

THIS TECHNICAL TIP 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.

© 2012 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.

Trademarks used in this text: Dell™, the DELL™ logo, 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.

April 2012 Rev. B
Contents

Introduction .......................................................................................................................... 1
Customer support .................................................................................................................. 1
Document Conventions ........................................................................................................ 1
Audience ............................................................................................................................... 2
Scope .................................................................................................................................. 2
Features of Dell Compellent Storage Center ................................................................. 2
  Remote Instant Replay (Remote Replication) ................................................................. 3
  Data Instant Replay™ (DIR) ............................................................................................ 3
  Consistency Group ............................................................................................................ 4
Disaster Recovery Challenges .......................................................................................... 5
Replicating Oracle Using Remote Instant Replay ............................................................ 5
  Dell Compellent Remote Replication Setup ................................................................. 6
Conclusion ........................................................................................................................... 18

Figures and Tables
Table 1. Revision History ................................................................................................. ii
Table 2. Conventions .......................................................................................................... 1
Figure 1: Remote Replication ............................................................................................ 3
Figure 2: Data Instant Replay (DIR) .................................................................................. 3
Figure 3: Consistency Group and Oracle ........................................................................... 4
Figure 4: Dell Compellent Remote Replication Setup ..................................................... 6
Figure 5: Starting Dell Compellent Enterprise Manager .................................................... 7
Figure 6: Enterprise Manager: Replicate Volumes ............................................................ 8
Figure 7: Enterprise Manager: Select the destination Storage Center ............................... 9
Figure 8: Enterprise Manager: Select volumes to replicate .............................................. 10
Figure 9: Enterprise Manager: Choose Replication Type ................................................ 11
Figure 10: Enterprise Manager: Choose Destination Folder ............................................. 12
Figure 11: Enterprise Manager: Replication Target Defined ........................................... 13
Figure 12: Enterprise Manager: Start Replication ............................................................. 14
Figure 13: Enterprise Manager: Replication Results .......................................................... 15
Figure 14: Enterprise Manager: Saving Restore Points ...................................................... 16
Figure 15: Enterprise Manager: Save Restore Points ......................................................... 17
Figure 16: Enterprise Manager: Finished saving Restore Points ........................................ 18
Introduction

IT leaders are continually reacting to current markets and uncertain economic outlook by establishing efficient and effective IT organizations that deliver on business transformation. A survey taken by Ernst & Young has shown that one of the top five priorities of business transformation on the minds of CIOs is business continuity\(^1\), an activity performed to ensure critical business functions are available during a disastrous event. It’s estimated that only 6 percent of companies suffering from a catastrophic data loss survive, 43 percent never reopen, and 51 percent close within two years\(^2\).

IT disaster recovery, commonly known as DR and a subset of business continuity, is a culmination of processes, procedures, and policies necessary for keeping critical IT systems functioning in the event of a disaster. This document describes how disaster recovery can be accomplished with Oracle and Dell Compellent Storage Center using Remote Replication in a simple but straightforward method, reducing the costs and management of the business continuity environment.

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 support@compellent.com. Dell Compellent responds to emails during normal business hours.

Document Conventions

<table>
<thead>
<tr>
<th>Table 2. Conventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
</tr>
<tr>
<td>Menu items, dialog box titles, field names, keys</td>
</tr>
<tr>
<td>Mouse click required</td>
</tr>
<tr>
<td>User Input</td>
</tr>
<tr>
<td>User typing required</td>
</tr>
<tr>
<td>System response to commands</td>
</tr>
<tr>
<td>Output omitted for brevity</td>
</tr>
<tr>
<td>Website addresses</td>
</tr>
<tr>
<td>Email addresses</td>
</tr>
</tbody>
</table>

\(^1\) [http://informationweek.in/Software/12-04-23/48_percent_of_CIOs_identify_business_continuity_as_one_of_their_top_five_priorities.aspx](http://informationweek.in/Software/12-04-23/48_percent_of_CIOs_identify_business_continuity_as_one_of_their_top_five_priorities.aspx)  
April 24, 2012

\(^2\) [http://findarticles.com/p/articles/mi_m0DUD/is_1_22/ai_68864006/](http://findarticles.com/p/articles/mi_m0DUD/is_1_22/ai_68864006/)  
April 24, 2012
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.

