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EVERYTHING YOU NEED TO KNOW ABOUT ZDLRA

ACES@home – Episode 4

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Oracle ACE ♠

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AGENDA

- Who I am and what I will be talking about.
- Backup, Recovery, and Availability.
- What is ZDLRA.
- ZDLRA: Enrolling and Protecting the database.
- ZDLRA + MAA.
- QA.

ABOUT ME

- Senior DBA at eProseed Luxembourg.
 - OCP, OCE RAC, OCI Architect, Autonomous Specialist.
- Oracle ACE ♠, OOW, OOWLA, and User Groups speaker/presentations.



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ABOUT ME

- DBA since 2004:
 - Oracle, PostgreSQL, SQLServer, and DB2.
- Head and DBA Team Manager at Court of Justice – 2010/2017:
 - Exadata since 2010:
 - Exadata V2, X2, X4 (Full), X5 (Full EF), and X6.
 - ZDLRA since 2014/2015:
 - MAA Project, Multi-Site protection, RAC+RAC, DG, ZDLRA:
<https://www.oracle.com/technetwork/database/availability/con8830-zdlradeepdive-2811109.pdf>
- Contributing with Oracle Brazil community since 2010.
- Luxembourg - October/2017:
 - eProseed - Senior Database Architect.
- Consulting at European Commission:
 - LCM (Life Cycle Management) to the Oracle Products.
- Consulting at Bank Institution:
 - Multi-site environment, MAA, Exadata, and ZDLRA.
- LUXOUG Co-Founder and Board Member.

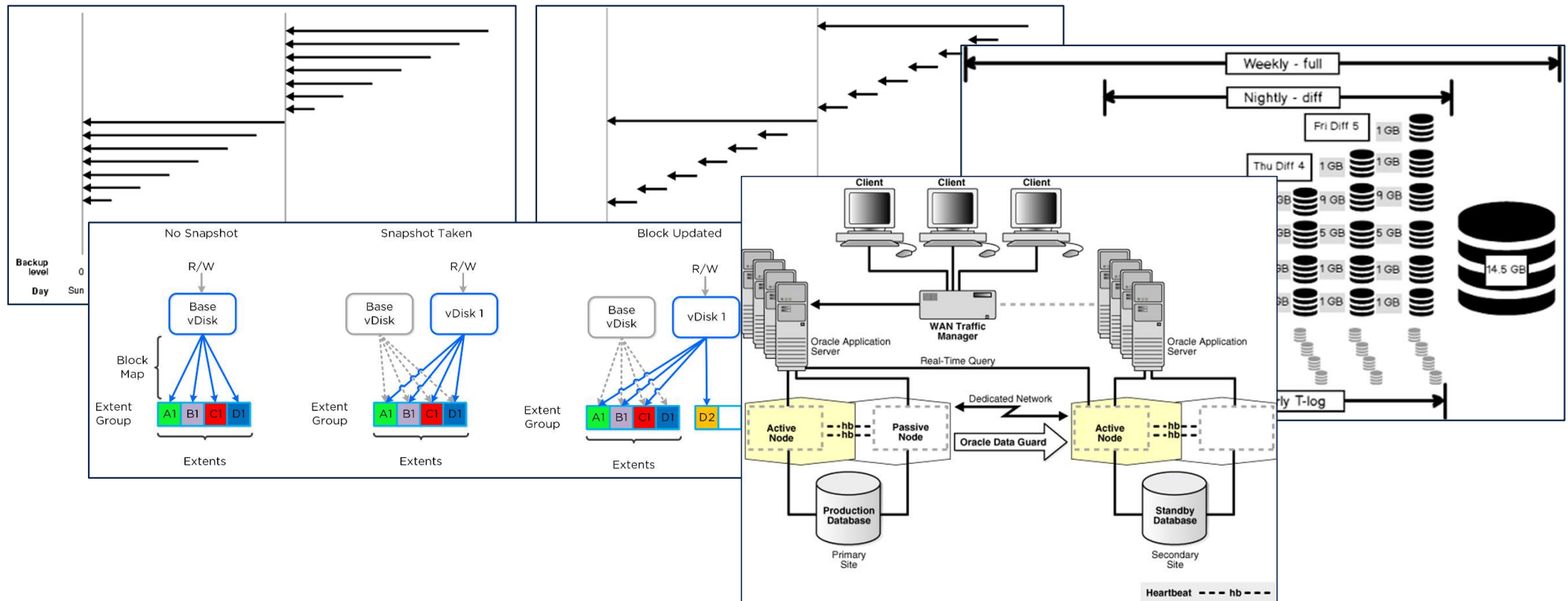
SESSION

- What is the **Zero Data Loss Recovery Appliance (ZDLRA)**?
 - What did you hear about it?
 - Just backup?
 - Backup Appliance?
 - ZDLBA?
 - Incremental forever strategy?
 - Deduplication, right?

SESSION

- How it is your protection today?
 - How much time I need to do my backups?
 - What is the load over the environment to do the backups?
 - What happens if you need to recover your database?
 - What is my data loss in the case of an outage?
 - What's happens if I lose my storage?
 - What is my protection today?
 - Do I know what I need to cover? What are the regulations?
 - My secondary site has the same protection as the primary?

BACKUP, RECOVERY, AND AVAILABILITY



BACKUP, RECOVERY, AND AVAILABILITY

- Principles and goals:
 - Availability of every information.
 - Application Continuity.
 - Low or zero impact on the environment.
 - Easy to operate, control, and verify.
 - Sustain compliances and corporate regulations.
 - 24x7x365.
 - No Data and Access Loss.
- Two words:
 - **RPO** – Recovery Point Objective:
 - Usually, what/how much you can lose.
 - **RTO** – Recovery Time Objective:
 - Usually, time to put everything running again.
- **The goal is zero RPO and zero RTO.**

BACKUP, RECOVERY, AND AVAILABILITY

- Real Life:
 - Data Loss (usually since the last backup).
 - **Huge impact** on the environment (Backup Window):
 - BCT available?
 - A lot of players (Tivoli, EMC, Data Protector, Commvault).
 - Cloud copy/clone/offload.
 - Inexistent report about recoverability.
 - Redundancy over redundancy over redundancy...
 - Endless Validation, test, validation, test...
- Questions that we face:
 - Where are my backups?
 - Lost data?
 - How they are?
 - Can I restore?
 - Where are the tapes?
 - Did I checked the report today?
 - Fragmented restore process!

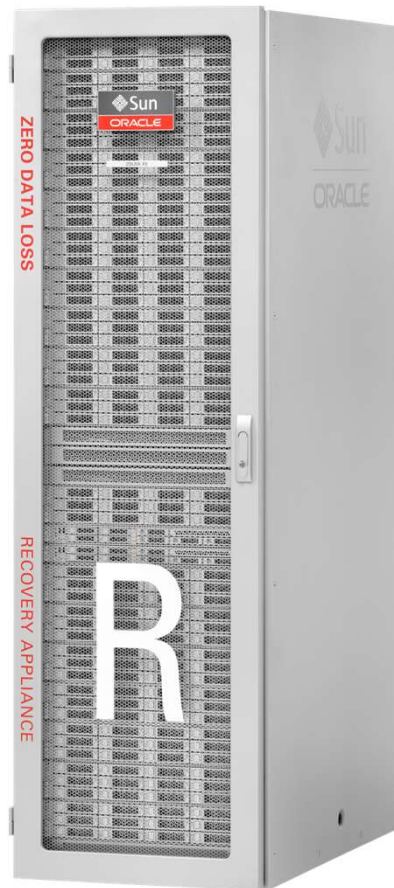
BACKUP, RECOVERY, AND AVAILABILITY

- **Schrödinger's Cat Backup Paradox:**

“The condition of any backup is unknown until a restore is attempted”



And it is worst...



