

October 22–25, 2018

SAN FRANCISCO, CA

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ORACLE®

Zero Data Loss Recovery Appliance: Leveraging Integration with Oracle Cloud

PRO 4217

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October 24, 2018

Safe Harbor Statement

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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



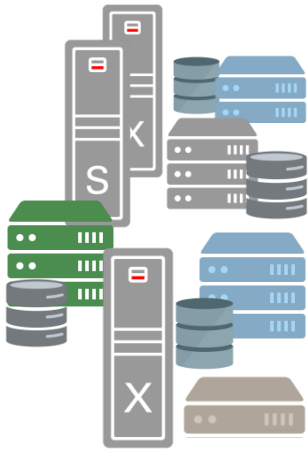
Oracle Cloud
Subscription
Oracle Managed



On-Premises Recovery Appliance

Zero Data Loss Recovery Appliance

Protected Databases



Delta Push

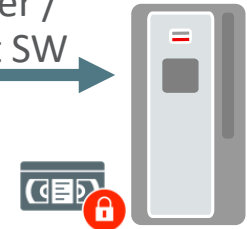
- Send only **Incremental changes** and no more full backups
- Real-time transactions copied over for **continuous data protection**

Recovery Appliance



Integrated Media Manager /
Third Party Backup Client SW

Offloads Tape Backup



Protects all DBs in Data Center

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

Delta Store

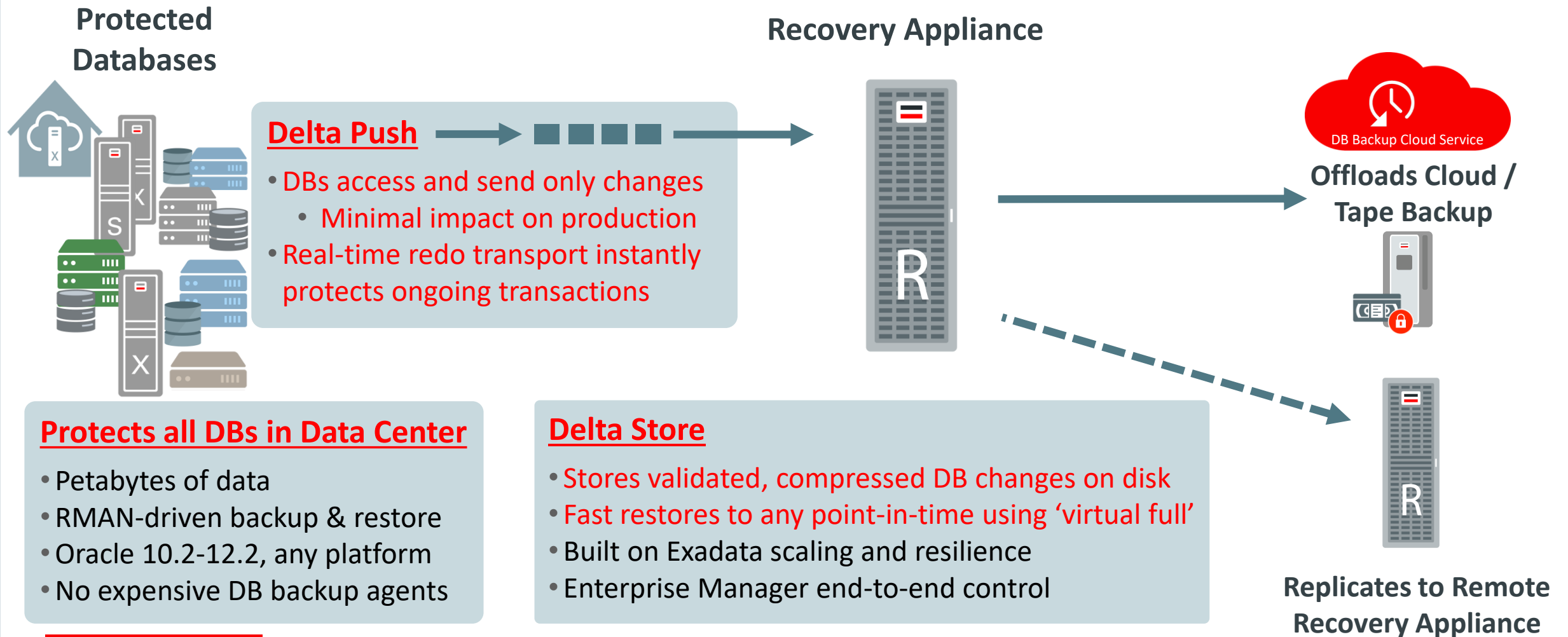
- Stores **validated**, compressed data on disk
- Fast restores to any point-in-time
- Built on Exadata scaling and resilience
- Enterprise Manager end-to-end control

