

ZDLRA, WHAT YOU NEED TO KNOW TO UNDERSTAND IT

Fernando Simon
Senior DBA Architect – eProseed



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AGENDA

- Session and About me.
- Backup, Recovery, and Availability.
- What is ZDLRA.
- ZDLRA + MAA.
- ZDLRA: Enrolling the database.
- ZDLRA: Protecting the database.
- QA.

SESSION

- What is Zero Data Loss Recovery Appliance (ZDLRA)?
 - What did you heard about it?
 - Just backup?
 - Backup Appliance?
 - ZDLBA?
 - Backup Incremental?
 - Incremental forever?
 - Deduplication, right?
- **In this session I will discuss about ZDLRA and how it is more (much more) than just backup.** I am not Oracle employee, what you will hear and see is my experience about it and not marketing session.

ABOUT ME

- Senior DBA at eProseed Luxembourg:
 - OCA, OCP, OCE RAC, OCI Architect, Autonomous Specialist.
 - Co-Founder and Board Member at LuxOUG.
 - Oracle ACE.

- Contacts:

fernando.simon@eproseed.com

<https://www.fernandosimon.com/blog/>

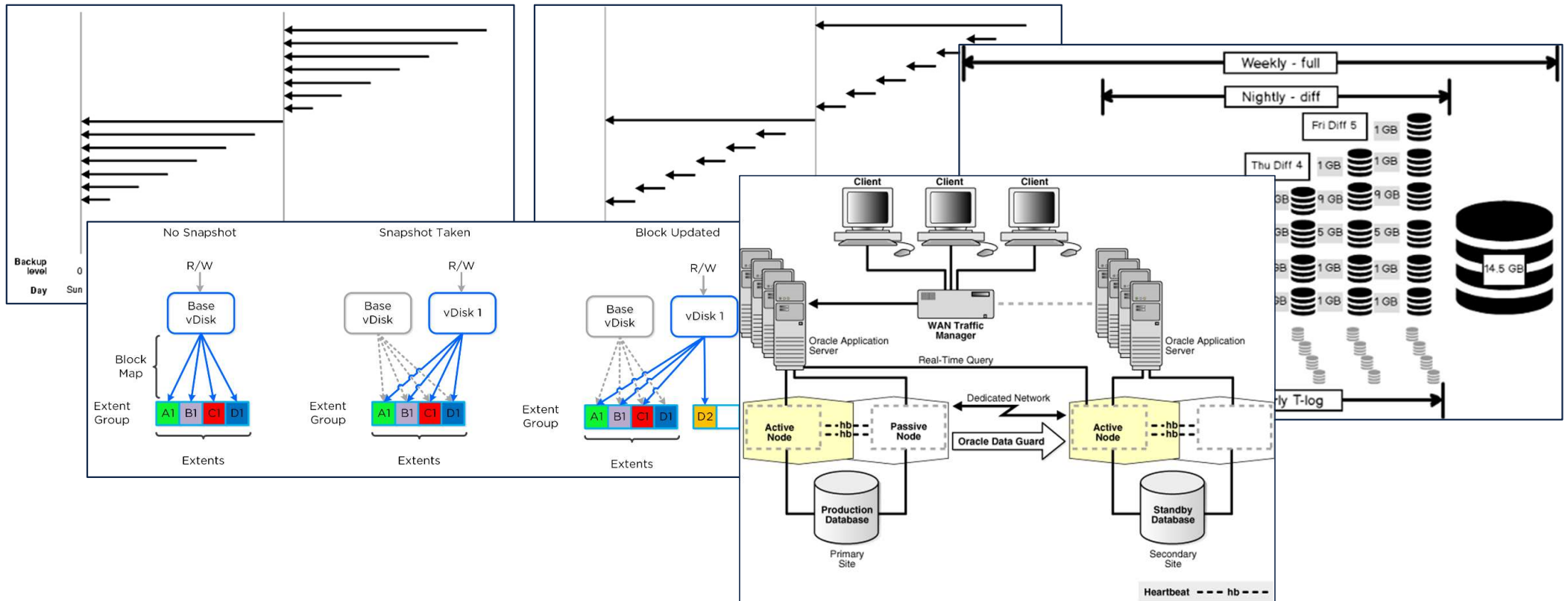
<https://twitter.com/FSimonDBA>

<https://www.linkedin.com/in/fernando-simon/>

ABOUT ME

- DBA since 2004:
 - Oracle, PostgreSQL, DB2.
 - Head and DBA Team Manager at Court of Justice – 2010/2017:
 - Exadata since 2010:
 - Exadata V2, Exadata X2, Exadata X4, Exadata X5 (Full EF), Exadata X6.
 - High consolidated environment, IORM, Resource Manager, Instance Caging.
 - +than 8.000 internal users + Web Access.
 - ZDLRA since 2014/2015:
 - First ZDLRA in Brazil, one of the first of the world worked replicated.
 - MAA Project, Multi-Site protection, RAC+RAC, DG, ZDLRA:
 - OOW SFO 2015:
- <https://www.oracle.com/technetwork/database/availability/con8830-zdlradeepdive-2811109.pdf>
- Luxembourg October/2017:
 - eProseed - Senior Database Architect.
 - Consulting at European Commission:
 - LCM (Life Cycle Management) to the Oracle Products.
 - Supporting the Production Databases.
 - Patch apply for all databases and cluster infrastructure.
 - Consulting at Bank Institution:
 - Multi-site environment.
 - DBA Architect: MAA Infrastructure, Exadata and ZDLRA support.
 - LUXOUG Co-Founder and Board Member.