WHAT IS ZDLRA

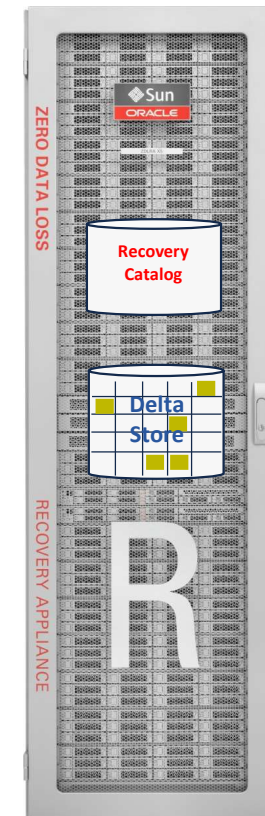
- **ZERO DATA LOSS RECOVERY APPLIANCE – ZDLRA:**

- Engineered Systems.
- Exadata based.
- Hardware + Software:
 - RA Library.
- Media Management Layer (MML) for tape.
- Native replication.
- RMAN Catalog.
- Can be used to protect ExaCC.

- **DOES NOT REDUCES RTO, JUST RPO.**

ZDLRA – BASE CONFIG

- Oracle Database:
 - Store the backups and configuration metadata:
 - Backup Policies and Database definitions.
 - Delta Store, Packages, tasks, and operations.
 - Rman catalog:
 - Lightly modified to cover internal RA tables.
 - Self-driven catalog: **No more crosscheck and validations.**
- EM/CC/CLI:
 - DBMS_RA package to manage everything.
- Backup library is installed in every server that will backup.
 - From Oracle 10g to 19c, RISC and CISC. AIX, Win, Linux, Solaris...



ZDLRA – DELTA STORE

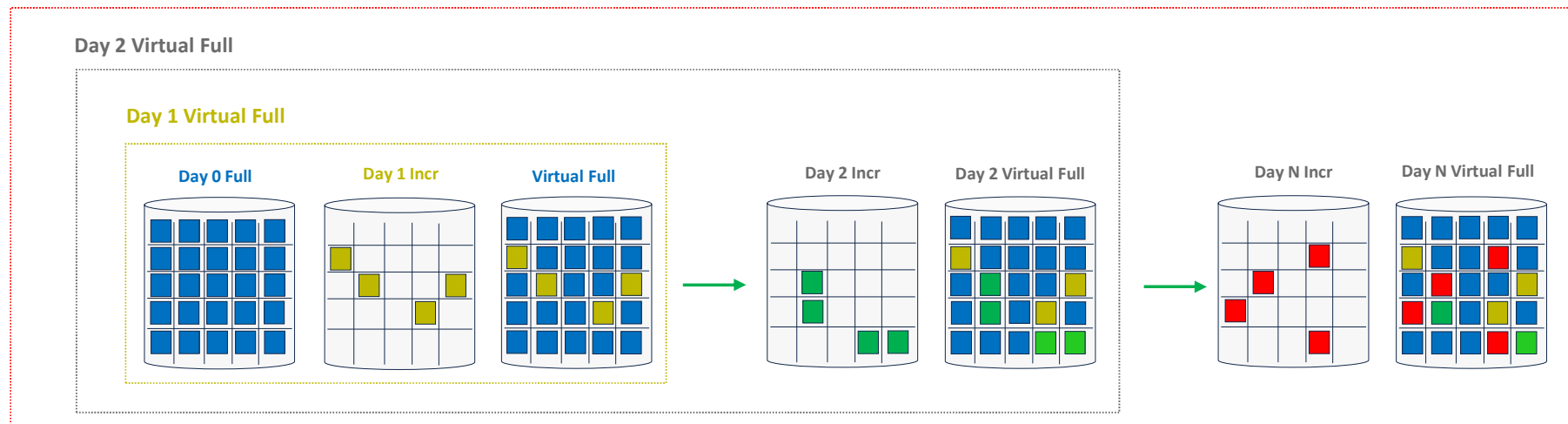
- Delta Store:
 - Where the data is stored:
 - **Store Oracle Data Blocks from datafiles**, not backup sets, not backup pieces, and not image copies.
 - Store compressed and validated data inside pools.
 - **Delta Push** = Ingested Backups + Real-Time Redo Transport.
 - Oracle Data Block validation during all backup/data life-cycle:
 - Validated during the backup ingestion, **rebuild**, replication, and clones (tape and cloud).
 - Tasks to sustain everything:
 - Automatic backup index, management, and validation.

ZDLRA – VIRTUAL FULL BACKUP

- Virtual Full Backup:
 - Ingested rman backup sets are deconstructed and reconstructed data block per data block.
 - Generate an index for every datafile.
 - Create plans (matrix of blocks) for every virtual backup.
 - Differs from deduplication:
 - **Content aware.**
 - Opens the backup set and **natively** “see” each Oracle Data Block.
 - Inside ZDLRA rman backup set does not exist, is merely a logical organization.
- **Incremental Forever Strategy:**
 - Initial level 0 backup + consequent level 1 backups.
 - ZDLRA merge both to generate the virtual full backup.
- Changes noting at the RMAN side. Backup and restore commands continue the same.

ZDLRA – VIRTUAL FULL BACKUP

Day N Virtual Full



RMAN> list backup of datafile 1;

List of Backup Sets
=====

BS Key	Type	LV	Size	Device	Type	Elapsed Time	Completion Time
14406	Incr	0	330.29M	SBT_TAPE		00:03:16	05/01/2020 17:40:31
BP Key: 14407 Status: AVAILABLE Compressed: YES Tag: BKP-DB-INC0							
Handle: VB\$_1891149551_14397I Media:							

List of Datafiles in backup set 14406

File	LV	Type	Ckp	SCN	Ckp Time	Abs Fuz	SCN	Sparse	Name
1	0	Incr	1885317		05/01/2020 17:37:15			NO	/u01/app/oracle/oradata/ORCL18C/system01.dbf

BS Key	Type	LV	Size	Device	Type	Elapsed Time	Completion Time
14431	Incr	1	56.00K	SBT_TAPE		00:00:02	05/01/2020 17:44:24
BP Key: 14432 Status: AVAILABLE Compressed: YES Tag: BKP-DB							
Handle: VB\$_1891149551_14430I Media:							

List of Datafiles in backup set 14431

File	LV	Type	Ckp	SCN	Ckp Time	Abs Fuz	SCN	Sparse	Name
1	1	Incr	1885774		05/01/2020 17:44:22			NO	/u01/app/oracle/oradata/ORCL18C/system01.dbf

BS Key	Type	LV	Size	Device	Type	Elapsed Time	Completion Time
14435	Incr	0	329.18M	SBT_TAPE		00:00:02	05/01/2020 17:44:24
BP Key: 14436 Status: AVAILABLE Compressed: YES Tag: BKP-DB							
Handle: VB\$_1891149551_14430_1 Media:							

List of Datafiles in backup set 14435

File	LV	Type	Ckp	SCN	Ckp Time	Abs Fuz	SCN	Sparse	Name
1	0	Incr	1885774		05/01/2020 17:44:22			NO	/u01/app/oracle/oradata/ORCL18C/system01.dbf