Replicates to Remote
Recovery Appliance



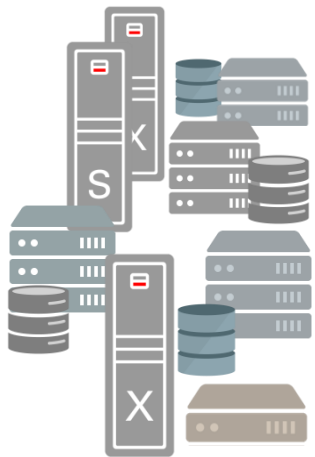
Recovery Appliance with Oracle Cloud

Zero Data Loss Recovery Appliance with Oracle Cloud

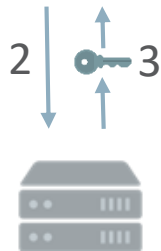


Recovery Appliance Archive to Cloud: Backup Workflow

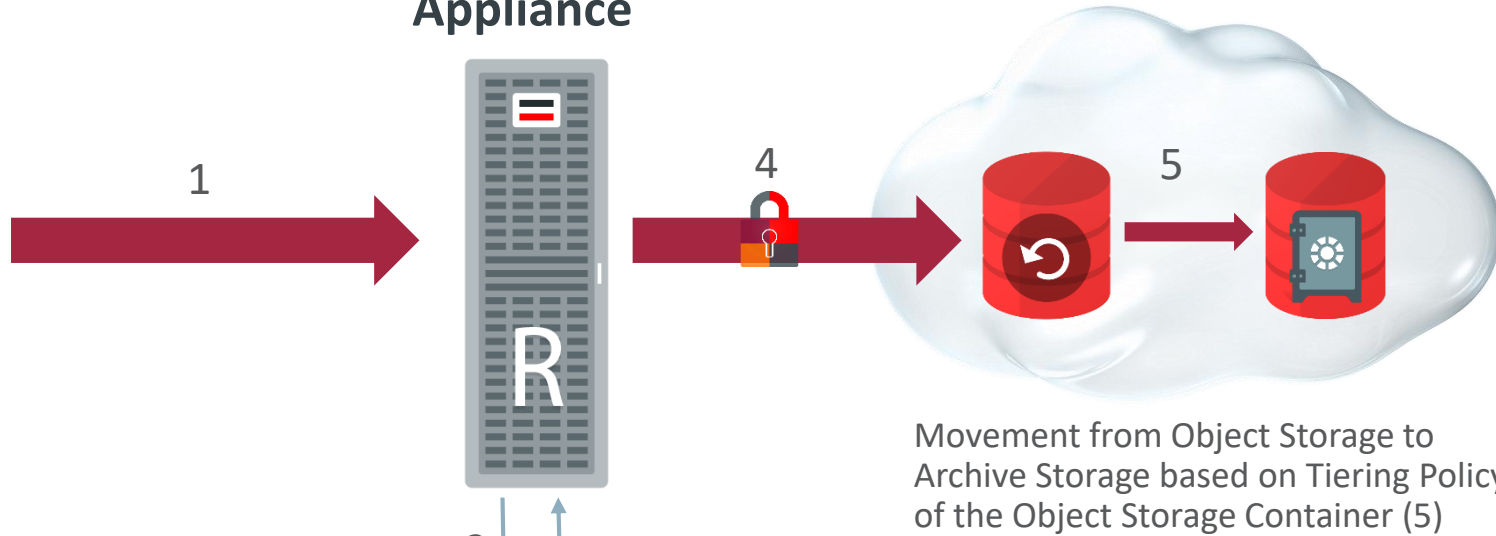
On-Prem Protected Databases



On-Prem Recovery Appliance



Oracle Key Vault server

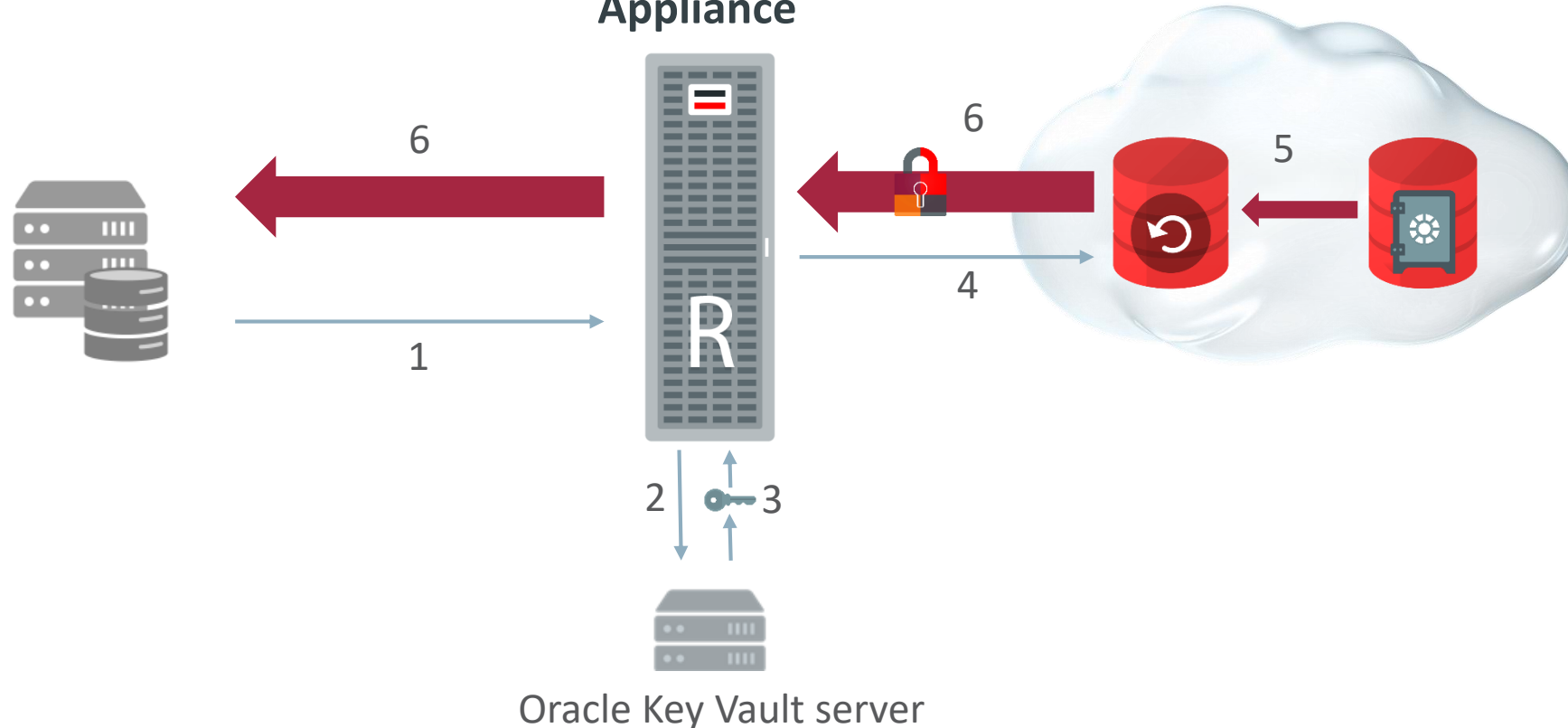


1. Incremental backup sent unencrypted to ZDLRA – Virtual Full is created
2. ZDLRA requests encryption key from OKV server
3. OKV server sends encryption key to ZDLRA
4. ZDLRA encrypts virtual full backup pieces and sends them to cloud storage
5. If container class is Tiering, backup pieces are moved to Archive Storage