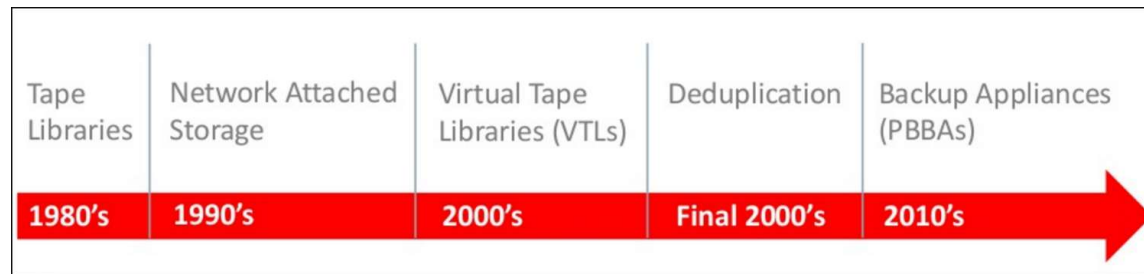
BACKUP, RECOVERY, AND AVAILABILITY



BACKUP, RECOVERY, AND AVAILABILITY

- Principles and goals:
 - Restore every information.
 - Low or zero impact over environment.
 - Easy to: operate, control, and verify.
 - Data retention and storage to sustain requirements and regulations.
 - 24x7.
 - No Data and Access Loss.
- Two words:
 - **RPO** – Recovery Point Objective:
 - Usually, what/how much you can loose.
 - **RTO** – Recovery Time Objective:
 - Usually, time to put everything running again.
- **The goal is zero RPO and zero RTO.**