RMAN>

MERGED

```

RMAN> list backup of datafile 414 completed after "sysdate - 2";

List of Backup Sets
=====

BS Key   Type LV Size       Device Type Elapsed Time Completion Time
-----
414182678 Incr 1 4.72G          SBT_TAPE 00:08:19      02/11/2020 01:09:58
        BP Key: 414182679 Status: AVAILABLE Compressed: YES Tag: BKP-DB
        Handle: VB$ 4025171673_414166781I Media:
        List of Datafiles in backup set 414182678
        File LV Type Ckp SCN      Ckp Time        Name
        -----
        414 1 Incr 5679540841750 02/11/2020 01:01:39 +DATAX6/opg5/datafile/tsdigimglong_pmax.267.954009149

BS Key   Type LV Size       Device Type Elapsed Time Completion Time
-----
414186971 Incr 0 24.28T          SBT_TAPE 00:08:19      02/11/2020 01:09:58
        BP Key: 414186972 Status: AVAILABLE Compressed: YES Tag: BKP-DB
        Handle: VB$ 4025171673_414166781_414 Media:
        List of Datafiles in backup set 414186971
        File LV Type Ckp SCN      Ckp Time        Name
        -----
        414 0 Incr 5679540841750 02/11/2020 01:01:39 +DATAX6/opg5/datafile/tsdigimglong_pmax.267.954009149

BS Key   Type LV Size       Device Type Elapsed Time Completion Time
-----
414232984 Incr 1 2.52G          SBT_TAPE 00:16:42      03/11/2020 01:19:00
        BP Key: 414232985 Status: AVAILABLE Compressed: YES Tag: BKP-DB
        Handle: VB$ 4025171673_414218563I Media:
        List of Datafiles in backup set 414232984
        File LV Type Ckp SCN      Ckp Time        Name
        -----
        414 1 Incr 5679737301521 03/11/2020 01:05:02 +DATAX6/opg5/datafile/tsdigimglong_pmax.267.954009149

BS Key   Type LV Size       Device Type Elapsed Time Completion Time
-----
414240294 Incr 0 24.28T          SBT_TAPE 00:16:42      03/11/2020 01:19:00
        BP Key: 414240295 Status: AVAILABLE Compressed: YES Tag: BKP-DB
        Handle: VB$ 4025171673_414218563_414 Media:
        List of Datafiles in backup set 414240294
        File LV Type Ckp SCN      Ckp Time        Name
        -----
        414 0 Incr 5679737301521 03/11/2020 01:05:02 +DATAX6/opg5/datafile/tsdigimglong_pmax.267.954009149

RMAN>

```

ZDLRA – REAL-TIME REDO TRANSPORT

- What is Real-Time Redo Transport:
 - Is the “**zero data loss**” - guarantee the zero RPO.
 - Reduces RPO from the last backup to zero/sub-seconds.
 - ZDLRA it is a log_archive_dest destination for your database:
 - Uses the same procedure as DG. **ZDLRA operates with RFS to receive redo log buffers.**

```
SQL> select value from v$parameter where name = 'log_archive_dest_2';  
  
VALUE  
-----  
SERVICE="zdlras1-scan:1521/zdlras1:VPCSRC" SYNC NOAFFIRM DB_UNIQUE_NAME=zdlras1 VALID_FOR=(ONLINE_LOGFILE,ALL_ROLES)  
  
SQL>
```

- If the protected database crash, ZDLRA creates ‘*partial archived log backup*’ with the last redo log buffer sent.
- Does not requires a DG license. Independently of Oracle edition that you use.

```
RMAN> list copy of archivelog all;
```

```
List of Archived Log Copies for database with db_unique_name OR19DG
```

```
=====
```

Key	Thrd	Seq	S	Low Time
13295	1	90	A	01/01/2020 22:28:18

Name: +RECO/OR19DG/ARCHIVELOG/2020_01_01/thread_1_seq_90.446.1028586681

```
RMAN> alter system archive log current;
```

```
Statement processed
```

```
RMAN> list backup of archivelog sequence 91;
```

```
List of Backup Sets
```

```
=====
```

BS Key	Size	Device Type	Elapsed Time	Completion Time
13314	21.50K	SBT_TAPE	00:00:01	01/01/2020 22:32:09

BP Key: 13315 Status: AVAILABLE Compressed: YES Tag: TAG20200101T223208
Handle: \$RSCN_1920977_RTIM_1028557385_THRD_1_SEQ_91_CTKEY_13291_BACKUP Media:

```
List of Archived Logs in backup set 13314
```

Thrd	Seq	Low SCN	Low Time	Next SCN	Next Time
1	91	2519988	01/01/2020 22:31:20	2520099	01/01/2020 22:31:51

```
RMAN>
```

```
[oracle@exac1vm01-ORAD18]$ for i in {1..100000}
> do
> echo "Insert Data $i - date +%d-%m-%Y-%H%M%S"
> sqlplus -s / as sysdba<<EOF
> set heading on feedback on;
> insert into testIns(c1, c2, c3) values ($i, sysdate, 'Loop');
> commit;
> EOF
> done
Insert Data 1 - 18-10-2019-230723

1 row created.

Commit complete.
...
...
Insert Data 1016 - 18-10-2019-230944

1 row created.

Commit complete.

Insert Data 1017 - 18-10-2019-230944

1 row created.

commit
*
ERROR at line 1:
ORA-03113: end-of-file on communication channel
Process ID: 142277
Session ID: 53 Serial number: 30197
```

Outage

```
[oracle@exac1vm01-ORAD18]$ for i in {1..100000}
> do
> echo "Insert Data $i - date +%d-%m-%Y-%H%M%S"
> sqlplus -s / as sysdba<<EOF
> set heading on feedback on;
> insert into testIns(c1, c2, c3) values ($i, sysdate, 'Loop2');
> commit;
> EOF
> done
Insert Data 1 - 18-10-2019-230816

1 row created.

Commit complete.

Insert Data 646 - 18-10-2019-230944

1 row created.

Commit complete.

Insert Data 647 - 18-10-2019-230944

1 row created.

commit
*
ERROR at line 1:
ORA-03113: end-of-file on communication channel
Process ID: 142274
Session ID: 41 Serial number: 3186
```

```
SQL> alter diskgroup data mount;
alter diskgroup data mount
*
ERROR at line 1:
ORA-15032: not all alterations performed
ORA-15017: diskgroup "DATA" cannot be mounted
ORA-15066: offlining disk "1" in group "DATA" may result in a data loss
SQL>
```

```
RMAN> list backup of archivelog all completed after "sysdate - 15/1440";
...
...
BS Key   Size      Device Type Elapsed Time Completion Time
-----
50958809 2.05M      SBT_TAPE    00:00:00     2019-10-18_23-10-12
          BP Key: 50958810   Status: AVAILABLE Compressed: YES Tag: TAG20191018T231012
          Handle: $RSCN_1129803_RTIM_1022011106_THRD_1_SEQ_5_CTKEY_50958757_BACKUP Media:

List of Archived Logs in backup set 50958809
Thrd Seq   Low SCN   Low Time      Next SCN   Next Time
---
1      5        1131667    2019-10-18_23-05-09 1135762    2019-10-18_23-09-44

RMAN>

RMAN> run{
2> set until scn 1135762;
3> restore database;
4> recover database;
5> }
```

