Zero Data Loss Recovery Appliance: Leveraging Integration with Oracle Cloud

PRO 4217

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Program Agenda

1. Recovery Appliance & Oracle Cloud Integration
2. Recovery Appliance & Oracle Cloud @ Customer Integration
3. Dialog Semiconductor: ZDLRA combined with ExaCC
Oracle Flexible Deployment Choices

On-Premises

Customer Data Center
Purchased
Customer Managed

Cloud at Customer

Customer Data Center
Subscription
Oracle Managed

Public Cloud Service

Oracle Cloud
Subscription
Oracle Managed
On-Premises Recovery Appliance
Zero Data Loss Recovery Appliance

**Protected Databases**
- RMAN Driven Framework
- Petabytes of data
- Oracle 10.2-12c, any platform
- No expensive DB backup agents

**Delta Push**
- Send only Incremental changes and no more full backups
- Real-time transactions copied over for continuous data protection

**Delta Store**
- Stores validated, compressed data on disk
- Fast restores to any point-in-time
- Built on Exadata scaling and resilience
- Enterprise Manager end-to-end control

**Recovery Appliance**
- Integrated Media Manager / Third Party Backup Client SW

**Offloads Tape Backup**
- Replicates to Remote Recovery Appliance
- Offloads Tape Backup

**Integration**
- Delta Push
- Delta Store
Recovery Appliance with Oracle Cloud
Zero Data Loss Recovery Appliance with Oracle Cloud

**Protected Databases**
- Protects all DBs in Data Center
  - Petabytes of data
  - RMAN-driven backup & restore
  - Oracle 10.2-12.2, any platform
  - No expensive DB backup agents

**Delta Push**
- DBs access and send only changes
  - Minimal impact on production
  - Real-time redo transport instantly protects ongoing transactions

**Delta Store**
- Stores validated, compressed DB changes on disk
  - Fast restores to any point-in-time using ‘virtual full’
  - Built on Exadata scaling and resilience
  - Enterprise Manager end-to-end control

**Recovery Appliance**
- Offloads Cloud / Tape Backup
- Replicates to Remote Recovery Appliance
Recovery Appliance Archive to Cloud: Backup Workflow

On-Prem Protected Databases

On-Prem Recovery Appliance

Oracle Key Vault server

Movement from Object Storage to Archive Storage based on Tiering Policy of the Object Storage Container (5)

1. Incremental backup sent unencrypted to ZDLRA – Virtual Full is created
2. ZDLRA requests encryption key from OKV server
3. OKV server sends encryption key to ZDLRA
4. ZDLRA encrypts virtual full backup pieces and sends them to cloud storage
5. If container class is Tiering, backup pieces are moved to Archive Storage
1. Restore request from ZDLRA is initiated on Protected DB
2. ZDLRA requests encryption key from OKV server
3. OKV server sends encryption key to ZDLRA
4. ZDLRA requests backup pieces from cloud storage
5. If backup pieces are in Archive Storage, they are first recalled to Object Storage
6. ZDLRA retrieves backup pieces from Object Storage, decrypts them and sends them to Protected DB
On-Prem Protected Databases

1. Restore request from Cloud Storage is initiated by Protected DB
2. Protected DB (must be enrolled as OKV endpoint) requests decryption key to OKV server
3. OKV server sends decryption key to Protected DB
4. Protected DB catalogs & reads backup pieces from Cloud Object Storage

Note: Restoring directly from Oracle Cloud Archive Storage will be announced at a future time.
1. Restore request from Cloud Storage is initiated by Cloud DB
2. Cloud DB (must be enrolled as OKV endpoint) requests decryption key to OKV server
3. OKV server sends decryption key to Cloud DB
4. Cloud DB catalogs & reads backup pieces from Cloud Object Storage

Key may alternatively be exported from OKV server into a wallet file and then copied to Cloud DB instance (2,3)

Note: Restoring directly from Oracle Cloud Archive Storage will be announced at a future time.
NEW: Enhanced EM End-to-End Backup Reports
Track Recovery Appliance Backups at Database Level – Virtual Full, Tape Copy, Replicated Copy
NEW: Enhanced EM End-to-End Backup Reports

Track Recovery Appliance Destination, Transfer Rates, Backup Type, Start/End Time, Backup Size