Restore from Cloud Storage via Recovery Appliance

On-Prem Protected Databases

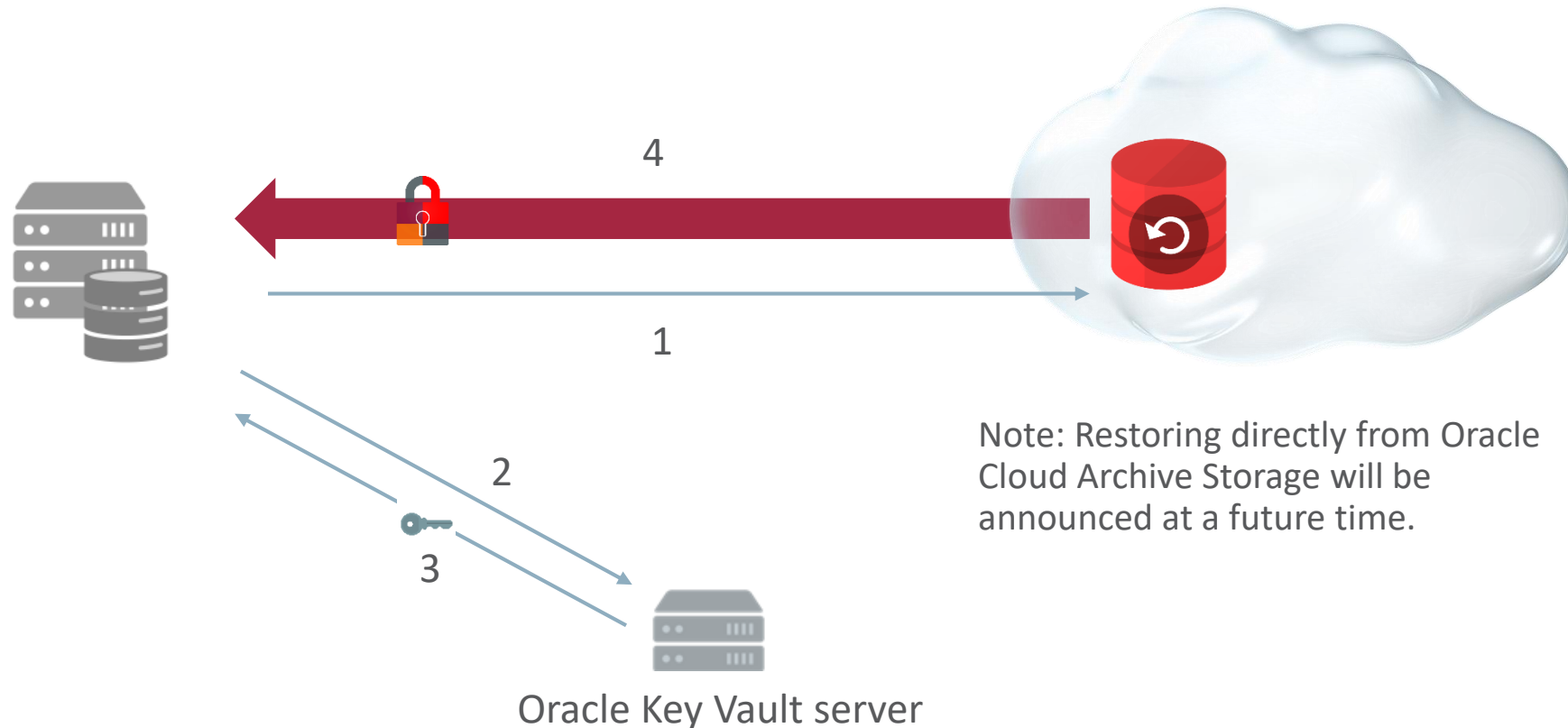
On-Prem Recovery Appliance



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

Restore Directly to On-Prem Database from Cloud Storage

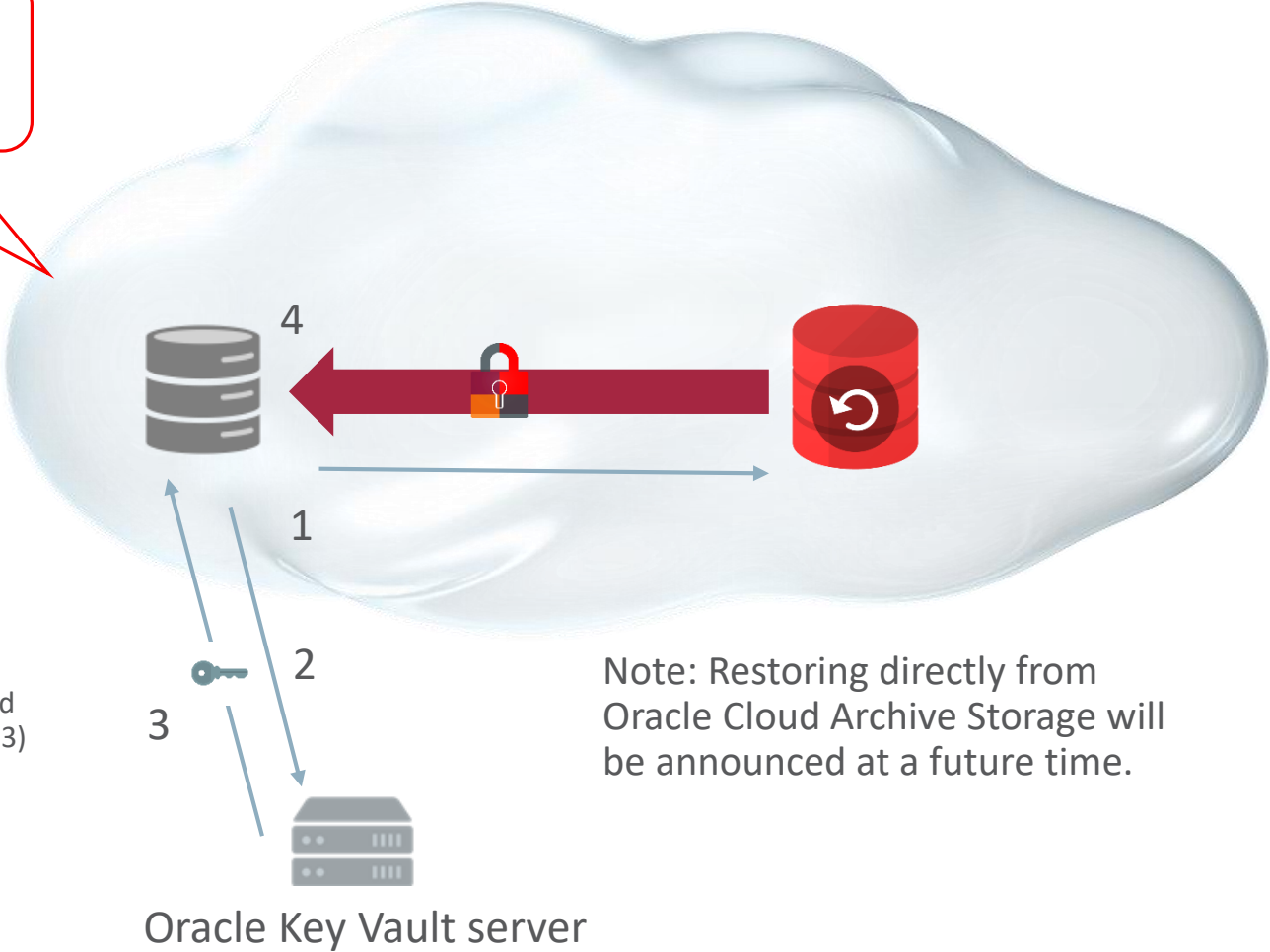
On-Prem Protected Databases



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

Restore Directly to DBCS / ExaCS Database

Test/Dev Cloud Refresh



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

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



NEW: Enhanced EM End-to-End Backup Reports

Track Recovery Appliance Backups at Database Level – Virtual Full, Tape Copy, Replicated Copy

ORACLE Enterprise Manager Cloud Control 13c

Enterprise Targets

db1212_scaaa171.us.oracle.com

Oracle Database Performance Availability Security Schema Administration

Backup Reports

Total 595 (Completed 557 | Completed With Warnings 1 | Failed 37)

Backup Name	Status	Command	Type	Destination	Start Time	Time Taken	Input Size (GB)	Output Size (GB)	Output Rate (MB/s)
2016-08-25T08:00:01	✓	DB INCR	Recovery Appliance	ZDLRA Montreal	Aug 25, 2016 08:00:13 AM MST	00:20:48	14.7578	0.0862	0.0707
2016-08-25T07:00:02	✓	DB INCR	Recovery Appliance	ZDLRA Montreal	Aug 25, 2016 07:00:15 AM MST	00:20:40	14.7545	0.0857	0.0540
2016-08-25T06:00:01	✓	DB INCR	Recovery Appliance	ZDLRA Montreal	Aug 25, 2016 06:00:06 AM MST	00:26:14	14.7539	0.0869	0.0565
2016-08-25T05:00:01	✓	DB INCR	Recovery Appliance	ZDLRA Montreal	Aug 25, 2016 05:00:07 AM MST	00:27:13	14.7529	0.0857	0.0537
2016-08-25T04:00:01	✓	DB INCR	Recovery Appliance	ZDLRA Montreal	Aug 25, 2016 04:00:06 AM MST	00:27:29	14.7500	0.0852	0.0529
2016-08-25T03:00:02	✓	DB INCR	Recovery Appliance	ZDLRA Montreal	Aug 25, 2016 03:00:05 AM MST	00:27:08	14.7500	0.0911	0.0573
2016-08-25T01:00:01	✓	DB INCR	Recovery Appliance	ZDLRA Montreal	Aug 25, 2016 01:00:09 AM MST	00:26:21	14.7480	0.0935	0.0606
2016-08-24T23:00:01	✓	DB INCR	Recovery Appliance	ZDLRA Montreal	Aug 24, 2016 11:00:13 PM MST	00:27:41	14.8037	0.7087	0.4369