**Audience**

This paper is intended for database administrators, system administrators, storage administrators, and architects that design, maintain, and need to understand how to configure Oracle databases on Dell Compellent Storage Center. Readers should be familiar with Dell Compellent Storage Center and have prior experience in configuring and operating the following:

- Oracle Architecture
- Oracle 10g and 11g
- Replication Technologies
- General understanding of SAN technologies

**Scope**

This white paper explains the Dell Compellent Storage Center features, steps, how-tos, and best practices to combine Oracle with Dell Compellent storage technology to meet these DR challenges.
Features of Dell Compellent Storage Center

Remote Instant Replay
Remote Instant Replay (Remote Replication) replicates continuous snapshots, called “Replays” between local and remote sites, ensuring business continuity at a fraction of the cost of other replication solutions. Using Dell Compellent’s wizard-based setup, customers are only several clicks away from a replication solution. Remote Instant Replay supports traditional Fibre Channel replication or cost-effective IP-based (iSCSI) replication which brings disaster recovery within reach of every budget.

Storage Center intelligently optimizes replication at the block-level to provide a more efficient replication solution called Thin Replication. During the initial site synchronization process, Thin Replication sends only written data instead of the allocated but unused space sent by other replication technologies. For ongoing replication, Thin Replication transfers only the changed data, consuming less space and lowering bandwidth costs. Because Thin Replication is space-efficient, you can create an unlimited number of Replays and easily replicate those Replays to one or more locations. This unlimited granularity enables short recovery intervals, allowing more recovery points so you can instantly recover from any point in time.

Data Instant Replay™ (DIR)
Data Instant Replay (DIR) is most compared to “snapshot” technology and provides continuous space-efficient data protection using a feature called Replays. Replays create point-in-time copies of your volumes where further changes to a volume are journaled in a way that allows the volume to be rolled back to its original state when the replay was created. This not only saves disk space, but speeds local recovery of lost or deleted files. Replays can be mounted as volumes, called view volumes, for the sake of partial or full volume data restore.

Policy based schedules, with varying intervals and expiration, can be created to manage Replays and provide greater recovery capabilities to a previous know state, and there is no limit on the number or replays taken. Replays,
when used in conjunction with another feature call Consistency Groups, provide data integrity of data spanning multiple volumes.

Consistency Group

Dell Compellent’s Consistency Group feature allows storage administrators to take a snapshot of an Oracle database atomically. When creating a snapshot of an open database, you must ensure that all storage volumes (LUNs) that make up your database be atomically snapped because of multiplexed control files and redo log files. Remember that Oracle writes to multiplexed control files and redo log files concurrently, so without a consistency group you cannot create a consistent snapshot of a running database.

If a consistency group is not used, the database must be configured with all control files in one volume and all redo log files in the same volume or another volume, but cannot be spread across volumes whether file system or Oracle ASM is used. The Consistency Group feature gives you the ability to

Figure 3: Consistency Group and Oracle
create a usable snapshot of a database with control files and redo log files spread across volumes which is to safeguard against single point of failure.

Disaster Recovery challenges

With the rise in information technology and the reliance on business-critical data, a disaster recovery plan should be in place in order to restart business operations in the event of a natural or human caused disaster.

For example: Your datacenter currently houses the following production servers:

- Business-critical database
- Business-critical applications

If disaster strikes your datacenter and you do not have a dual data center or alternate DR site, you will need to rebuild your servers and restore everything from offsite backup tapes. This will take a lot of time and effort and does not guarantee you will get everything back. Some of your applications may be obsolete and the last data backup to tape may be several days old. This all lends itself to the potential loss of mission-critical business applications and data.

With Dell Compellent Remote Instant Replay feature, all of these concerns can be eliminated.

Replicating Oracle using Remote Instant Replay

Let's assume that you have two datacenters (production and DR). These datacenters are currently interconnected via a Fibre Channel link or IP based link. Your production site has one Dell Compellent Storage Center and your DR site has another Dell Compellent Storage Center. You are running business-critical databases at your production site and would like to implement replication. You can configure your database volumes to be replicated to your DR site. Of course, there is a server at the DR site to mount the volumes in case a disaster occurs at the production site, but you don’t want to leave this server untouched. This would be a waste of resources and money.