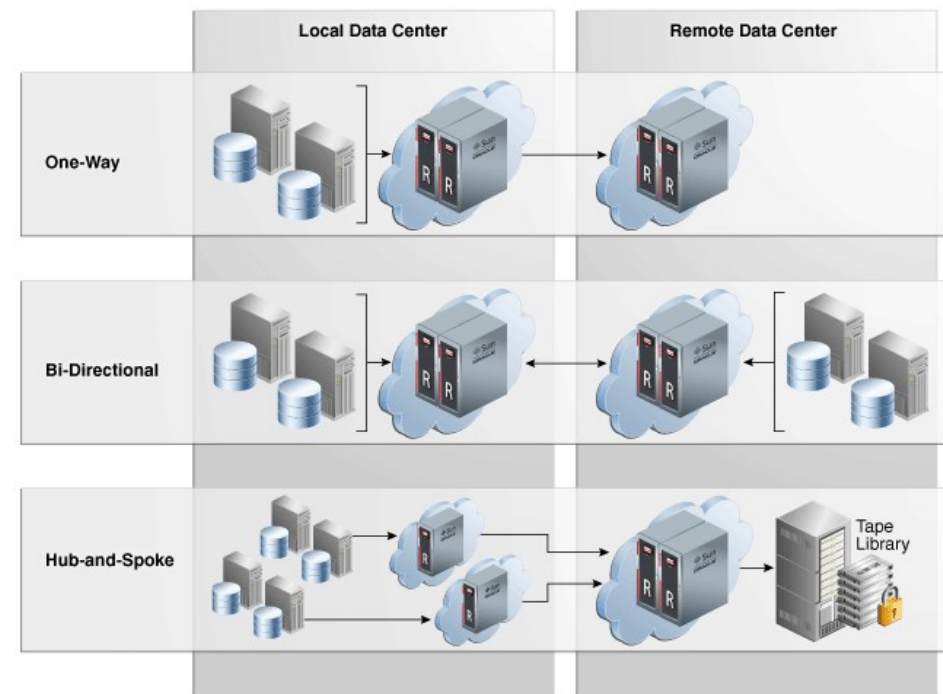
```
SQL> select count(*) from testIns group by c3;

COUNT(*)
-----
        646
       1016

SQL>
```


ZDLRA - REPLICATION

- Replication:
 - One-Way:
 - One master and one destination.
 - Bi-Directional:
 - Both sides replicate each other.
 - Hub/Spoke:
 - One to many.



ZDLRA - REPLICATION

- Replication:
 - ZDLRA native replication, done ASAP.
 - Upstream (source) and Downstream (destination):
 - Same process, Upstream ingests backups at Downstream.
 - **Just replicate archive logs and incremental backups:**
 - Each sides generate the virtual full.
 - Every ZDLRA can have different policies and recovery windows.

```
RMAN> list backup of datafile 1;
```

```
List of Backup Sets
```

```
=====
```

```
BS Key   Type LV Size
-----
9265     Incr 1  88.00K
```

```
List of Datafiles in backup set 9265
```

File	LV	Type	Ckp	SCN	Ckp Time	Abs Fuz	SCN	Sparse	Name
1	1	Incr	2066326	22/12/2019 22:08:46		NO			/u01/app/oracle/oradata/ORCL19/system01.dbf

```
Backup Set Copy #1 of backup set 9265
```

Device	Type	Elapsed Time	Completion Time	Compressed	Tag
SBT_TAPE		00:00:42	22/12/2019 22:08:49	YES	BKP-DB

```
List of Backup Pieces for backup set 9265 Copy #1
```

BP Key	Pc#	Status	Media	Piece Name
9266	1	AVAILABLE		VB\$_1891149551_9264I

```
Backup Set Copy #2 of backup set 9265
```

Device	Type	Elapsed Time	Completion Time	Compressed	Tag
SBT_TAPE		00:00:42	22/12/2019 22:09:28	YES	BKP-DB

```
List of Backup Pieces for backup set 9265 Copy #2
```

BP Key	Pc#	Status	Media	Piece Name
9676	1	AVAILABLE	ZDLRAS2_REP	VB\$_2127575003_7641I

```
BS Key   Type LV Size
-----
9269     Incr 0 320.50M
```

```
...
```

```
...
BS Key   Type LV Size
-----
9269     Incr 0 320.50M
```

```
List of Datafiles in backup set 9269
```

File	LV	Type	Ckp	SCN	Ckp Time	Abs Fuz	SCN	Sparse	Name
1	0	Incr	2066326	22/12/2019 22:08:46		NO			/.../system01.dbf

```
Backup Set Copy #1 of backup set 9269
```

Device	Type	Elapsed Time	Completion Time	Compressed	Tag
SBT_TAPE		00:00:42	22/12/2019 22:08:49	YES	BKP-DB

```
List of Backup Pieces for backup set 9269 Copy #1
```

BP Key	Pc#	Status	Media	Piece Name
9270	1	AVAILABLE		VB\$_1891149551_9264_1

```
Backup Set Copy #2 of backup set 9269
```

Device	Type	Elapsed Time	Completion Time	Compressed	Tag
SBT_TAPE		00:00:42	22/12/2019 22:09:28	YES	BKP-DB

```
List of Backup Pieces for backup set 9269 Copy #2
```

BP Key	Pc#	Status	Media	Piece Name
9690	1	AVAILABLE	ZDLRAS2_REP	VB\$_2127575003_7641_1

```
RMAN>
```

ZDLRA – CLONES

- Tape and Cloud:
 - Can copy to tapes directly, is Media Management Layer (MML):
 - Natively it uses the Oracle Secure Backup (OSB).
 - Can be OSB or Third-Party (since is compatible with rman).
 - Can copy backups to Oracle Cloud, Object Storage.
 - Totally integrated with the RMAN catalog.
 - **Needs to be scheduled:**
 - Clones based in Policies, Tags, Databases, and Backup Types.
 - Always clone the reconstructed rman backup set.

```

RMAN> list backupset 12631;

```

```

List of Backup Sets
=====

```

```

BS Key   Type LV Size
-----

```

```

12631    Incr 0   336.35M

```

```

List of Datafiles in backup set 12631

```

File	LV	Type	Ckp SCN	Ckp Time	Abs Fuz SCN	Sparse	Name
1	0	Incr	2452316	01/01/2020 20:25:20		NO	+DATA/OR19DG/DATAFILE/system.265.1028557261

```

Backup Set Copy #1 of backup set 12631

```

Device Type	Elapsed Time	Completion Time	Compressed	Tag
SBT_TAPE	01:50:05	01/01/2020 20:25:23	YES	BKP-DB

```

List of Backup Pieces for backup set 12631 Copy #1

```

BP Key	Pc#	Status	Media	Piece Name
12632	1	AVAILABLE		VB\$_1891149551_12626_1

```

Backup Set Copy #2 of backup set 12631

```

Device Type	Elapsed Time	Completion Time	Compressed	Tag
SBT_TAPE	01:50:05	01/01/2020 22:15:25	NO	BKP-DB

```

List of Backup Pieces for backup set 12631 Copy #2

```

BP Key	Pc#	Status	Media	Piece Name
13361	1	AVAILABLE	zdlras1-osbmf-000001	RA_SBT_OR19DG_41954437_13318_qsuktnpg_1_2_12631

```

RMAN>

```

ZDLRA

Virtual Full Backup

- Merge Level 0 + Level 1 to generate a new Level 0, and so on.
- Incremental forever strategy.
- ZDLRA natively reads data blocks inside the RMAN backup set.
- Compatible with TDE.