BACKUP, RECOVERY, AND AVAILABILITY

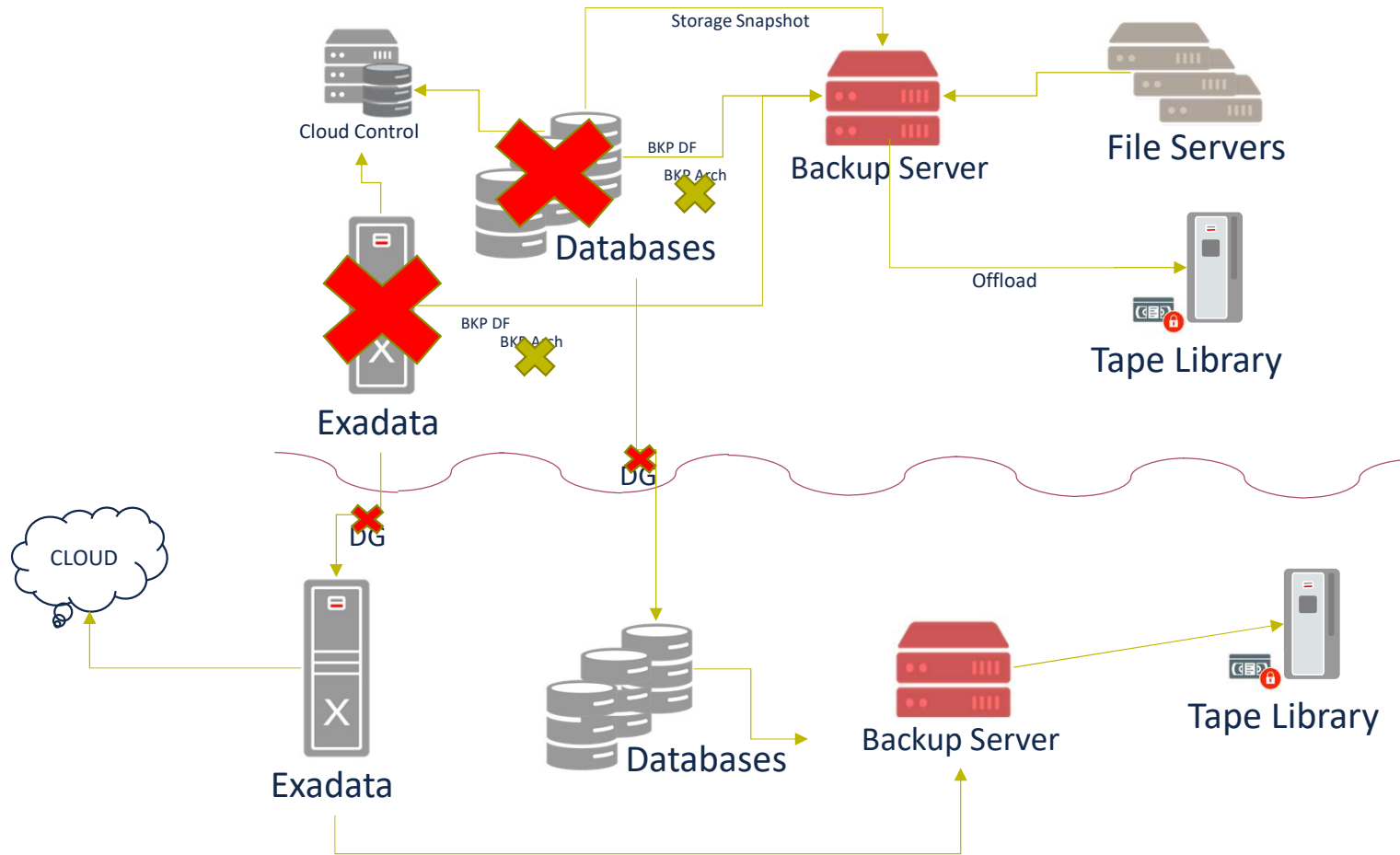


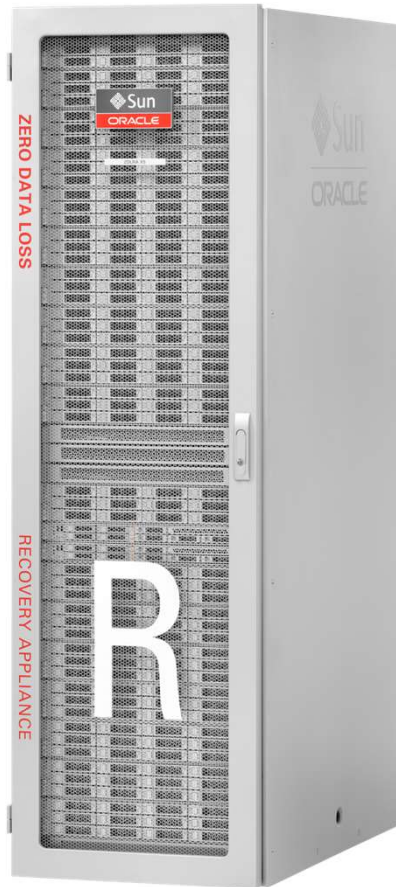
And I will add: Recently, CLOUD

BACKUP, RECOVERY, AND AVAILABILITY

- Real Life:
 - Data Loss (usually since the last backup).
 - Need to create fancy strategies.
 - Huge impact over the environment, Backup Window.
 - BCT available?
 - A lot of players (Tivoli, EMC, DataProtector, Commvault).
 - Cloud copy/clone/offload.
 - Inexistent report about recoverability.
 - Validation, test, validation, test, validation, test....
- Questions that we face:
 - Where are my backups?
 - How they are?
 - Can I restore?
 - Needs to rescan the tape?
 - Where are the tapes?
 - Did I checked the report today?
 - Backup team sent it?
 - **Schrödinger's Cat Backup Quantum Paradox:**
 - “The condition of any backup is unknow until a restore is attempted”
- And it is worst...

BACKUP, RECOVERY, AND AVAILABILITY





WHAT IS ZDLRA

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

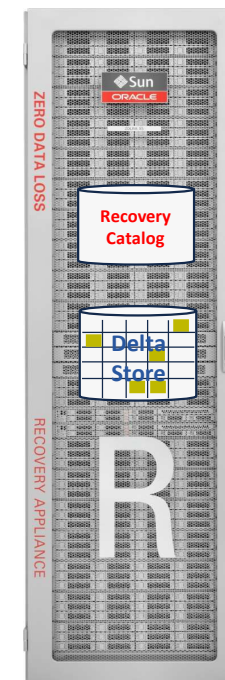
- Engineered Systems.
- Exadata based.
 - But it 's an appliance.
- Hardware + Software:
 - RA Library.
- Media Management Layer (MML) for tape:
 - SAN.
 - Oracle Secure Backup.
- Native replication.
- RMAN Catalog.
- Can be used to protect ExaCC.

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

- **MORE THAN JUST BACKUP. PILLAR OF MAA DESIGN!!!**

WHAT IS ZDLRA

- Oracle Database:
 - Rman catalog:
 - Light modified to cover internal RA tables.
 - Self-driven catalog: **No more crosscheck and validations.**
 - Store the configurations
 - Backup Policies and Database definitions.
 - Delta Store, Packages, tasks, and operations.
- EM/CC/CLI:
 - DBMS_RA package to manage everything.
- Backup library is installed in every server that will backup.
 - Client send data using normal and traditional rman backup commands.



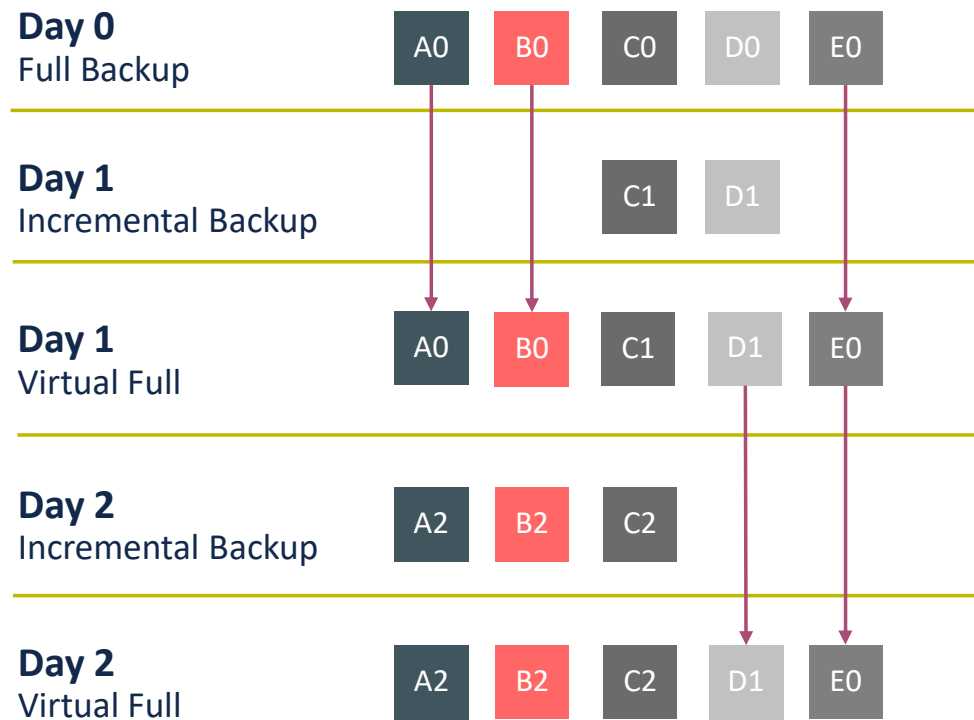
WHAT IS ZDLRA

- Key features and details:
 - Virtual Full Backup.
 - Real-Time Redo.
 - Delta Store.
 - Native Replication.
 - MAA Integration.

WHAT IS ZDLRA

- Virtual Full Backup:
 - **Incremental Forever Strategy:**
 - Initial level 0 backup + consequent level 1 backups.
 - ZDLRA merge both to generate a virtual full backup for your datafile.
 - Just execute incremental level 1 backups after that. **Incremental Forever Strategy.**
 - Generate index for every datafile backup.
 - Validated against corruption for backup blocks **AND** datafile blocks.
 - Differs from deduplication:
 - Opens the sent RMAN backupset and “see” each datafile blocks and not in black magic (reverse engineering).
 - Only RMAN (and Oracle) can natively translate and understand the internal map between “backupset block” and “datafile block”.
 - Compatible with TDE at database side but not compatible with RMAN encryption.
 - Changes nothing at RMAN side. Backup and restore commands continue the same.