Backup Report: Job 2016-08-25T08:00:01.350519

Inputs Outputs **End-to-End Summary** End-to-End Piece Details

Backup Operation	Source	Destination	Data Transfer Rate (MB/s)	Resulting Backup	Level	Start Time	End Time	Output Size (GB)
Original Backup	db1212_scaaa171.us.oracle.com	ZDLRA Montreal	0.0707	Virtual	Incr	Aug 25, 2016 08:04:14 AM MST	Aug 25, 2016 08:18:56 AM MST	0.0027
Copy to Tape	ZDLRA Montreal	Tape	19.3735	Tape	Full	Aug 30, 2016 11:57:36 AM MST	Aug 30, 2016 12:00:20 PM MST	14.2912
					Incr	Aug 25, 2016 01:45:44 PM MST	Aug 25, 2016 01:46:52 PM MST	0.0850
Replication	ZDLRA Montreal	ZDLRA Boston	N/A	Virtual	Full	Aug 25, 2016 08:04:17 AM MST	Aug 25, 2016 08:18:57 AM MST	6.2175
					Incr	Aug 25, 2016 08:04:17 AM MST	Aug 25, 2016 08:18:57 AM MST	0.0027

NEW: Enhanced EM End-to-End Backup Reports

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

Backup Report: Job 2016-08-25T08:00:01.350519

Inputs Outputs **End-to-End Summary** End-to-End Backup Piece Details

Backup Operation	Source	Destination	Data Transfer Rate (MB/s)	Resulting Backup		Start Time	End Time	Output Size (GB)
				Type	Level			
Original Backup	db1212_scaaa171.us.oracle.com	ZDLRA Montreal	0.0707	Virtual	Full	Aug 25, 2016 08:04:14 AM MST	Aug 25, 2016 08:18:56 AM MST	6.2175
					Incr	Aug 25, 2016 08:04:14 AM MST	Aug 25, 2016 08:18:56 AM MST	0.0027
Copy to Tape	ZDLRA Montreal	Tape	19.3735	Tape	Full	Aug 30, 2016 11:57:36 AM MST	Aug 30, 2016 12:00:20 PM MST	14.2912
					Incr	Aug 25, 2016 01:45:44 PM MST	Aug 25, 2016 01:46:52 PM MST	0.0850
Replication	ZDLRA Montreal	ZDLRA Boston	0.001	Virtual	Full	Aug 25, 2016 08:04:17 AM MST	Aug 25, 2016 08:18:57 AM MST	6.2175
					Incr	Aug 25, 2016 08:04:17 AM MST	Aug 25, 2016 08:18:57 AM MST	0.0027

NEW: Enhanced EM End-to-End Backup Reports

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

Backup Report: Job 2016-08-25T08:00:01.350519

Inputs Outputs End-to-End Summary **End-to-End Backup Piece Details**

Search

View Total 36 (Non-Virtual 4 | Virtual 20 | Tape Copy 12)

Backup Set	Level	Piece Key	Piece Name	Type	Location	Media	Media Type	Copy Number	Compressed	Completion Time	File Size (GB)
352040	Incr										
		352041	VB\$_1794949914_352035I	Virtual			Disk	1	YES	Aug 25, 2016 08:04:12 AM MST	0.0000
		353753	VB\$_1431583174_401731I	Virtual		ZDLRA9_REP	Disk	2	YES	Aug 25, 2016 08:04:12 AM MST	0.0000
		361508	RA_SBT_118553_abre4chl_1_3_352040	Tape Copy		scao09adm03_db-000005	Tape	3	NO	Aug 25, 2016 01:46:32 PM MST	0.0000
352044	Full										
		352045	VB\$_1794949914_352035_5	Virtual			Disk	1	YES	Aug 25, 2016 08:04:12 AM MST	4.7200
		353755	VB\$_1431583174_401731_5	Virtual		ZDLRA9_REP	Disk	2	YES	Aug 25, 2016 08:04:12 AM MST	4.7200
		425317	RA_SBT_118552_4rre4chl_1_3_352044	Tape Copy		scao09adm03_db-000009	Tape	3	NO	Aug 30, 2016 11:58:50 AM MST	10.6500

NEW: Tenant-View RA Database Monitoring and Reporting

ORACLE® Enterprise Manager Cloud Control 13c

Enterprise Targets Favorites History Setup

ZDLRA Montreal Recovery Appliance

Page Refreshed Apr 10, 2018 9:38:01 AM PDT

Auto Refresh Off

Summary

Protected Databases 9 Status ✔ 5 ✖ 2 ⚠ 3

Current Activity Activity Over Last 24 Hours

Operation	Databases	Pieces	Longest Run Time
Backups	1	3	0 days 00:32:52
Copy-to-Tape	0	0	
Replications	1	5	0 days 00:52:15
Restores	0	0	

Protected Database Issues

Not Meeting Recovery Window Goal 3 Exceeding Unprotected Data Threshold 0 Not Backed-Up 2 View 10 With Most Recent Warnings

Database	Target Name	Errors	Warnings	Recovery Window		Unprotected Data Window		Last Complete Backup
				Goal	Current	Threshold	Current	
FIN	fin.us.oracle.com	✖ (43)	⚠ (1)	18 days	6 days 23:42	0 days 00:00:30	< 1 sec	Apr 6, 2018 9:33 AM P...
REC	rec.us.oracle.com		⚠ (1)	18 days	6 days 10:10	0 days 00:00:30	0 days 1...	Apr 9, 2018 9:51 PM P...
HRDB	hrdb.us.oracle.com		⚠ (1)	18 days	6 days 23:57	0 days 00:00:30	0 days 0...	Apr 10, 2018 6:52 AM ...

ORACLE® Enterprise Manager Cloud Control 13c

Enterprise Targets Favorites History Setup

ZDLRA Montreal_rauser11 Recovery Appliance Monitoring View

Page Refreshed Apr 10, 2018 9:32:34 AM PDT

Auto Refresh Off

Summary

Protected Databases 3 Status ✔ 1 ✖ 1 ⚠ 2

Data Sent/Received (Daily)

Protected Database Issues

Not Meeting Recovery Window Goal 2 Exceeding Unprotected Data Threshold 0 Not Backed-Up 0 View 10 With Most Recent Warnings

Database	Target Name	Errors	Warnings	Recovery Window		Unprotected Data Window		Last Complete Backup
				Goal	Current	Threshold	Current	
FIN	fin.us.oracle.com	✖ (43)	⚠ (1)	18 days	6 days 23:42	0 days 00:00:30	< 1 sec	Apr 6, 2018 9:33 AM PDT
REC	rec.us.oracle.com		⚠ (1)	18 days	6 days 10:10	0 days 00:00:30	0 days 1...	Apr 9, 2018 9:51 PM PDT

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

ZDLRA Montreal > All Metrics

Recovery Appliance

All Metrics

Search

View

Last Complete Backup

Database Unique Name	Protection Policy	Last Collected Value
MAACDB1	PLATINUM	2018-04-10 10:00:26 -07:00
MAA12201	PLATINUM	2018-04-05 12:49:56 -07:00
FIN	ALUMINUM	2018-04-06 09:33:11 -07:00
REC	ALUMINUM	2018-04-10 09:51:51 -07:00
MAA11204	SILVER	2018-04-10 10:00:39 -07:00
MONZA	PLATINUM	2018-04-05 16:09:25 -07:00
HRDB	TIN	2018-04-10 06:52:19 -07:00