Real-Time Redo Transport

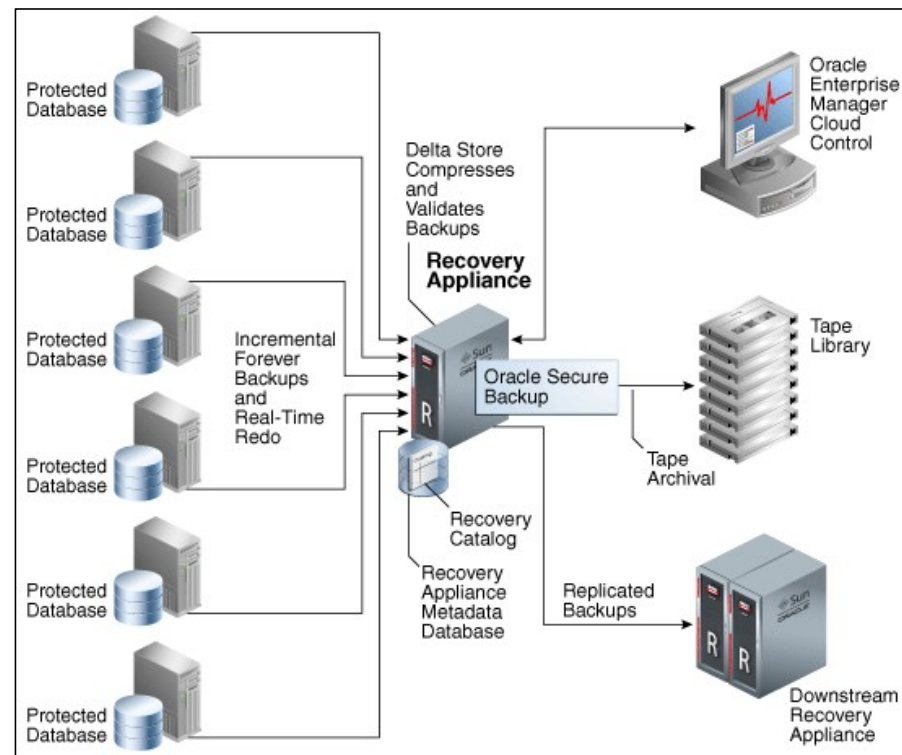
- Guarantee the zero RPO.
- Don't need to pay for DG license to use.
- Can be used from SE to EE, from SI to DG.

Replication

- Based on policies.
- Not use dbms_scheduler, tends to replicate ASAP.
- Replicate just incremental/archivelogs backups.

Clones

- It is not online, it is scheduled.
- Can have multiple schedules, backup sets, archivelogs.
- Always clones a valid rman backup set.



ZDLRA - ENROLLING AND PROTECTING THE DATABASE

- The process to enroll/protect the database is simple:
 1. Define **Virtual Private Catalog** (VPC) user, Create **Protection Policy**,
 2. Add/Link the database with VPC and policy.
 3. Install the library at the client and configure the wallet.
 4. Register the database with RMAN.
 5. Backup.

ZDLRA - ENROLLING AND PROTECTING THE DATABASE

- **Create VPC:**
 - Virtual Private Catalog (VPC) user defines the catalog access at your RMAN connection.
 - It is not the RMAN catalog, is just the user to access it.
 - Can be created using EM/CC/CLI.
 - Don't need to be created for all databases, can be used by 1 to N databases.

ZDLRA - ENROLLING AND PROTECTING THE DATABASE

- **Create Policy:**

- **Most important** part of ZDLRA usage and reliability.
- Every database is linked with one policy.
- Where you define the recovery window constraints.
- ZDLRA control the backup expiration based on the policy:
 - If you define 30 days for recovery window at rman, but for policy, you define 15 days, the backups will be removed after 15 days.
 - Can even block deletion triggered from the rman side.
- Different retention for disk and tapes:
 - MAX_RETENTION_WINDOW is a hard limit.

```
SQL> BEGIN
  2  DBMS_RA.CREATE_PROTECTION_POLICY(
  3      protection_policy_name => 'ZDLRA_WEBINAR'
  4      , description => 'Policy ZDLRA WEBINAR'
  5      , storage_location_name => 'DELTA'
  6      , recovery_window_goal => INTERVAL '30' DAY
  7      , max_retention_window => INTERVAL '60' DAY
  8      , recovery_window_sbt => INTERVAL '120' DAY
  9      , guaranteed_copy => 'NO'
 10      , allow_backup_deletion => 'YES'
 11  );
 12  END;
 13  /
```

PL/SQL procedure successfully completed.

SQL>

ZDLRA - ENROLLING AND PROTECTING THE DATABASE

- **Add database:**

- Link database with the VPC and the protection policy.
- Defines the reserved space for the database inside the “delta store”.

```
SQL> BEGIN
  2  DBMS_RA.ADD_DB (
  3      db_unique_name => 'ORCL18C'
  4      , protection_policy_name => 'ZDLRA_WEBINAR'
  5      , reserved_space => '50G'
  6  );
  7  END;
  8  /
```

PL/SQL procedure successfully completed.

SQL>

```
SQL> BEGIN
  2  DBMS_RA.GRANT_DB_ACCESS (
  3      db_unique_name => 'ORCL18C'
  4      , username => 'vpcwebi'
  5  );
  6  END;
  7  /
```

PL/SQL procedure successfully completed.

SQL>

- **RESERVED_SPACE** needs to sustain the full backup + “incremental” + retention window:
 - Best practices recommend about database size + 20%
 - Depends the recovery_window from the policy.

ZDLRA - ENROLLING AND PROTECTING THE DATABASE

- Client configuration:

- Download library from MOS note [2219812.1](#)
- Unzip and copy to \$ORACLE_HOME/lib.

```
[oracle@orcloe17 tmp]$ unzip ra_linux64.zip
Archive: ra_linux64.zip
  inflating: libra.so
  inflating: metadata.xml
[oracle@orcloe17 tmp]$
[oracle@orcloe17 tmp]$ cp ./libra.so /u01/app/oracle/product/18.6.0.0/dbhome_1/lib/libra.so
[oracle@orcloe17 tmp]$
```

- Create the wallet for VPC and add the credential:

- The wallet is created to allow access to avoiding password requests (ALO).

```
[oracle@orcloe17 tmp]$ mkstore -wrl $ORACLE_HOME/dbs/ra_wallet -createCredential zdlras1-scan:1521/zdlras1:VPCWEBI VPCWEBI s3nh4web1
Oracle Secret Store Tool Release 18.0.0.0.0 - Production
Version 18.1.0.0.0
Copyright (c) 2004, 2017, Oracle and/or its affiliates. All rights reserved.

[oracle@orcloe17 tmp]$
```

ZDLRA - ENROLLING AND PROTECTING THE DATABASE

- Register database:

VPC

Scan of ZDLRA

```
[oracle@orcloe17 ~]$ rman target=/ catalog=vpcwebi/s3nh4web1@zdlras1-scan:1521/zdlras1

Recovery Manager: Release 18.0.0.0.0 - Production on Sun Dec 15 22:08:08 2019
Version 18.6.0.0.0

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connected to target database: ORCL18C (DBID=558466555)
connected to recovery catalog database
recovery catalog schema version 19.03.00.00. is newer than RMAN version

RMAN> register database;

database registered in recovery catalog
starting full resync of recovery catalog
full resync complete

RMAN>
```

ZDLRA - ENROLLING AND PROTECTING THE DATABASE

- Channel configuration:

```
RMAN> CONFIGURE CHANNEL 1 DEVICE TYPE 'SBT_TAPE' FORMAT '%d_%U' PARMS "SBT_LIBRARY=/u01/app/oracle/product/18.6.0.0/dbhome_1/lib/libra.so,
ENV=(RA_WALLET='location=file:/u01/app/oracle/product/18.6.0.0/dbhome_1/dbs/ra_wallet credential_alias=zdlras1-scan:1521/zdlras1:VPCWEBI')";

new RMAN configuration parameters:
CONFIGURE CHANNEL 1 DEVICE TYPE 'SBT_TAPE' FORMAT '%d_%U' PARMS "SBT_LIBRARY=/u01/app/oracle/product/18.6.0.0/dbhome_1/lib/libra.so,
ENV=(RA_WALLET='location=file:/u01/app/oracle/product/18.6.0.0/dbhome_1/dbs/ra_wallet credential_alias=zdlras1-scan:1521/zdlras1:VPCWEBI')";
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete

RMAN>
```

- Look at the details:

- Device type.
- Library location.
- Credential location.
- Credential name.