WHAT IS ZDLRA



WHAT IS ZDLRA

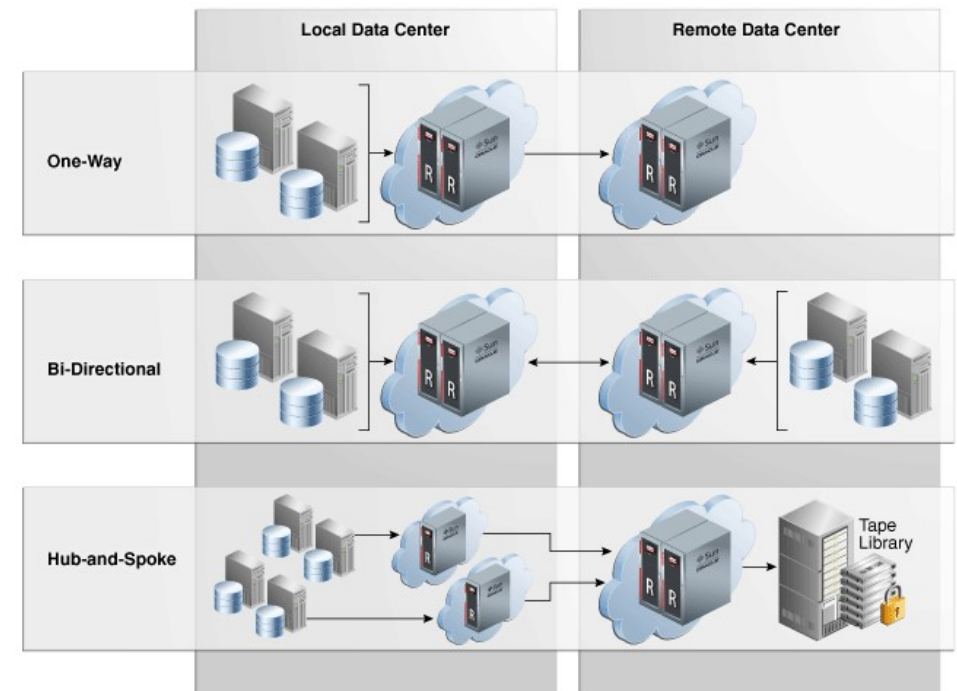
- Real-Time Redo:
 - **Is the “zero data loss” - guarantee the zero RPO.**
 - Reduces RPO from the last backup to zero/sub-seconds
 - ZDLRA it is a log_archive_dest destination:
 - Can be SYNC or ASYNC.
 - Uses same procedure than DG. ZDLRA operates with RFS to receive redo buffers.
 - Differ from FARSYNC, just need to config the archive dest at database side.
 - If protected database crash, ZDLRA creates ‘partial archived log backup’ with last sent redo info.
 - 100% integrated and compatible with MAA.
 - **DOES NOT REQUIRE DG LICENSE! INDEPENDETELY OF ORACLE EDITION THAT YOU USE!**

WHAT IS ZDLRA

- Delta Store:
 - Where the data is stored.
 - Store compressed and validated data
 - **Delta Push** = Virtual Backups + Real Time Redo.
 - Main tasks: Automatic backup index, management, and validation.
 - End to end block validation during life cycle:
 - Data validated during the backup ingestion.
 - Data validated during the backup rebuild.
 - Data validated during backup life cycle (time to time task).
 - Data validated during replication and clones (tape and cloud).

WHAT IS ZDLRA

- Replication:
 - One-Way:
 - One master and one destination.
 - Bi-Directional:
 - Both sides replicate each other.
 - Hub/Spoke:
 - One to many.
 - Just replicate archivelogs and incremental backups.
 - Each sides generate the virtual full.
 - **Each ZDLRA's can have different policies and recovery windows.**

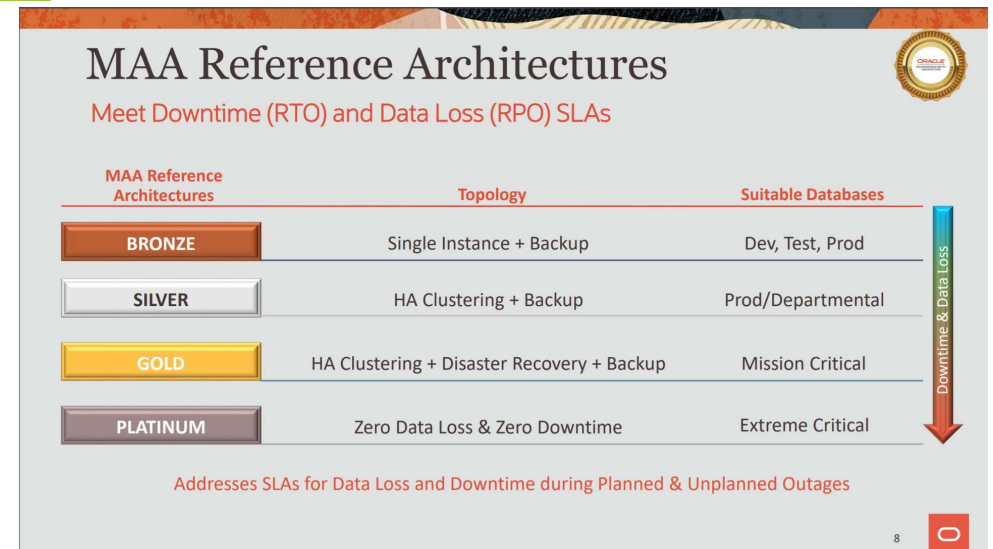


WHAT IS ZDLRA

- Tape and Cloud:
 - Can copy backups to Oracle Cloud, Object Store:
 - Uses Key Vault.
 - Can copy to tapes directly, ZDLRA is Media Management Layer (MML):
 - Natively, the Oracle Secure Backup (OSB) is used:
 - Direct SAN connection.
 - Can be OSB or Third Part (since is compatible with rman).
 - Offload/copy backupsets:
 - Not in real-time, needs to be scheduled.
 - Sends the rman backupset, not the virtual index or unstructured objects.
 - Can clone to tape based in attributes (like tag's, and backup types).
 - Totally integrated with RMAN catalog.

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 everything.
 - Protect all Architectures:
 - **From** Single Instance.
 - **To** Multi-Site Data Guard environment.
 - Key features:
 - Less impact over the environment.
 - Centralized and auto-managed catalog.
 - Can be used to reduce the load during clones (for standby or dev/int/uat) creation.