ZDLRA Montreal_rauser11 > All Metrics

Recovery Appliance Monitoring View

All Metrics

Search

View

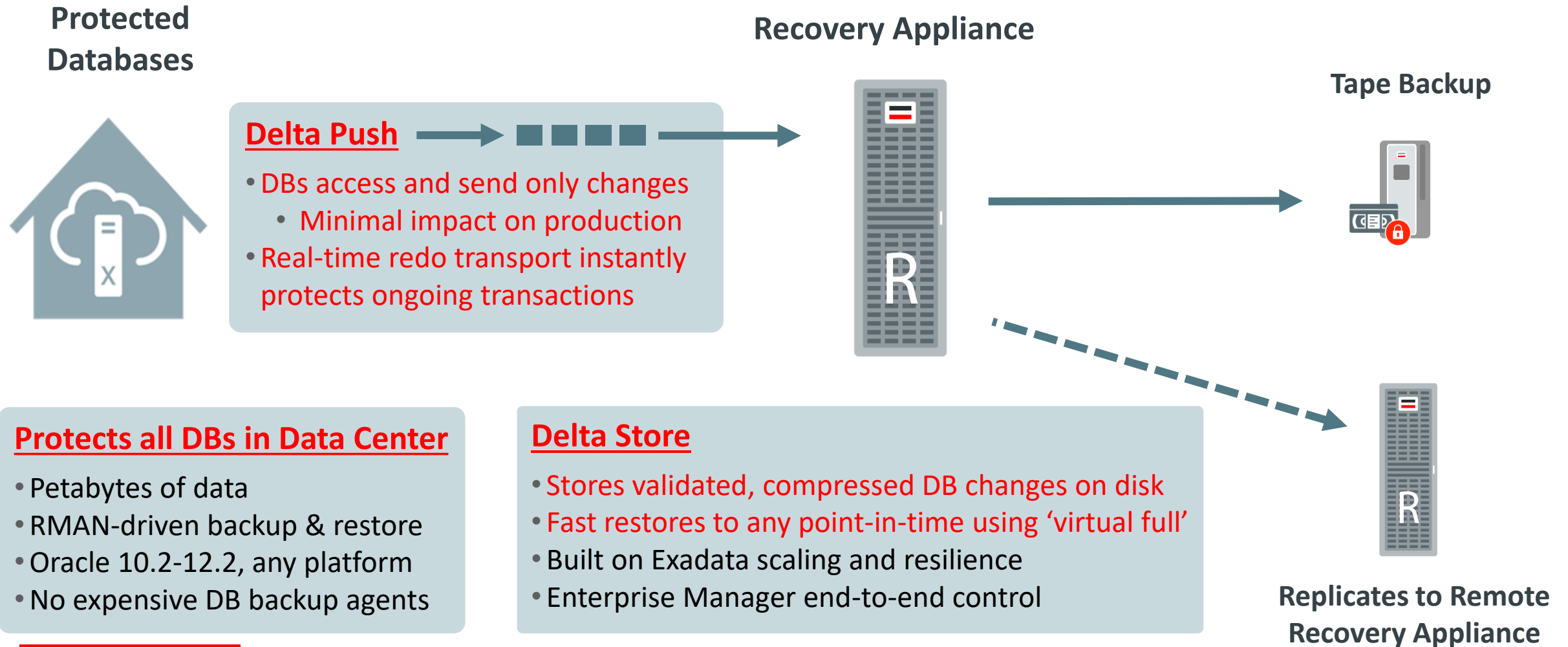
Last Complete Backup

Database Unique Name	Protection Policy	Last Collected Value
FIN	ALUMINUM	2018-04-06 09:33:11 -07:00
REC	ALUMINUM	2018-04-10 09:51:51 -07:00
MAA11204	SILVER	2018-04-10 10:00:39 -07:00

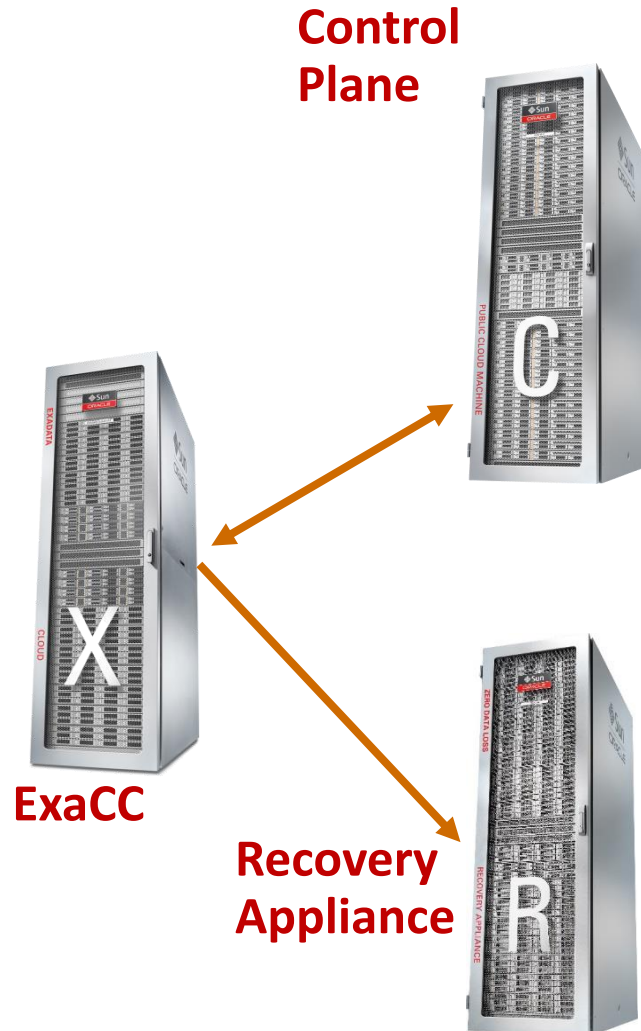


Recovery Appliance with Cloud @ Customer

Zero Data Loss Recovery Appliance with Cloud @ Customer



Recovery Appliance: ExaCC Backup & Recovery Configuration



ORACLE CLOUD My Services

Oracle Database Cloud Service
Create Service

Previous Cancel Service **Details** Confirm Next

Service Details [Selection Summary](#)

Provide details for this Oracle Database Cloud Service instance.

Database Configuration Hostnames All ?

Backup and Recovery Configuration * Backup Destination ZDLRA Storage Only ?

Backup and Recovery Configuration

* Backup Destination ZDLRA Storage Only ?

* Zdlra Storage Container scaz15inges-scan1:1521/zdlra9: ?