<table>
<thead>
<tr>
<th>Backup Operation</th>
<th>Source</th>
<th>Destination</th>
<th>Data Transfer Rate (MB/s)</th>
<th>Resulting Backup</th>
<th>Start Time</th>
<th>End Time</th>
<th>Output Size (GB)</th>
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<td>Aug 25, 2016 08:18:57 AM MST</td>
<td>0.9027</td>
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</table>
**NEW: Enhanced EM End-to-End Backup Reports**

Track Recovery Appliance Backups by Piece Names – Disk / Tape / Completion Time / Size

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### Backup Report: Job 2018-06-25T08:00:31:350519

#### End-to-End Summary

<table>
<thead>
<tr>
<th>Backup Set</th>
<th>Level</th>
<th>Piece Key</th>
<th>Piece Name</th>
<th>Type</th>
<th>Location</th>
<th>Media</th>
<th>Media Type</th>
<th>Copy Number</th>
<th>Compressed</th>
<th>Completion Time</th>
<th>File Size (GB)</th>
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</thead>
<tbody>
<tr>
<td>352040</td>
<td>Inc</td>
<td>352040</td>
<td>VBE_179499014_3520351</td>
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<td>ZDLRA6_REP</td>
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**ORACLE**

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NEW: Tenant-View RA Database Monitoring and Reporting
NEW: Tenant-View RA Database Monitoring and Reporting

- Monitoring metrics show filtered data from RA target metrics
  - Filtered within EM repository
  - No additional collections run on ZDLRA
- Metric shape identical to RA target, but filtered by protected DB
Recovery Appliance with Cloud @ Customer
Zero Data Loss Recovery Appliance with Cloud @ Customer

**Protected Databases**

*Delta Push*
- DBs access and send only changes
- Minimal impact on production
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**Protects all DBs in Data Center**
- Petabytes of data
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**Delta Store**
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- Built on Exadata scaling and resilience
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**Recovery Appliance**

**Tape Backup**

**Replicates to Remote Recovery Appliance**
NEW: Database Migration using RA – Oracle 10g thru 18c
Dramatically Reduce Migration Time – From Hours/Days to Few Hours or Less

- Centralized, offloaded “migration engine” & DB remains read-write (short read-only window at end)
  - Daily incremental backups -> virtual full backups on Recovery Appliance
- At destination, restore latest virtual full backup, prior to migration window
  - RESTORE FROM PLATFORM XXX FOREIGN DATAFILE YYY
- When ready to switchover, final incremental and metadata tablespace export taken in read-only
  - RECOVER FROM PLATFORM XXX FOREIGN DATAFILECOPY YYY
  - IMPORT Data Pump export file
- Destination open in read-only to verify, then open read-write for business
The 10 commandments of deploying ExaCC with ZDLRA

1. Understand the importance of **networking** - Engage the network team early in the sales cycle, workshops and PoC.
2. Engage the MAA team in ExaCC / ZDLRA discussions - Architecture, customer meetings and deployment planning.
3. Understand how the ZDLRA will be used with ExaCC in the customer’s environment.
4. Learn the network topology for ExaCC / ZDLRA deployment - Backup and Client Networks.
5. Uncover any potential bottlenecks with ExaCC / ZDLRA backup and restores - Network capacity for OCC / ExaCC.
6. Respect the RTO - How the network throughput and the database size can affect it.
7. Highlight any potential red flags that would not allow to meet the RTO.
8. Test early - [How to measure network performance from RMAN for ZDLRA or Cloud Backups (Doc ID 2371860.1)](Doc ID 2371860.1), RMAN nettest, and validate the configuration after the initial service configuration.
9. Be careful when using wallets - Some customers may or may not enable TDE and may or may not enable real time redo shipping. There are multiple wallets involved and a bad configuration will cause trouble.
10. Validate the bkup_api and ensure it uses the ZDLRA best practices and make sure the latest libra.so is installed on the database nodes.
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ZDLRA combined with ExaCC