ZDLRA - ENROLLING AND PROTECTING THE DATABASE

- Backup Level 0:

```
RMAN> BACKUP INCREMENTAL LEVEL 0 DEVICE TYPE SBT FILESPERSET 1 FORMAT '%U' DATAFILE 1 TAG 'BKP-LEVEL0';

Starting backup at 18/10/2020 19:14:49
allocated channel: ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: SID=65 device type=SBT_TAPE
channel ORA_SBT_TAPE_1: RA Library (ZDLRAS1) SID=B1F6229C7B58107CE053010310AC01FF
channel ORA_SBT_TAPE_1: starting incremental level 0 datafile backup set
channel ORA_SBT_TAPE_1: specifying datafile(s) in backup set
input datafile file number=00001 name=/u01/app/oracle/oradata/ORCL18C/system01.dbf
channel ORA_SBT_TAPE_1: starting piece 1 at 18/10/2020 19:15:26
channel ORA_SBT_TAPE_1: finished piece 1 at 18/10/2020 19:18:01
piece handle=afvda2me_1_1 tag=BKP-LEVEL0 comment=API Version 2.0,MMS Version 12.2.0.2
channel ORA_SBT_TAPE_1: backup set complete, elapsed time: 00:02:35
Finished backup at 18/10/2020 19:18:01

Starting Control File and SPFILE Autobackup at 18/10/2020 19:18:01
piece handle=c-558466555-20201018-00 comment=API Version 2.0,MMS Version 12.2.0.2
Finished Control File and SPFILE Autobackup at 18/10/2020 19:18:18

RMAN>
```

ZDLRA - ENROLLING AND PROTECTING THE DATABASE

- Subsequent Level 1:

```
RMAN> BACKUP INCREMENTAL LEVEL 1 DEVICE TYPE SBT FILESPERSET 1 FORMAT '%U' DATAFILE 1 TAG 'BKP-DF1';

Starting backup at 18/10/2020 19:24:38
using channel ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: starting incremental level 1 datafile backup set
channel ORA_SBT_TAPE_1: specifying datafile(s) in backup set
input datafile file number=00001 name=/u01/app/oracle/oradata/ORCL18C/system01.dbf
channel ORA_SBT_TAPE_1: starting piece 1 at 18/10/2020 19:24:42
channel ORA_SBT_TAPE_1: finished piece 1 at 18/10/2020 19:24:57
piece handle=ahvda37q_1_1 tag=BKP-DF1 comment=API Version 2.0,MMS Version 12.2.0.2
channel ORA_SBT_TAPE_1: backup set complete, elapsed time: 00:00:15
Finished backup at 18/10/2020 19:24:57

Starting Control File and SPFILE Autobackup at 18/10/2020 19:24:57
piece handle=c-558466555-20201018-01 comment=API Version 2.0,MMS Version 12.2.0.2
Finished Control File and SPFILE Autobackup at 18/10/2020 19:25:14

RMAN>
```


ZDLRA - PROTECTING THE DATABASE

```

RMAN> list backup of datafile 1;

List of Backup Sets
=====

BS Key   Type LV Size       Device Type Elapsed Time Completion Time
-----
12460    Incr 0  330.99M   SBT_TAPE  00:02:28    18/10/2020 19:17:54
        BP Key: 12461   Status: AVAILABLE Compressed: YES  Tag: BKP-LEVEL0
        Handle: VB$_1918343643_12441I Media:
List of Datafiles in backup set 12460
File LV Type Ckp SCN    Ckp Time              Abs Fuz SCN Sparse Name
-----
1       0  Incr 2046957    18/10/2020 19:15:26              NO    /u01/app/oracle/oradata/ORCL18C/system01.dbf

BS Key   Type LV Size       Device Type Elapsed Time Completion Time
-----
12493    Incr 1  96.00K    SBT_TAPE  00:00:13    18/10/2020 19:24:55
        BP Key: 12494   Status: AVAILABLE Compressed: YES  Tag: BKP-DF1
        Handle: VB$_1918343643_12488I Media:
List of Datafiles in backup set 12493
File LV Type Ckp SCN    Ckp Time              Abs Fuz SCN Sparse Name
-----
1       1  Incr 2048451    18/10/2020 19:24:42              NO    /u01/app/oracle/oradata/ORCL18C/system01.dbf

BS Key   Type LV Size       Device Type Elapsed Time Completion Time
-----
12516    Incr 0  329.89M   SBT_TAPE  00:00:13    18/10/2020 19:24:55
        BP Key: 12517   Status: AVAILABLE Compressed: YES  Tag: BKP-DF1
        Handle: VB$_1918343643_12488_1 Media:
List of Datafiles in backup set 12516
File LV Type Ckp SCN    Ckp Time              Abs Fuz SCN Sparse Name
-----
1       0  Incr 2048451    18/10/2020 19:24:42              NO    /u01/app/oracle/oradata/ORCL18C/system01.dbf

RMAN>

```

ZDLRA - ENROLLING AND PROTECTING THE DATABASE

```
RMAN> BACKUP INCREMENTAL LEVEL 1 DEVICE TYPE SBT FILESPERSET 1 FORMAT '%U' DATAFILE 1 TAG 'BKP-DF1';
```

```
Starting backup at 18/10/2020 19:35:12
allocated channel: ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: SID=59 device type=SBT_TAPE
channel ORA_SBT_TAPE_1: RA Library (ZDLRAS1) SID=B1F66B8DDCF816C6E053010310ACE300
channel ORA_SBT_TAPE_1: starting incremental level 1 datafile backup set
channel ORA_SBT_TAPE_1: specifying datafile(s) in backup set
input datafile file number=00001 name=/u01/app/oracle/oradata/ORCL18C/system01.dbf
channel ORA_SBT_TAPE_1: starting piece 1 at 18/10/2020 19:35:15
channel ORA_SBT_TAPE_1: finished piece 1 at 18/10/2020 19:35:22
piece handle=ajvda3rj_1_1 tag=BKP-DF1 comment=API Version 2.0,MMS Version 12.2.0.2
channel ORA_SBT_TAPE_1: backup set complete, elapsed time: 00:00:07
Finished backup at 18/10/2020 19:35:22
```

```
Starting Control File and SPFILE Autobackup at 18/10/2020 19:35:22
piece handle=c-558466555-20201018-02 comment=API Version 2.0,MMS Version 12.2.0.2
Finished Control File and SPFILE Autobackup at 18/10/2020 19:35:27
```

```
RMAN>
```

```
RMAN> list backup of datafile 1;
```

```
List of Backup Sets
```

```
=====
...
...
```