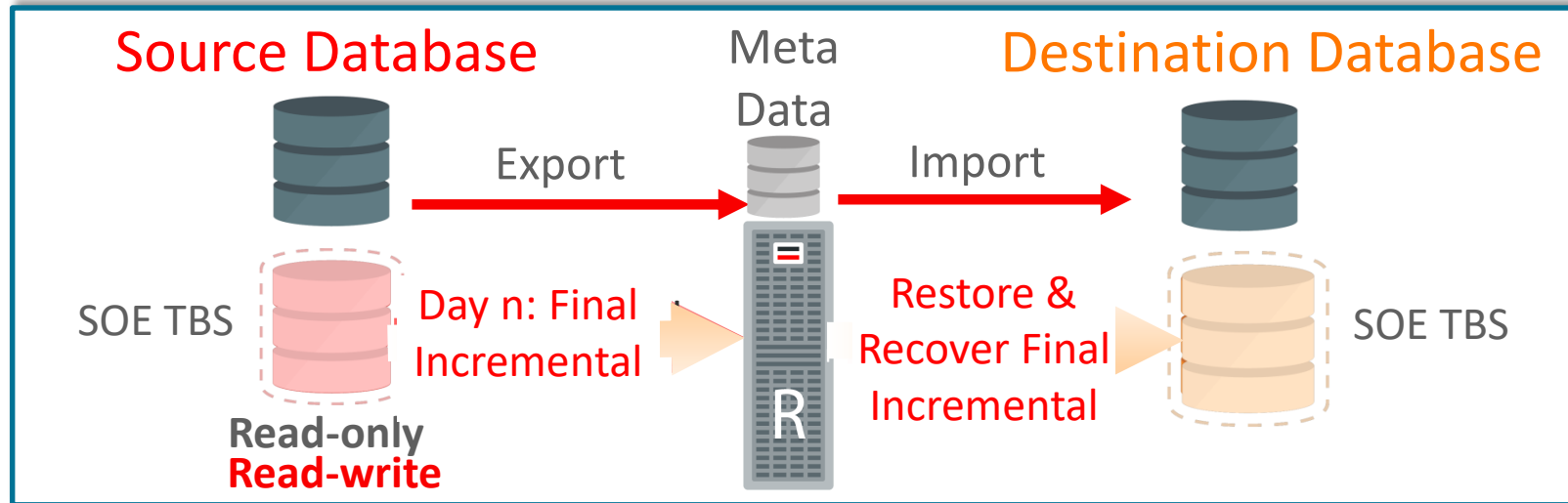
* Username bkupapivpc ?

* Password

scaz15inges-scan1:1521/zdlra9: ?
bkupapivpc ?
..... ?
c1 - Quarter Rack (2 nodes) ?
? ?

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 \(Doc ID 2371860.1\)](#), 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.