Jochen Hinderberger
Director, IT Applications
Dialog Technology Leadership

<table>
<thead>
<tr>
<th>Leadership portfolio in power savings technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best-in-class mobile PMIC with broad IP portfolios</td>
</tr>
<tr>
<td>#1 market share for pure play PMIC suppliers</td>
</tr>
<tr>
<td>#2 Bluetooth LE market share. Over 180M units shipped with industry’s lowest power</td>
</tr>
<tr>
<td>#1 in RapidCharge (fast charging) market share for smartphone adapters. Leading LED driver solutions.</td>
</tr>
<tr>
<td>Industry’s only fully configurable Mixed-signal ICs (CMICs)</td>
</tr>
<tr>
<td>Industry leading RF wireless charging</td>
</tr>
</tbody>
</table>

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Where we came from

2017:

Exadata X4 (Primary Cluster)

Exadata X2 (Standby Cluster)

NFS mounted backup device

NFS file systems

Multiple app servers on VM ware ESX + Simplifity
Engineered Systems today

Setup today:

- OCC (Control Plane)
- ExaCC X6 (Primary Cluster)
- Exadata X4 (Standby Cluster)
- ZDLRA (Backup Appliance)

Multiple app servers on VM ware ESX + Simplify

NFS file systems
Where we are working on

Goal: all services will run in the cloud (at customer)
...as a next step into the Oracle public cloud

OCC (Control Plane + virtual machines)
ExaCC X6 (Primary Cluster)
Exadata X4 (Standby Cluster)
ZDLRA (Backup Appliance)

NFS file systems
Multiple app servers on VM ware ESX + Simplifity

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Backup architecture

- No backup load on Primary
- Real time redo log shipping is enabled from Standby using redo routes
Changes to RTO?

- RTO was 48 hours
- With ZDLRA as of April 13th, we are down to 12 hours (~4X faster)

- Weekly L0 duration was 38 hours
- With ZDLRA the first L0 was around 10 hours (~4X) and no more L0 of primary being required as ZDLRA will create its own virtual L0 backups

- Earlier, INCR L1 backup + archive log backup duration was 3+ hours
- With ZDLRA, the INCR L1 backup taking around 1.5 hours (~2X faster) along with Real Time Redo Log shipping enabled
- ZDLRA together with DG can nicely be used for migrations to new environments:
  - Backup the database to ZDLRA + redo log shipping enabled
  - Restore at any point in time a (virtual) full backup to the new environment
  - Add the restored DB as a standby
  - DG switch over to the restored DB on new environment took <5 minutes
    - migration with no load at primary and at higher speed compared to standard backup
Initial challenges with the ZDLRA

- Restore timeout issue experienced during RMAN duplication:
  - Network switch port failure. This was an internal issue but was identified by Oracle Support and fixed by us
  - Restore of a Bigfile datafile (around 12 TB) timed out at client side. The timeout was related to an issue with the restore servlet which was resolved by changing an internal parameter on the ZDLRA
  - ZDLRA development was directly involved with daily follow-up calls. This issue is fixed in a later release of ZDLRA software
- our findings as early adaptor are now part of the todays SW version
- Multiple executions of manual restore / recover and RMAN duplication scenarios were tested with ExaCC by recovering the production database of 52 TB from ZDLRA. This testing was done with different RMAN attributes and RMAN channel tunings related to RA to make sure maximum possible speed of restore / recover got achieved with no failures in the process of duplication or restore.
- Low RTO: Forever INCR1 backup to ZDLRA and logical INCR0 backup is available all time for restore. Nearly ~ 4X faster for restoration of multi-terabyte database incase of failure

- Low RPO: Real time redo shipping is enabled which leads to RPO <1sec

- No special monitoring / maintenance on ZDLRA because it is an appliance managed by Oracle (ASRs, Platinum patching, integrates into existing EM13 monitoring)

- BI reports are available to check the status of backup / internal jobs / commands executed on RA next to EM13 monitoring

- Higher performance compared to the previous legacy backup
Powering the Smart Connected Future

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Q & A
Other Recovery Appliance Sessions & Demos

  – Wednesday, Oct 24, 4:45-5:30 pm, Moscone West – Room 3007
  – Co-sponsor: METRO-nom GmbH
  – Latest deployment, monitoring, and operational best practices

• Recovery Appliance & Backup/Recovery Demo Showcases
  – The Exchange, Moscone South, Open Monday-Wednesday, Talk to Experts
  – Live RA Archive to Cloud, HA for Backup & Recovery Operations, Database Migration Demos
  – Live RMAN, OSB, Backup Cloud Service Demos