BS Key	Type	LV	Size	Device	Type	Elapsed Time	Completion Time
12516	Incr	0	329.89M	SBT_TAPE		00:00:13	18/10/2020 19:24:55

BP Key: 12517 Status: AVAILABLE Compressed: YES Tag: BKP-DF1
Handle: VB\$_1918343643_12488_1 Media:

```
List of Datafiles in backup set 12516
```

File	LV	Type	Ckp SCN	Ckp Time	Abs Fuz SCN	Sparse	Name
1	0	Incr	2048451	18/10/2020 19:24:42		NO	/u01/app/oracle/oradata/ORCL18C/system01.dbf

BS Key	Type	LV	Size	Device	Type	Elapsed Time	Completion Time
12562	Incr	1	584.00K	SBT_TAPE		00:00:03	18/10/2020 19:35:18

BP Key: 12563 Status: AVAILABLE Compressed: YES Tag: BKP-DF1
Handle: VB\$_1918343643_12561I Media:

```
List of Datafiles in backup set 12562
```

File	LV	Type	Ckp SCN	Ckp Time	Abs Fuz SCN	Sparse	Name
1	1	Incr	2049857	18/10/2020 19:35:15		NO	/u01/app/oracle/oradata/ORCL18C/system01.dbf

BS Key	Type	LV	Size	Device	Type	Elapsed Time	Completion Time
12566	Incr	0	329.89M	SBT_TAPE		00:00:03	18/10/2020 19:35:18

BP Key: 12567 Status: AVAILABLE Compressed: YES Tag: BKP-DF1
Handle: VB\$_1918343643_12561_1 Media:

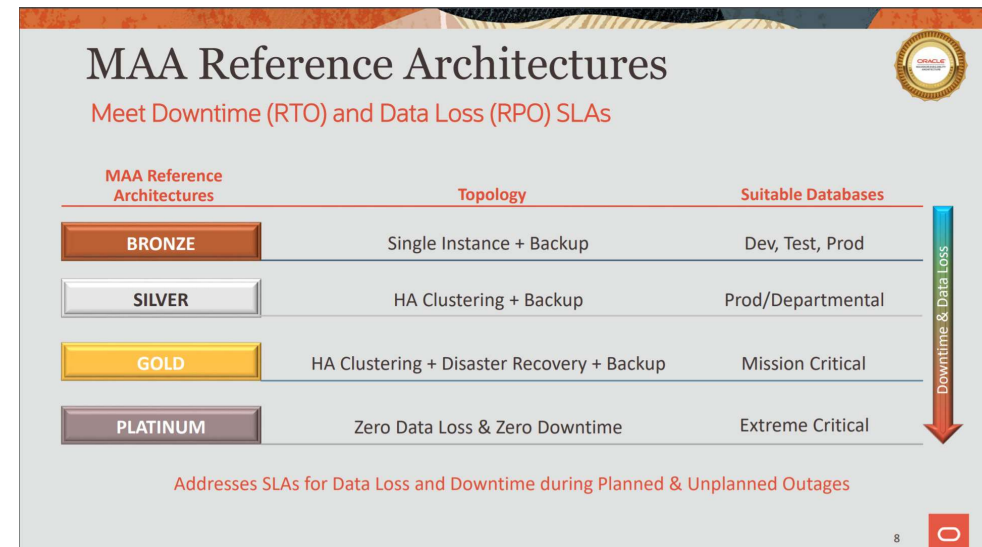
```
List of Datafiles in backup set 12566
```

File	LV	Type	Ckp SCN	Ckp Time	Abs Fuz SCN	Sparse	Name
1	0	Incr	2049857	18/10/2020 19:35:15		NO	/u01/app/oracle/oradata/ORCL18C/system01.dbf

```
RMAN>
```

ZDLRA + MAXIMUM AVAILABILITY ARCHITECTURE (MAA)

- Pillar of the MAA On-Premises Architecture:
 - Blueprints for reduced planned and unplanned downtime for the On-Premises
 - <https://www.oracle.com/a/tech/docs/maa-overview-onpremise-2019.pdf>
 - One appliance to protect all architectures:
 - **From** Single Instance.
 - **To** Multi-Site Data Guard environment.
 - Key features:
 - Less impact on the environment.
 - Centralized and auto-managed catalog.
 - Can be used to reduce the load during clones.
 - Zero RPO even after serious outages.



MAA Reference Architectures
Meet Downtime (RTO) and Data Loss (RPO) SLAs

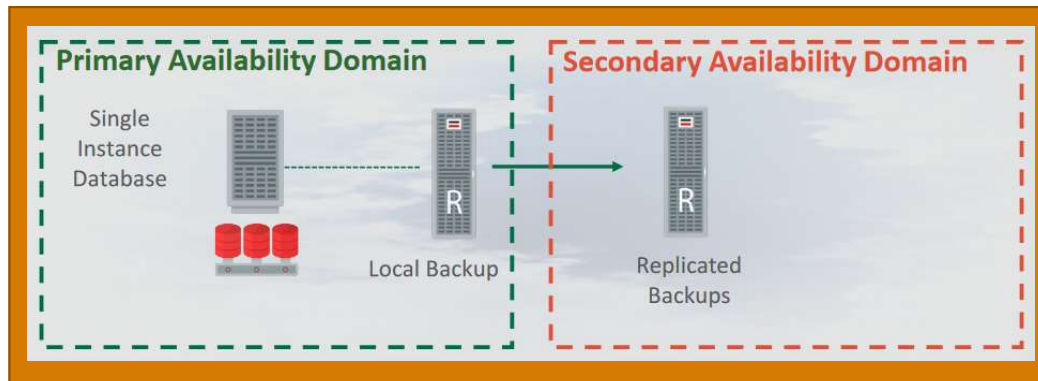
MAA Reference Architectures	Topology	Suitable Databases
BRONZE	Single Instance + Backup	Dev, Test, Prod
SILVER	HA Clustering + Backup	Prod/Departmental
GOLD	HA Clustering + Disaster Recovery + Backup	Mission Critical
PLATINUM	Zero Data Loss & Zero Downtime	Extreme Critical