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

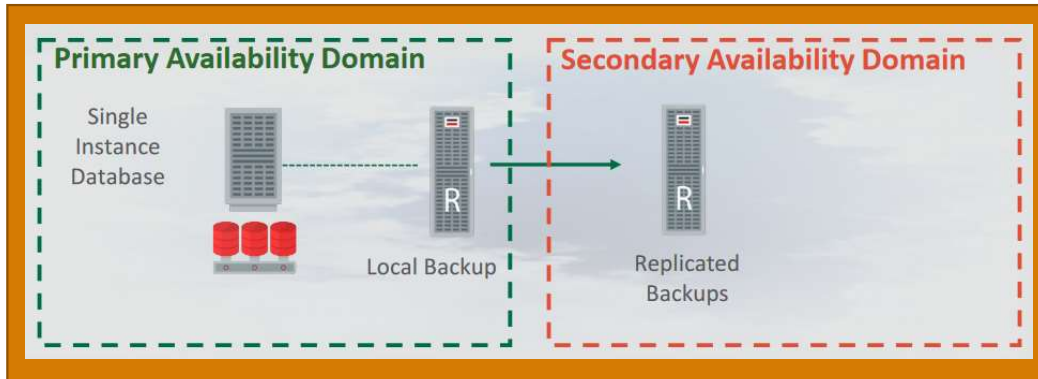
MAA Reference Architectures	Topology	Suitable Databases
BRONZE	Single Instance + Backup	Dev, Test, Prod
SILVER	HA Clustering + Backup	Prod/Departmental
GOLD	HA Clustering + Disaster Recovery + Backup	Mission Critical
PLATINUM	Zero Data Loss & Zero Downtime	Extreme Critical

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

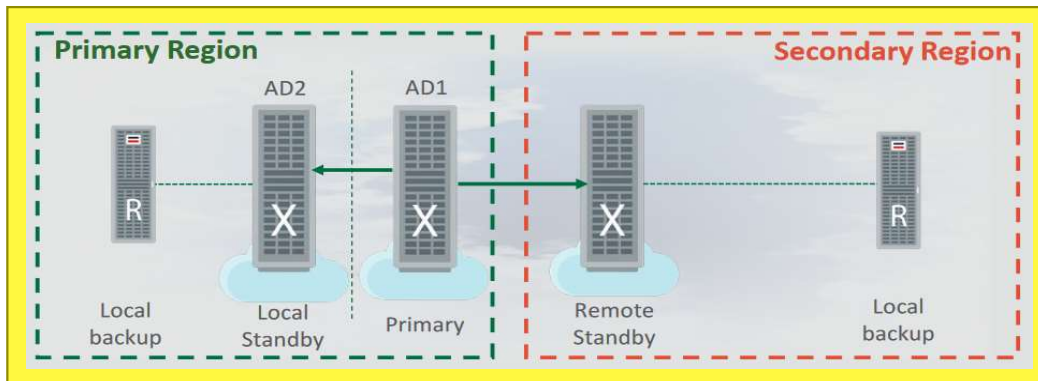
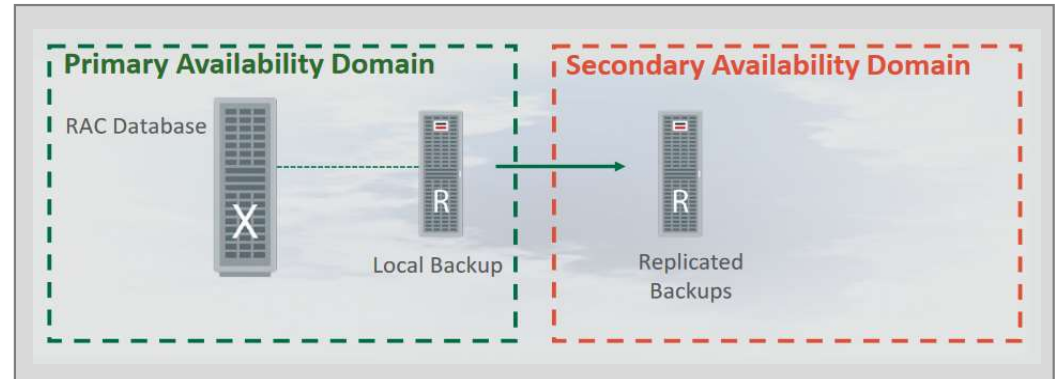
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ZDLRA + MAA

