Zero Data Loss Recovery Appliance – a good investment?!?

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- Training

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- 200 Service Level Agreements
- Over 4,000 training participants
- Research and development budget: CHF 5.0 million
- Financially self-supporting and sustainably profitable
- Experience from more than 1,900 projects per year at over 800 customers
Trivadis at DOAG 2015

Level 3 - next to the escalator

We look forward to your visit.

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Technology on its own won't help you. You need to know how to use it properly.
Agenda

1. Data protection story
2. ZDLRA functionality
3. Recovery Appliance configuration
4. Recovery Appliance implementation architecture
5. Prices & Licences
6. Evaluation Questions (& Answers)
7. Conclusion
Zero Data Loss recovery Appliance - a good investment?!!

18/11/2015
Top Challenges
Data Protection Best Practices:
To Ensure Complete Data Protection Use “3-2-1 Rule”

- **3** Three copies of the data
  *(production copy, DP copy, decoupled DP copy)*
- **2** At two different locations
- **1** One copy on tape (decoupled)
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<th>Category</th>
<th>Technology / Solution</th>
<th>Recovery Time Objective (RTO)</th>
<th>Recovery Point Objective (RPO)</th>
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<td>Physical Data</td>
<td>Recovery Manager (RMAN)</td>
<td>Days/Hours</td>
<td>As of last backup</td>
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<td>Protection</td>
<td><strong>Zero Data Loss Recovery Appliance</strong></td>
<td>Days/Hours</td>
<td>Sub-second</td>
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<td>Data Guard or Active Data Guard</td>
<td>Minutes/Seconds</td>
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<td>Logical Data</td>
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<td>Protection</td>
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<tr>
<td>Recovery Analysis</td>
<td>Data Recovery Advisor (DRA)</td>
<td>Optimized</td>
<td>Optimized</td>
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<td></td>
<td>Minimizes time for problem identification &amp; recovery planning</td>
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Most enterprises expect 50x data growth by 2020, resulting in sprawling data sets at high risk for data loss.
From DBLRA to ZDLRA

History:
- OOW 2013: DBLRA
  - Database Logging Revocery appliance
- OOW 2014: ZDLRA
  - Zero Data Loss Recovery Appliance
- Jan 2015: X5 ZDLRA

Why this tongue-twister name??

DeBRA was not to bad…
Now it seems to be a ZeBRA
ZDLRA Functionality
Design goals of ZDLRA

- **Eliminate data loss**
  - Zero to Sub second

- **Database Level Recoverability**
  - Not only files or backupsets/pieces
  - Any point in time

- **Minimal Impact Backups**
  - Least CPU usage
  - Least IO generation

- **Cloud-scale Database Protection as a Service**
  - Different service levels
  - Linear scale out
Recovery Appliance Architecture

Protected Database

Protected Database

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Protected Database

Protected Database

Protected Database

Protected Database

Protected Database

Delta Store Compresses and Validates Backups

Incremental Forever Backups and Real-Time Redo

Recovery Catalog

Recovery Appliance Metadata Database

Oracle Secure Backup

Recovery Appliance

Recovery Appliance

Oracle Enterprise Manager Cloud Control

Tape Library

Tape Archival

Downstream Recovery Appliance

Replicated Backups
Eliminate data loss – Real Time redo transport

- Real Time redo transport
  - Data Guard like but asynchronous
  - Changes out of Logbuffer transferred
  - Validate and writes to a stage area

- Redolog switch on database
  - RA converts the staged redo data to a compressed archived redolog backup
  - Writes this archlog backup to catalog
  - Ready for future restores

- Explizit Archlog backup NOT necessary

⇒ Reduces RPO to (near) zero
Secure Recovery Appliance Replication – DR

One Way

Bi-Directional

Hub & Spoke

Datacenter 1

Datacenter 2

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Autonomous Tape Archival

- RA not the Database writes to Tape automatically
- RA creates a non-virtual full backup to tape
- Oracle Secure Backup used no need for 3rd party media manager
- Optimized write to tape from one system
End-to-End Data Validation – Recovery Reassurance

- A BR basic principle
  → ensure that backups can be restored successfully
- Prevent/detect corruption
  - One out of four restore fail

- Recovery Appliance validates data everytime
  - Incoming, Stored, Restored, Replicated
Minimal Backup Overhead

- Traditional Backup
  - Read/Write for Disk/Tape Backup
  - Deduplication
  - Compression
  - Validation
  - Deletion
  - Merging
- All on database host
  ➔ Degrade performance

- Recovery Appliance
  - Offloading operations
  - Delta Push
  - Delta Store
Delta Push – incremental forever

Delta Push is a highly optimized form of source-side deduplication
– Trough RMAN block change tracking
– No reading of unchanged data
– No commited undo

Two operations on the protected Database
– Incremental backup
– Real time redo transport

One-time full backup as prerequirement
Afterwards Incremental forever backup

⇒ Less data, less I/O, less networktraffic
Delta Store – the “brains” of the Recovery Appliance