Addresses SLAs for Data Loss and Downtime during Planned & Unplanned Outages

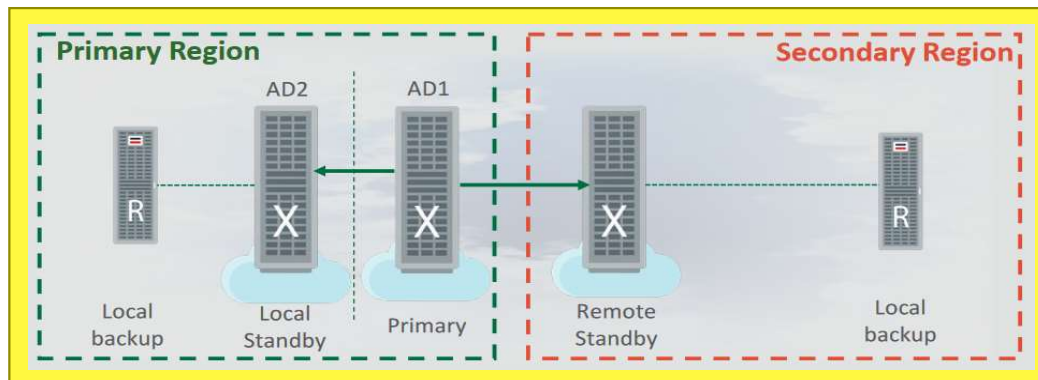
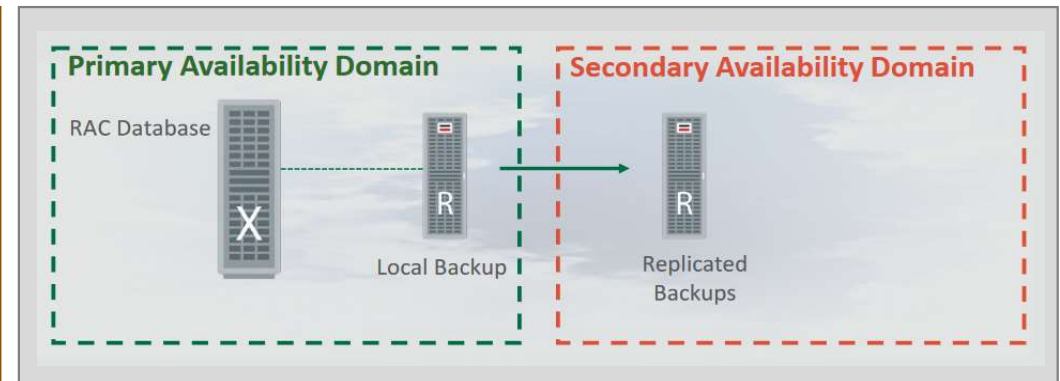
8

ZDLRA + MAA

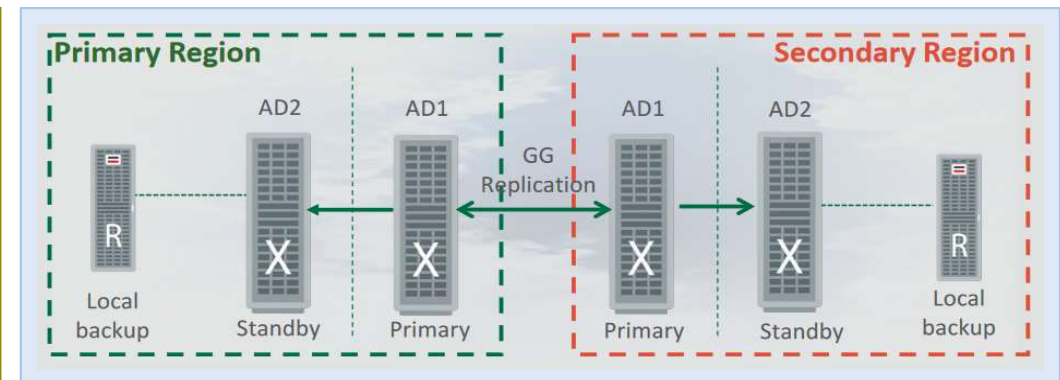
Bronze



Silver



Gold



Platinum

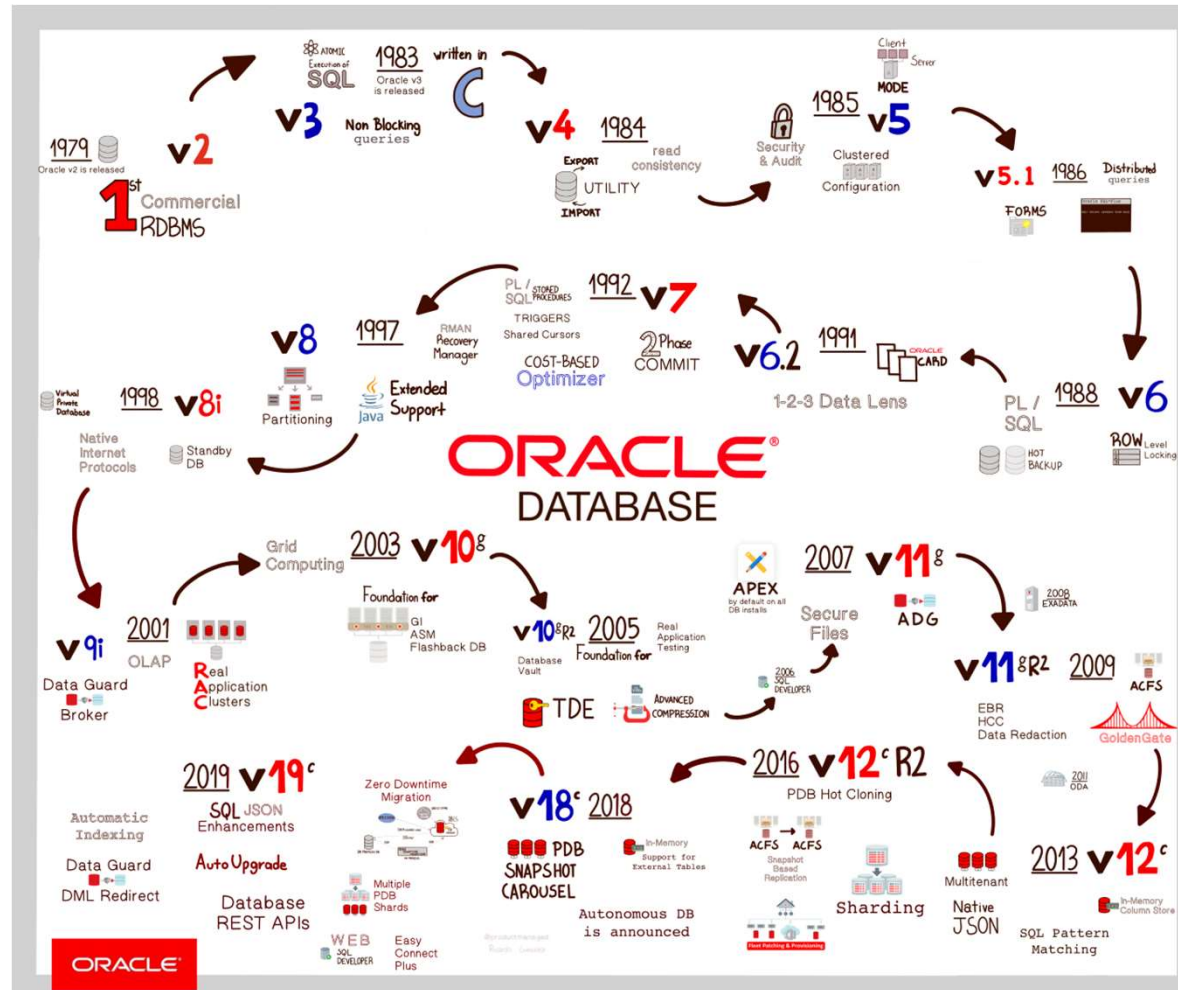
WOULD YOU LIKE TO KNOW MORE?

- Check more details at my blog:

- [ZDLRA, How to enroll a database](#)
- [ZDLRA, Protecting Databases with Replication](#)
- [ZDLRA, Real-Time Redo and Zero RPO](#)
- [ZDLRA, Multi-site protection – ZERO RPO for Primary and Standby](#)
- [MAA, Blueprints and On-Premise Architecture Reference](#)
- [ZDLRA + MAA, Protection for Platinum Architecture](#)
- [ZDLRA + MAA, Protection for Gold Architecture](#)
- [ZDLRA + MAA, Protection for Silver Architecture](#)
- [ZDLRA + MAA, Protection for Bronze Architecture](#)

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