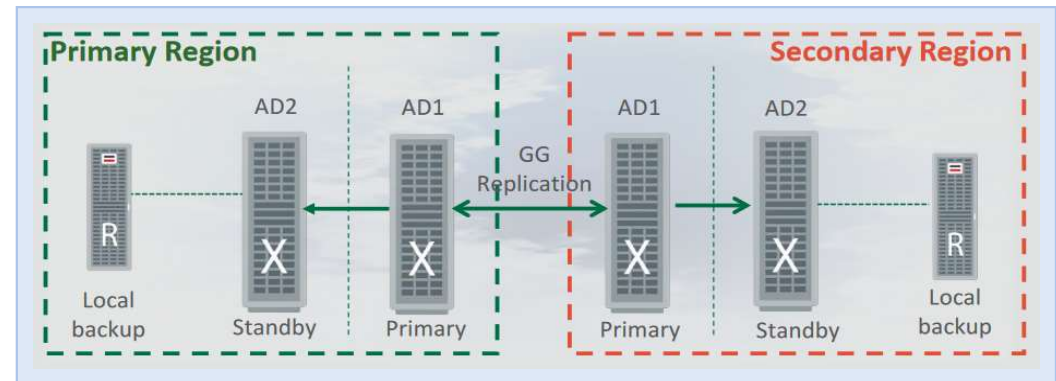
Bronze



Silver

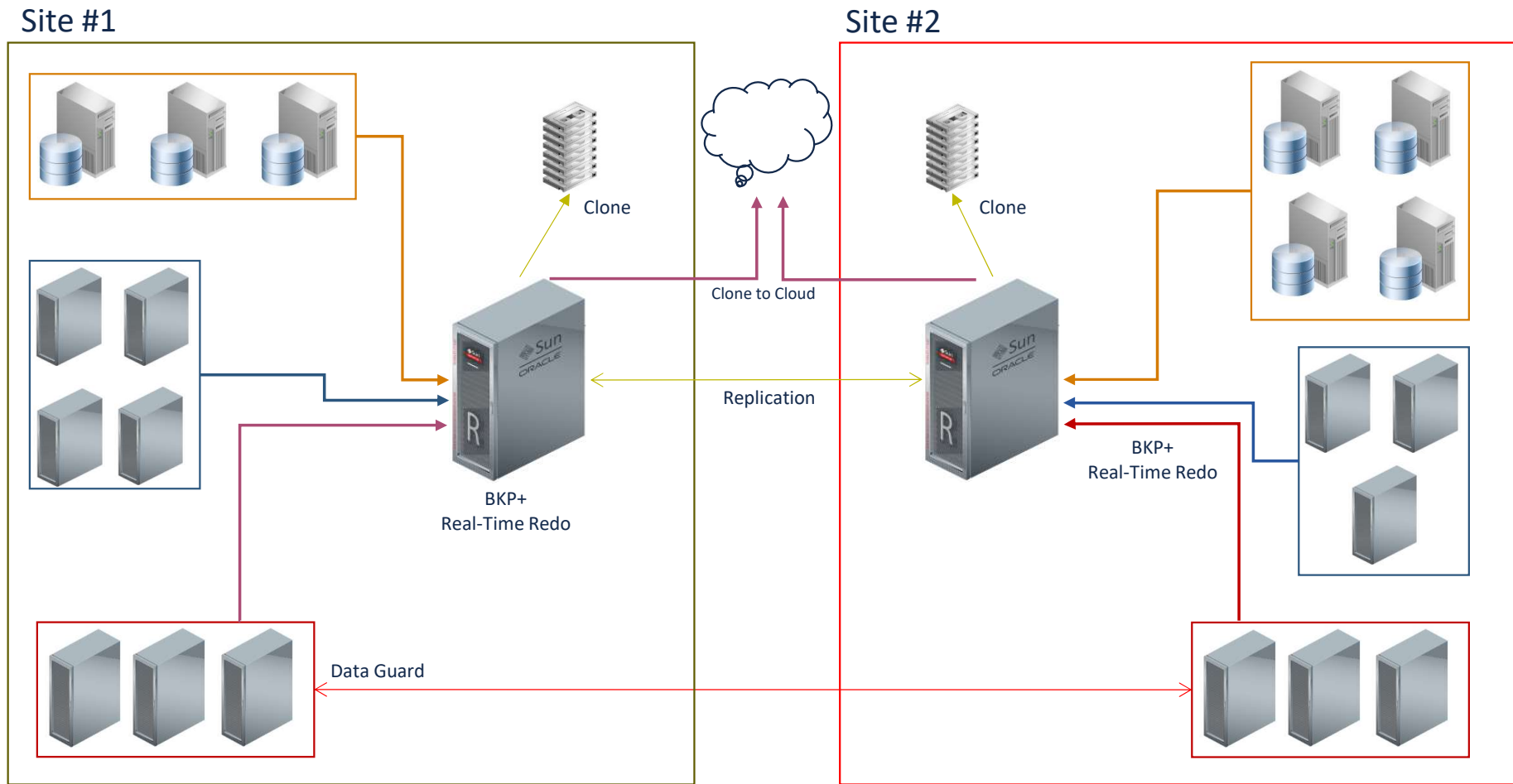


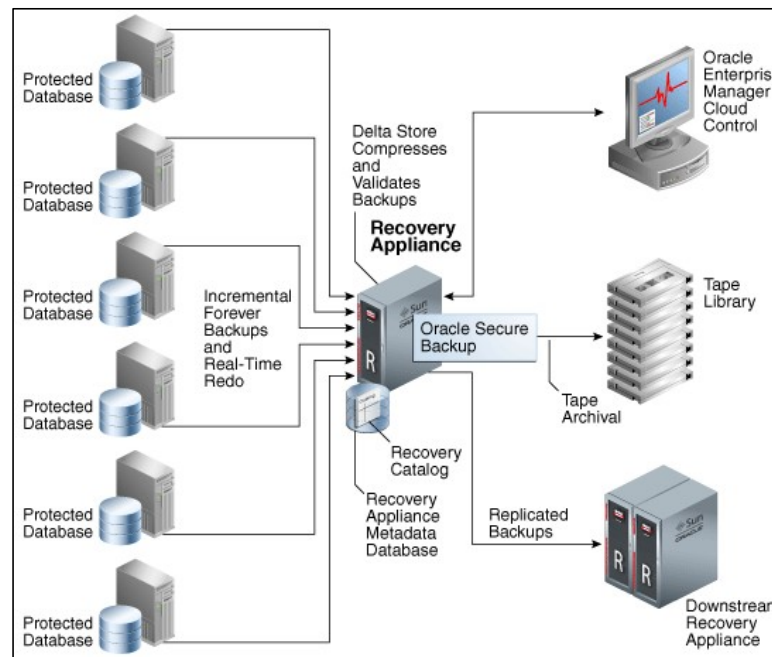
Golden



Platinum

ZDLRA + MAA





ZDLRA, ENROLLING THE DATABASE

- The process to protect database it is simple:
 - Define Virtual Private Catalog (VPC) user, Create Policy, and link the database with VPC and policy.
 - Install library at the client and configure wallet.
 - Register database with RMAN.
 - Backup.

ZDLRA, ENROLLING THE DATABASE

- **Create VPC:**

- At ZDLRA server, create the Virtual Private Catalog (VPC) user:

```
[root@zdlras1n1 ~]# /opt/oracle.RecoveryAppliance/bin/racli add vpc_user --user_name=vpcwebi
[vpcwebi] New Password: s3nh4web1
Sun Dec 15 19:20:52 2019: Start: Add vpc user vpcwebi.
Sun Dec 15 19:20:53 2019:      Add vpc user vpcwebi successfully.
Sun Dec 15 19:20:53 2019: End:   Add vpc user vpcwebi.
[root@zdlras1n1 ~]#
```

- Can be done using EM/CC too.
- **VPC username defines the catalog name for your RMAN.**
- The correct way is using racli command to avoid errors:
 - Example: forgot to use digest when creating the user with sqlplus. Replication will fail.