Backup
- Validates the incoming blocks
- Compresses, indexes and stores
- Creates a *Virtual Full Database Backups*
- 10 times less storage usage
- High number of virtual full backups
- Higher recover window

Day 0 Full
Day 1 Incr
Day N Incr

Day N Virtual Full
Day 1 Virtual Full

Backup validates the incoming blocks, compresses, indexes and stores. It creates a *Virtual Full Database Backups* with 10 times less storage usage, a high number of virtual full backups, and a higher recover window.
Delta Store – fast restore/recover

**Restore**

- Recreates a physical full backup out of a virtual one
- No need of transfer and apply incremental backups
- Roll forward with restored redologs
- Uses Exadata performance and scalability

**Day ‘N’ Full Backup**

- Day 0 Full
- Day 1 Incr
- Day N Incr

**Delta Store**

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**Improved End-to-End Data Protection Visibility**

- Oracle Cloud Control
  - EM ZDLRA plug in
  - Administration
  - Monitoring
  - Alerting / Reporting
  - Overview from Disk/Tape to replicas
- DBMS_RA Package
  - CLI alternative
- Recovery Appliance catalog views
Policy-Based Database Protection as a Service

Gold Policy – Customer Critical
- Disk: 45 days
- Tape: 90 days

Silver Policy – Internal Critical
- Disk: 30 days
- Tape: 45 days

Bronze Policy - Test/Dev
- Disk: 15 days
- Tape: 30 days

- Standardized protection policies
  - Recovery window
  - Retention
  - Replication

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The Recovery Appliance automatically provisions space so that the recovery window goal for each database is met.

- According to its
  - Policies
  - Deletion rules
- Alerts Admin in case of space problems
Massive Scale out – Oracle Database Backup Service

- 10/100/1000 DBs across datacenters
- RMAN-integrated subscription-based backup storage in the public cloud
- RMAN compression and encryption
- quickly and easily setup with a secure, low-cost backup
- Flexibility in backup/archive concepts
- The Recovery Appliance flexibly supports both tape and cloud archival option
Recovery Appliance Configuration
Base Rack Recovery Appliance X5

2 **Compute** Servers, each:
- 2 x Eighteen-Core Intel® Xeon® E5-2699 v3 Processors (2.3 GHz)
- 256 GB Memory
- Connectivity (1/10Gb Ethernet copper/optical, Fibre Channel HBA, 40Gb/s InfiniBand Ports)

2 x 36 port QDR (40 Gb/sec) **InfiniBand** Switches

3 x **Storage** Servers
- 2 x Eight-Core Intel® Xeon Processors
- 12 x 8TB (raw) 7,200 RPM High Capacity disks
- 32TB usable (tripple mirrored)
... up to Full Rack Recovery Appliance X5

- Increase storage capacity by server
  - Up to 18 storage server
  - 580TB usable
  - 5.8 Petabytes of virtual Backups effectively
- Fully Scale-out Architecture
  - Up to 18 Racks
  - 10PB usable, 100PB virtual backups
Performance Characteristics

Backup
- receive 12 TB/hour of change data
- convert it into 120TB/hour of virtual backups
- Linear with rack scale out
- 216 TB/hour of Delta Ingest
- 2 Petabytes/hour of virtual backups

Restore
- 12 TB/hour restore
- Linear with rack scale out
- 216 TB/hour restore
Protected Databases requirements

- Oracle 10gR2 – 12c
- All supported OS Platforms
- **Configuration**
  - Create RA Users and permissions
  - Define a protection policy
  - Set RA connection credentials
- **Recovery Appliance Backup Module**
  - an Oracle-supplied SBT library
  - to transfer backup data over the network

- Installed in all ORACLE_HOME
  - Protected DBs
  - Replicating upstream RA
Download/Install RA Backup SBT Module from OTN

Zero Data Loss Recovery Appliance (ZDLRA) Backup Module


Thank you for accepting the OTN License Agreement; you may now download this software.

ZDLRA Backup Module allows Oracle Database 10gR2, 11g, and 12c to be configured for backup and restore, using standard Recovery Manager (RMAN) commands, to and from ZDLRA.

Supported Oracle Database Versions (EE & SE): 10.2.0.4 and above
Supported Platforms (64-bit): Linux, Solaris, SPARC, HP-UX, AIX, Windows, zLinux

* All Supported Platforms (2,453,131 bytes) (Requires JDK version 1.5 or higher) README
Configuring Protected Databases
Configuring Backup Settings for Protected Databases

Using Cloud Control

![Cloud Control interface](image)

Using Command Line Interface

```bash
% rman target /

CONFIGURE CHANNEL DEVICE TYPE SBT PARMS 'SBT_LIBRARY=/u01/app/oracle/product/12.1.0.2.0/dbhome_1/lib/libra.so, ENV=(RA_WALLET='location=file:/u01/app/oracle/product/12.1.0.2.0/dbhome_1/dbs/ba
credential_alias=recoapp1.trivadis.com:1521/RecoveryAppliance1:dedicated')'
```
ZDLRA Monitoring