Dialog Semiconductor

Dialog Semiconductor ZDLRA combined with ExaCC

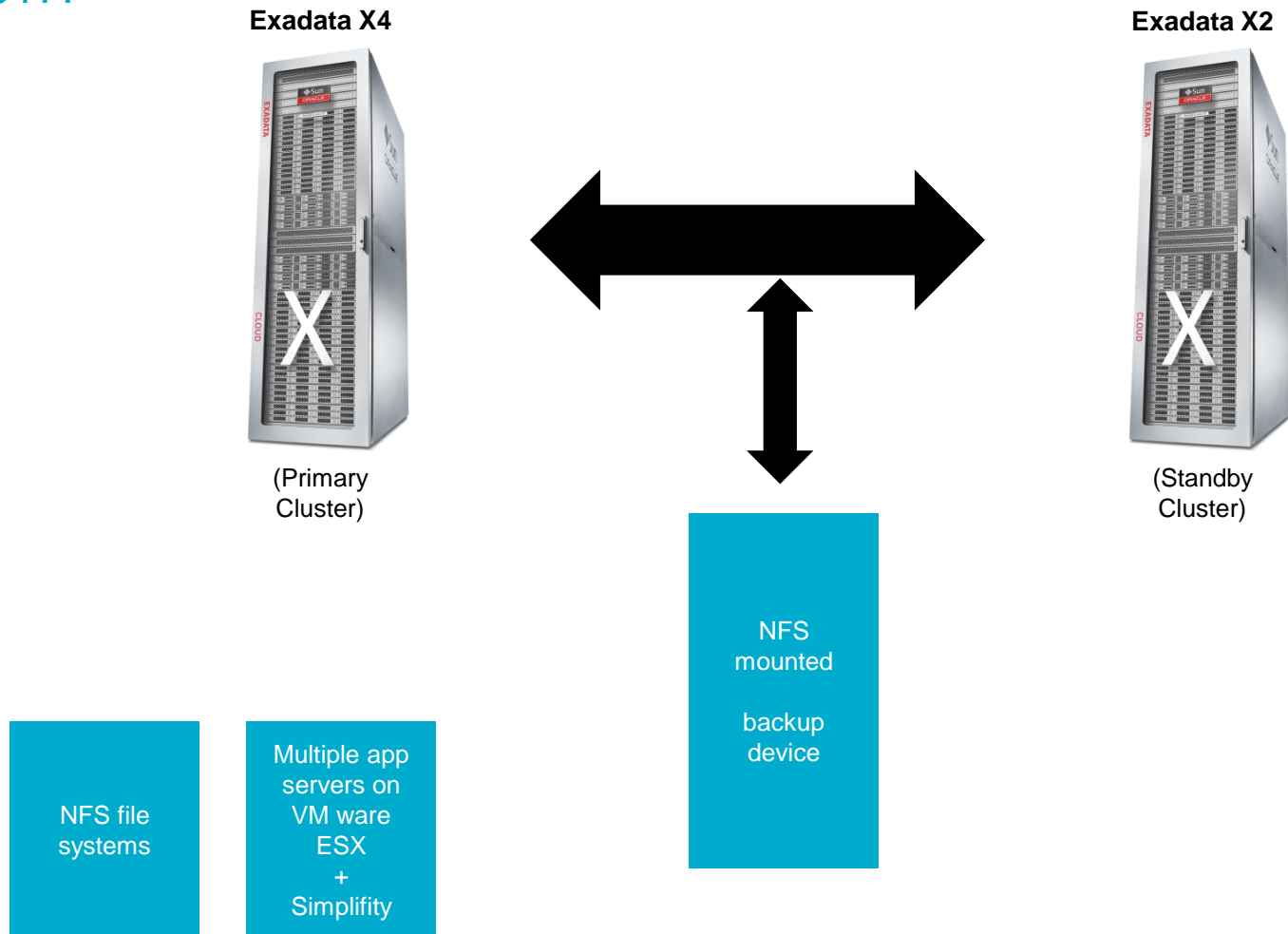


- ...personal
- ...portable
- ...connected

Jochen Hinderberger
Director, IT Applications

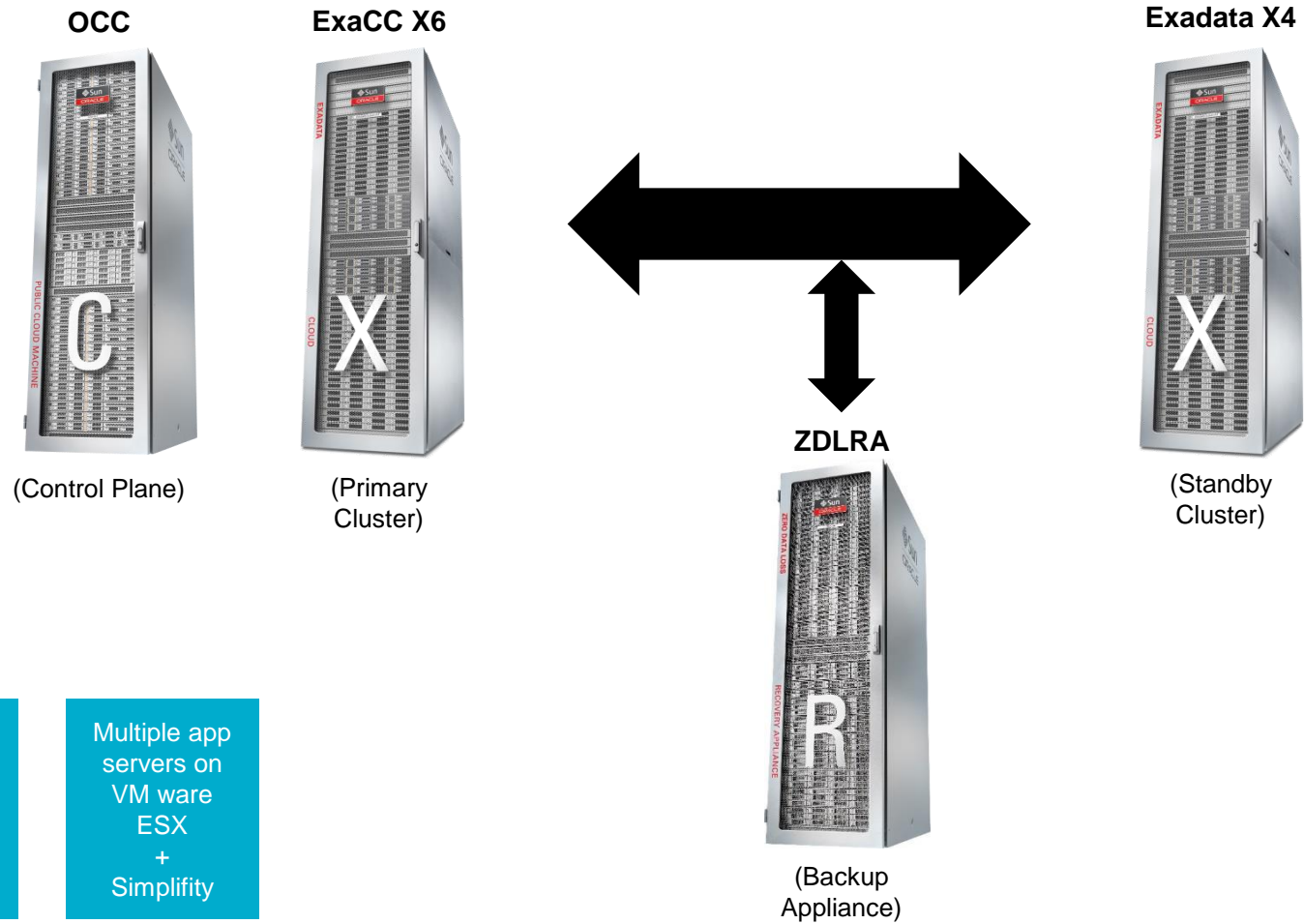
Where we came from

2017:



Engineered Systems today

Setup today:



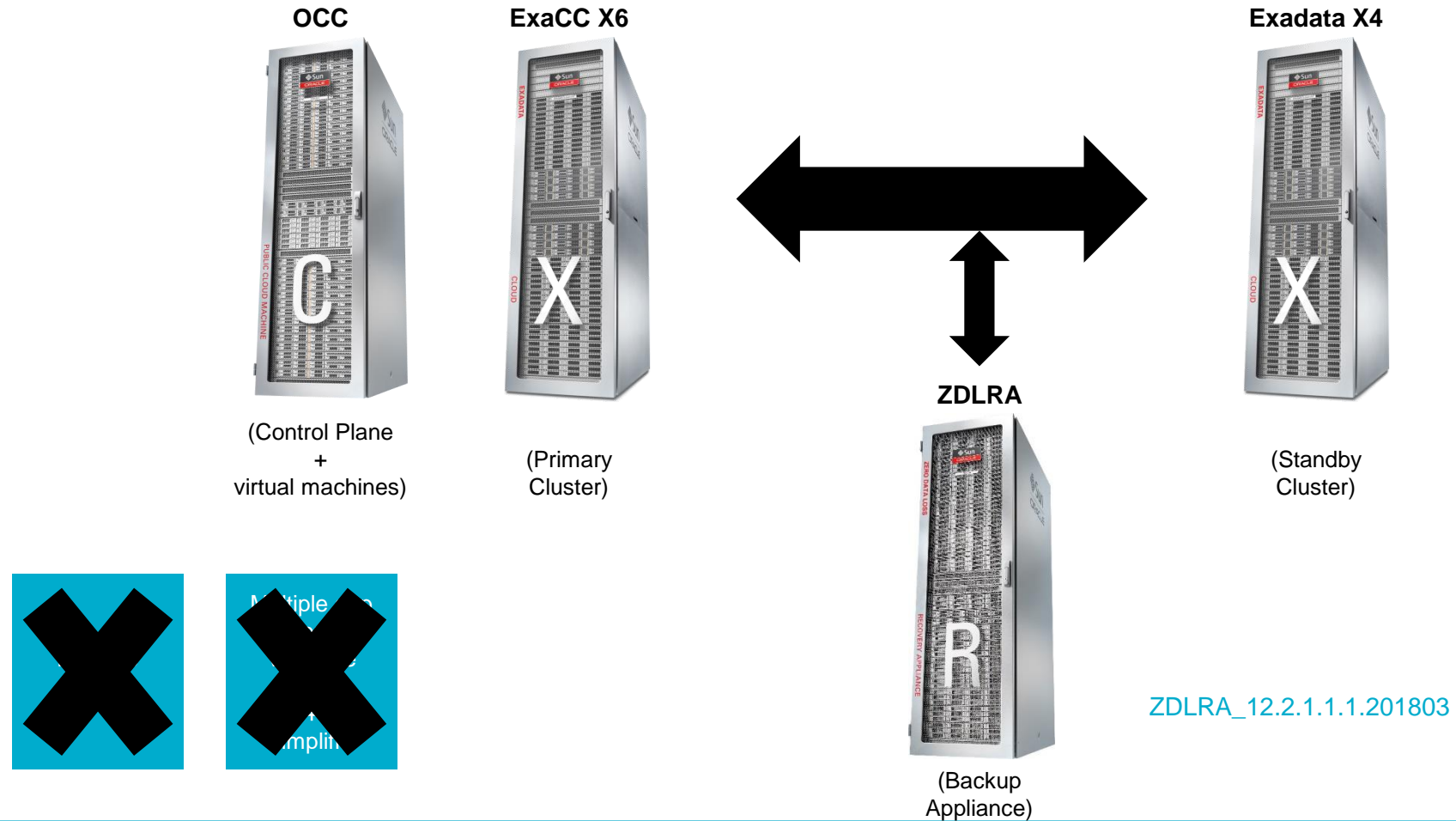
NFS file systems

Multiple app servers on VM ware ESX + Simplify

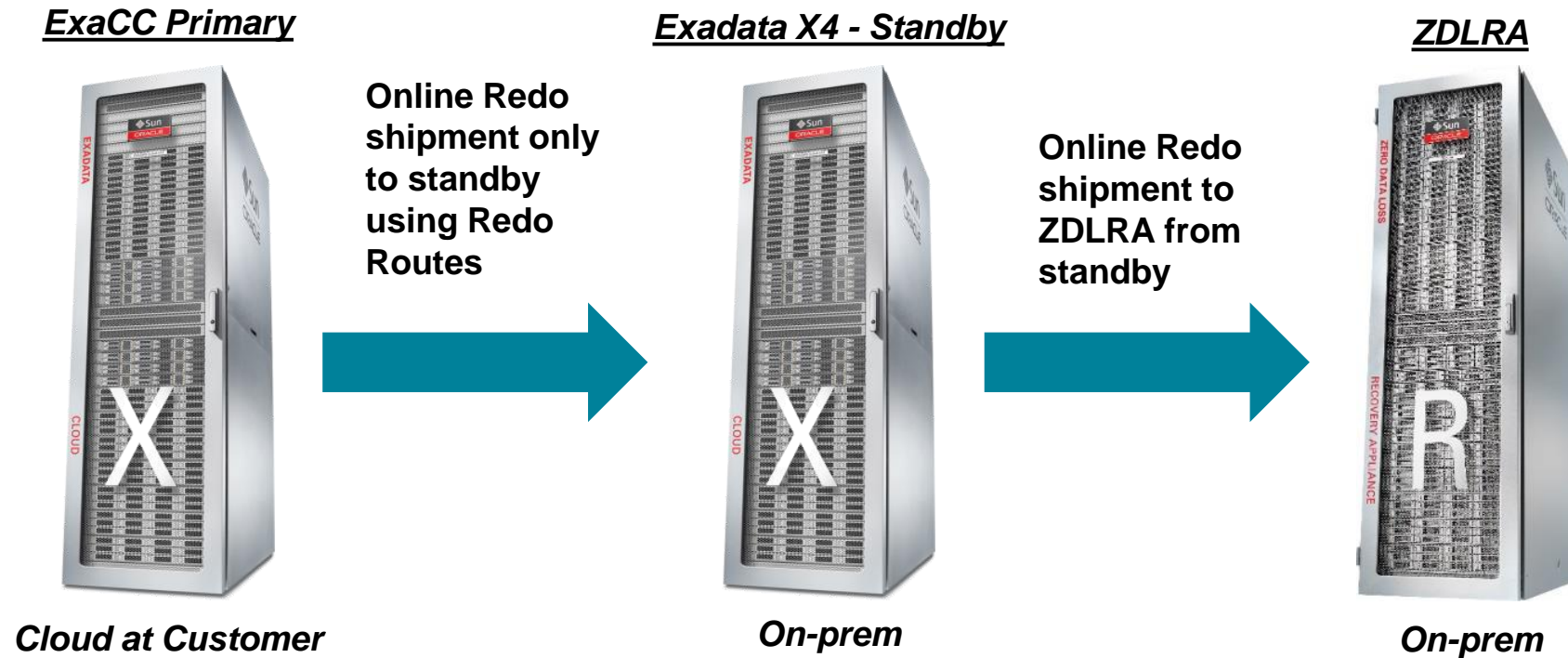


Where we are working on

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



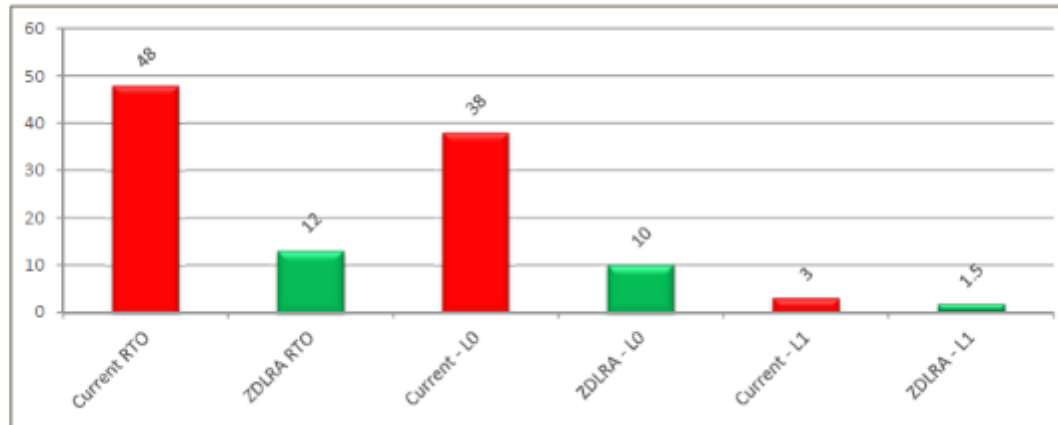
Backup architecture



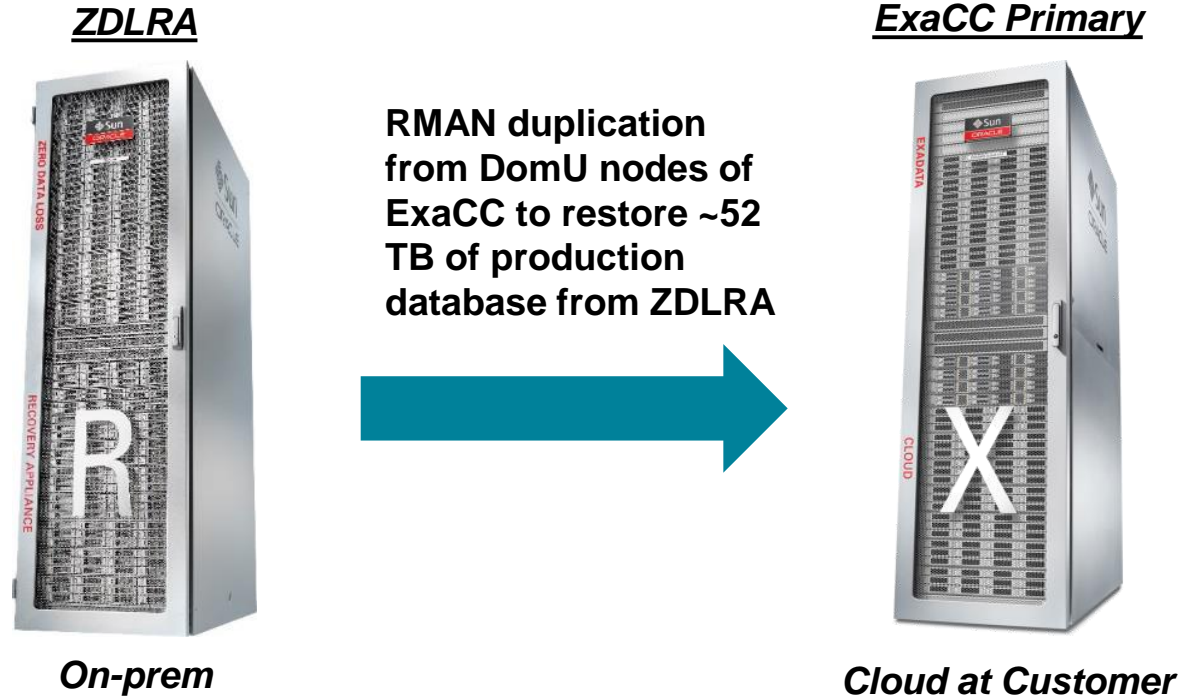
- No backup load on Primary
- Real time redo log shipping is enabled from Standby using redo routes

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 for data migration?



- 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.

Wrap up

- 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

www.dialog-semiconductor.com



...personal
...portable
...connected



Q & A

Other Recovery Appliance Sessions & Demos

- **Zero Data Loss Recovery Appliance: Insider's Guide to Architecture & Best Practices**
 - Wednesday, Oct 24, 4:45-5:30 pm, Moscone West – Room 3007
 - Co-speaker: 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

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