ZDLRA, ENROLLING THE DATABASE

- **Create Policy:**

- Policy is important part for ZDLRA maintenance and reliability:
 - Good ZDLRA project start with good policy definition.
- Every database is linked with one policy.
- Where you define the recovery window constraints:
 - Minimum and maximum time that backup will be keep.
- ZDLRA control the backup deletion based in the protection policy definitions:
 - 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.
- **MAX_RETENTION_WINDOW** is hard limit.
 - As best practice, don't be so hard on it.

```
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 THE DATABASE

- **Add database:**

- Link the VPC user with the policy.
- Defines the reserved space for 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 => '5G'
  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>
```

- **RESERVERED_SPACE** needs to sustain the full backup + “incrementals” + retention window
 - Best practices recommends about database size + 20%
 - But depends the database load. Needs to have small follow up.
 - Depends the recovery_window from policy.

ZDLRA, ENROLLING THE DATABASE

- **Client configuration:**

- The steps are:
 - Library installation.
 - Wallet and config file.
 - Register database and allocate rman channel.
- Download library from MOS note [2219812.1](#)
- Unzip and copy to \$ORACLE_HOME/lib.

```
[oracle@orcloel7 tmp]$ unzip ra_linux64.zip
Archive:  ra_linux64.zip
inflating:  libra.so
inflating:  metadata.xml
[oracle@orcloel7 tmp]$
[oracle@orcloel7 tmp]$ cp ./libra.so /u01/app/oracle/product/18.6.0.0/dbhome_1/lib/libra.so
[oracle@orcloel7 tmp]$
```

ZDLRA: ENROLLING AND PROTECTING THE DATABASE

- **Client configuration:**
 - Create the wallet for VPC and add the credential:
 - The wallet is created to allow access avoiding password request (ALO).
 - Wallet can be reused or have more than one credential.

```
[oracle@orcloel7 tmp]$ mkstore -wrl $ORACLE_HOME/dbs/ra_wallet -createALO
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@orcloel7 tmp]$
[oracle@orcloel7 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@orcloel7 tmp]$
[oracle@orcloel7 tmp]$ mkstore -wrl $ORACLE_HOME/dbs/ra_wallet -listCredential
Oracle Secret Store Tool Release 18.0.0.0.0 - Production
Version 18.1.0.0.0
Copyright (c) 2004, 2017, Oracle and/or its affiliates. All rights reserved.
List credential (index: connect_string username)
1: zdlras1-scan:1521/zdlras1:VPCWEBI VPCWEBI
[oracle@orcloel7 tmp]$
```

ZDLRA, ENROLLING THE DATABASE

- Register database:

```
[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  
  
Copyright (c) 1982, 2018, Oracle and/or its affiliates. All rights reserved.  
  
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 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')";
```

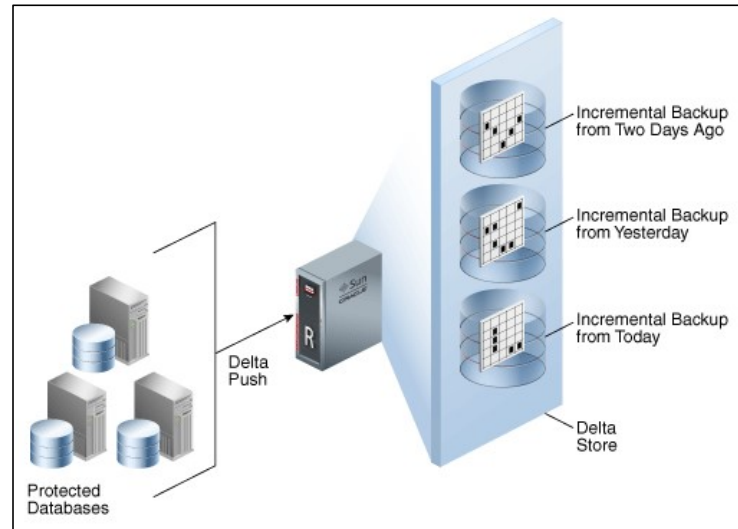
new RMAN configuration parameters are successfully stored

starting full resync of recovery catalog

full resync complete

RMAN>

- Look the details:
 - Device type.
 - Library location.
 - Credential location.
 - Credential name.



ZDLRA, PROTECTING THE DATABASE

- Backup Database:

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

Starting backup at 15-12-2019_23:01:54
allocated channel: ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: SID=7 device type=SBT_TAPE
channel ORA_SBT_TAPE_1: RA Library (ZDLRAS1) SID=99C63E35B30630EAE053010310ACEB04
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: finished piece 1 at 15-12-2019_23:15:37
piece handle=44ujh7cm_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: 00:00:03
Finished backup at 15-12-2019_23:15:37

Starting Control File and SPFILE Autobackup at 15-12-2019_23:15:37
piece handle=c-558466555-20191215-00 comment=API Version 2.0,MMS Version 12.2.0.2
Finished Control File and SPFILE Autobackup at 15-12-2019_23:15:57

RMAN>
```

ZDLRA, PROTECTING THE DATABASE

- Subsequent Level 1:

```
RMAN> BACKUP INCREMENTAL LEVEL 1 DEVICE TYPE SBT FILESPERSET 1 DATABASE TAG 'BKP-DB-INC';