This is huge 😊 on all Levels

- … of Recovery Appliance
- … of Protected DB
- … of Backup/Restore
- even of Tape infrastructure
Recovery Appliance Implementation Architecture
Architecture Protected DBs

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Recovery Appliance & Oracle MAA

Production Site

RAC
- Scalability
- Server HA

ASM
- Local storage protection

Flashback
- Human error correction

Active Replica

Active Data Guard
- Data Protection, DR
- Query Offload

GoldenGate
- Active-active (heterog.) replication

RMAN, Oracle Secure Backup, Zero Data Loss Recovery Appliance
- Backup to disk, tape or cloud
Recovery Appliance & Oracle HA Technologies

**ZS3 Backup Appliance**
- Fast, low cost Backup-Storage
- RAID-Z and compression for efficient usage
- Snapshot and Cloning for dev/test environment provisioning

**Zero Data Loss Recovery Appliance**
- Real-time redo transport, stores history for weeks/months
- Offload Disk and Tape Backup load from production systems
- Scaleable Database Protection as a Service for enterprises

**Active Data Guard**
- Fast failover for single DBs, max availability (RTO ~ = 0)
- Real-Time Redo Transport (RPO = 0)
- Optimal Performance and Availability through offloaded reporting
Prices/Licences
The ZDLRA software license includes

- Use of Recovery Appliance software only on Recovery Appliance hardware
- Restricted use of Oracle Database Enterprise Edition and the following options:
  - Oracle Real Application Clusters, Oracle Advanced Compression Option, Oracle Advanced Security Option, and Oracle Partitioning
  - Databases are created and used by Recovery Appliance software – customers cannot create their own databases
- Oracle Secure Backup
- Oracle Enterprise Manager Packs, with restriction for use only with the ZDLRA
  - Oracle Diagnostics Pack
  - Database Lifecycle Management Pack for Oracle Database
- Oracle Exadata Storage Server Software
Prices

**Hardware**
- Base Rack: $290k (200k + 30k per storage cell)
- Additional storage cells: $30k each
- Full Rack: $740k (same as Base Rack + 15 storage cells)
- + OS & HW Maintenance

**Software Licensing**
- Licensing per physical disk
- $6k per disk
- Base Rack = 12 * 3 * 6k = $144k
- Full Rack = 12 * 14 * 6k = ~$1000k
- + SW Maintenance
Evaluation Questions (&Answers)
ZDLRA or Data Guard?

I have already Data Guard, does it make sense to implement ZDLRA?

- The Recovery Appliance provides similar levels of data protection as in Data Guard today, for databases that do not necessarily require Data Guard’s fast failover and query offload capabilities.

- True, Data Guard has much better RTO with similar RPO.

- Backup has to be done anyway, why not in the best way?

⇒ Data Guard AND Recover Appliance
ZDLRA or Media Manager infrastructure?

I have a Media Manager Infrastructure in place, does it make sense to implement ZDLRA?

- The Recovery Appliance can be integrated into the Media Manager Infrastructure for archiving backup to tape
  - Either Oracle Tape HW or 3rd party
  - Either Oracle Secure Backup or 3rd party Media Manager Software

- ZDLRA is an optimal Stage area for efficient transfer of backupsets to tape

→ Media Manager AND Recover Appliance
Market acceptance of ZDLRA?

Do we have a lot of Reference customers for ZDLRA?

- As of everybody has a more or less woring backup the obvious need is not often seen
- ZDLRA is an additional piece in the backup infrastructure, in most cases not replacing one part
- The market will need time, as it needed for Exadata to see the benefits

→ It’s an infrastructure optimization question
Evaluation Case ZDLRA
Is the investment worth it?

Customer backup status
- Je 2 Exadata 1/4 and 1/2 Rack
- > 130 DBs
- ~ 13 TB DB space
- 200 GB/h Redo generation
- 18TB daily Backup volume
- 30 days retention
- 25%+ of CPU used during Backup
- Typical data protection challenges
- Data Guard for RPO

Recovery Appliance
- Base Configuration is far enough
  - Price ~ $500k
- Save RDBMS CPU License (25%)
- Save expensive Backup Space in Exa
- Save 50% Standby Site CPU due to improved RPO
- Quality
- Risk
- TCO

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Conclusion
Conclusion

- Oracle reinvented the Database Protection with the ZDLRA
- Existing well known functionality is assembled in a innovative way
- RPO ist (near) zero
- Even RTO ist much better than existing systems
- Comprehensive End-to-end Monitoring

➤ Risk reduced, cost reduced, quality improved

➤ ZDLRA will find it’s customer!
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Further information…

http://docs.oracle.com/cd/E55822_01/index.htm
# Zero Data Loss Recovery Appliance Documentation

Release 12.1

http://docs.oracle.com/cd/E55822_01/index.htm

## Release Notes

- Release Notes

## Deployment

- Safety and Compliance Guide

## Administration

- Administrator's Guide

## Protected Database Configuration

- Protected Databases Configuration Guide

## Master Glossary

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- Database Licensing Information
- Secure Backup Licensing Information