In order to get your best ROI, you can utilize this DR server as your test or development server by creating and mounting separate volumes on the DR server. In the event of disaster, you can then un-mount your test or development database volumes so you don’t waste server’s resources and mount the production DR volumes on your DR server. This will allow you to restart production at your DR site.

Performing Oracle replication using Dell Compellent Remote Replication couldn’t be easier. There are two types of replications:

- Synchronous mode
  - In this mode, any write to a source volume will not be acknowledged by the application until the IO is confirmed on the DR site. Use this mode only if you have a high bandwidth link between the two sites (i.e. Fibre Channel link).
- Asynchronous mode
  - In this mode, the application will return a success as soon as the IO is written to the source volume.

---

**Dell Compellent Remote Replication setup**

Below is an example of how to set up asynchronous replication for an Oracle Database running on a Linux server.

Assumptions:

- An Oracle 10g or 11g instance is running and its database is open on a Linux database server.
- Dell Compellent Enterprise Manager Client version 5.5.5.8 is used.
- Dell Compellent Storage Center (SC) Versions: 5.5.6 (source SC) and 5.5.4 (target SC)
- The database spans 4 volumes on the source SC. The 4 volumes are:
  - Cam-OEL5U5-x64-dorabase (Contains $ORACLE_HOME)
Oracle Disaster Recovery with Compellent Remote Replication

Cam-OEL5U5-x64-oracle-tst-archivelogs (Contains archive logs)
Cam-OEL5U5-x64-oracle-tst-oradata (Contains datafiles)
Cam-OEL5U5-x64-oracle-tst-redologs (Contains redo logs)

The database is in archive log mode

The fabric allows connectivity between the source and target Storage Centers

A folder, which will be used to contain the replicated database, was pre-created on the target SC.

1. On the database server, start SQL*Plus and put the database in backup mode and force Oracle to switch out the current log and archive it:

   ```sql
   alter database begin backup;
   alter system archive log current;
   ```

2. Create replays of the above volumes by using a Storage Center consistency group that contains all four volumes.

3. Take the production database out of backup mode:

   ```sql
   alter database end backup;
   ```


   ![Figure 5: Starting Dell Compellent Enterprise Manager](image)

5. On the left-hand side under heading ‘Storage Centers’, right click on the source Storage Center that hosts the database and select: ‘Tasks’, ‘Replication’, and ‘Replicate Volumes’
6. From the ‘Create Replication Wizard’ window, select the destination Storage Center (SC) for the replication. In this example, the destination SC is ‘SC 14’. Select ‘Next’.
Figure 7: Enterprise Manager: Select the destination Storage Center

7. A new replication wizard window appears. Locate and select the check box of the volumes you want to replicate and click ‘Next’.
8. Choose the replication type, transport type, Qos definition, Storage Type, Destination Volume Name Prefix, and Folder.

Note: if check box ‘Replicate Active Replay’ is selected, after the replays are initially created and the replication is started, any changes made to the source volumes will automatically replicate to the destination volumes without recreating replays on the source volumes. However, taking subsequent replays for replication is a must to guaranteed recovery points. You would need to make a decision for how to implement replication based on your business requirements.
To change the destination folder, select ‘Change’ and then locate and highlight the desired folder and select “OK”
If the folder does not exist, select ‘Create Volume Folder’ and follow the instructions given in the windows to create a new folder.
Once the replication has been defined, select ‘Next’
9. A final replication wizard screen appears. Select “Start” to begin the initial replication.

![Enterprise Manager: Start Replication](image-url)
10. When replication completes, select ‘Next’

Figure 13: Enterprise Manager: Replication Results
11. Select check box ‘Save Restore Points’ and the select ‘Finish’

Figure 14: Enterprise Manager: Saving Restore Points
12. Select ‘Next’

Figure 15: Enterprise Manager: Save Restore Points
13. Select ‘Finish’

![Enterprise Manager: Finished saving Restore Points](image)

**Figure 16: Enterprise Manager: Finished saving Restore Points**

**Conclusion**

With Dell Compellent’s Remote Instant Replay feature, you can be rest assured that your production environment will be up and running in a matter of minutes. Dell Compellent Remote Instant Replay provides a robust and reliable business continuity solution for your company critical data against any natural disasters or any unplanned outages. All it takes is a few clicks in the GUI and you are all set.