Starting backup at 15-12-2019_23:22:20
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=00003 name=/u01/app/oracle/oradata/ORCL18C/sysaux01.dbf
channel ORA_SBT_TAPE_1: starting piece 1 at 15-12-2019_23:22:22
channel ORA_SBT_TAPE_1: finished piece 1 at 15-12-2019_23:22:25
piece handle=ORCL18C_48ujh7pe_1_1 tag=BKP-DB-INC comment=API Version 2.0,MMS Version 12.2.0.2
...
...
channel ORA_SBT_TAPE_1: specifying datafile(s) in backup set
input datafile file number=00012 name=/u01/app/oracle/oradata/ORCL18C/ORCL18P/users01.dbf
channel ORA_SBT_TAPE_1: starting piece 1 at 15-12-2019_23:22:33
channel ORA_SBT_TAPE_1: finished piece 1 at 15-12-2019_23:22:36
piece handle=ORCL18C_4hujh7pp_1_1 tag=BKP-DB-INC comment=API Version 2.0,MMS Version 12.2.0.2
channel ORA_SBT_TAPE_1: backup set complete, elapsed time: 00:00:03

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
-----
8613     Incr 0 330.29M   SBT_TAPE  00:02:51    15-12-2019_23:04:59
        BP Key: 8614   Status: AVAILABLE Compressed: YES Tag: BKP-LEVEL0
        Handle: VB$ 1891149551_8607I Media:
List of Datafiles in backup set 8613
File LV Type Ckp SCN      Ckp Time                Abs Fuz SCN Sparse Name
-----
1       0   Incr 1779792  15-12-2019_23:02:08      NO      /u01/app/oracle/oradata/ORCL18C/system01.dbf

BS Key   Type LV Size       Device Type Elapsed Time Completion Time
-----
8962     Incr 1 80.00K    SBT_TAPE  00:00:02    15-12-2019_23:26:37
        BP Key: 8963   Status: AVAILABLE Compressed: YES Tag: BKP-DB-INC
        Handle: VB$ 1891149551_8961I Media:
List of Datafiles in backup set 8962
File LV Type Ckp SCN      Ckp Time                Abs Fuz SCN Sparse Name
-----
1       1   Incr 1781251  15-12-2019_23:26:35      NO      /u01/app/oracle/oradata/ORCL18C/system01.dbf

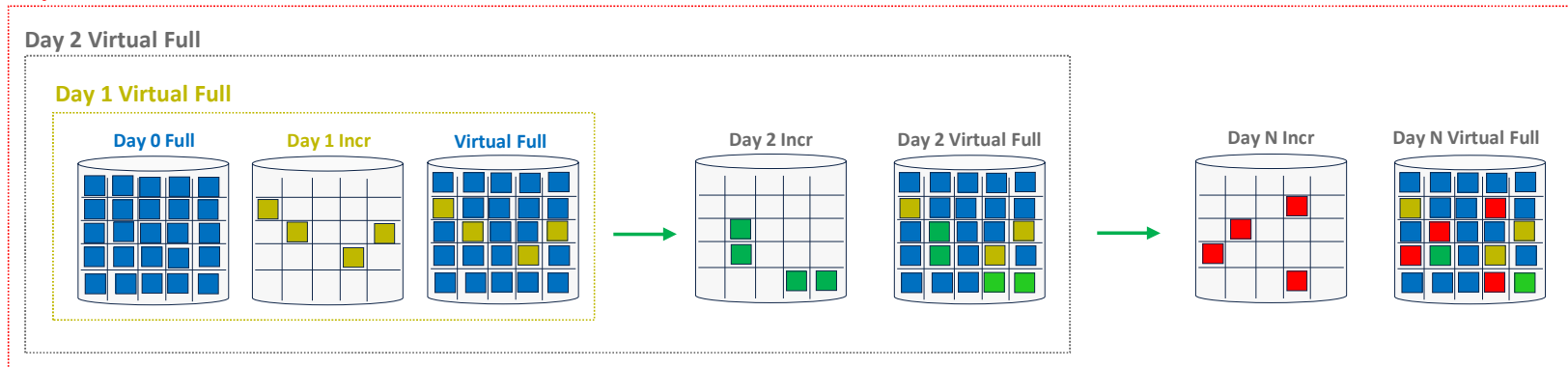
BS Key   Type LV Size       Device Type Elapsed Time Completion Time
-----
8980     Incr 0 329.18M   SBT_TAPE  00:00:02    15-12-2019_23:26:37
        BP Key: 8981   Status: AVAILABLE Compressed: YES Tag: BKP-DB-INC
        Handle: VB$ 1891149551_8961_1 Media:
List of Datafiles in backup set 8980
File LV Type Ckp SCN      Ckp Time                Abs Fuz SCN Sparse Name
-----
1       0   Incr 1781251  15-12-2019_23:26:35      NO      /u01/app/oracle/oradata/ORCL18C/system01.dbf

RMAN>

```

ZDLRA, PROTECTING THE DATABASE

Day N Virtual Full



ZDLRA, PROTECTING THE DATABASE

```

RMAN> list backupset 293767549;

List of Backup Sets
=====

BS Key Type LV Size
-----
293767549 Incr 0 43.61G
List of Datafiles in backup set 293767549
File LV Type Ckp SCN Ckp Time Name
-----
8 0 Incr 204322096297 09/06/2017 01:00:33 +DATA/unic/datafile/unic_data.858.847126617

Backup Set Copy #1 of backup set 293767549
Device Type Elapsed Time Completion Time Compressed Tag
-----
SBT_TAPE 28:44:59 09/06/2017 01:01:51 YES BKP-DB

List of Backup Pieces for backup set 293767549 Copy #1
BP Key Pc# Status Media Piece Name
-----
293767550 1 AVAILABLE VB$_4025171673_293765109_8

Backup Set Copy #3 of backup set 293767549
Device Type Elapsed Time Completion Time Compressed Tag
-----
SBT_TAPE 28:44:59 10/06/2017 05:45:30 YES BKP-DB

List of Backup Pieces for backup set 293767549 Copy #3
BP Key Pc# Status Media Piece Name
-----
293863827 1 AVAILABLE spmlx-zdgr5-01_db-000540 RA_SBT_15032274_m3s6aq5f_1_3_293767549

Backup Set Copy #2 of backup set 293767549
Device Type Elapsed Time Completion Time Compressed Tag
-----
SBT_TAPE 28:44:59 09/06/2017 01:04:26 YES BKP-DB

List of Backup Pieces for backup set 293767549 Copy #2
BP Key Pc# Status Media Piece Name
-----
293782984 1 AVAILABLE ZDLRA_REP VB$_4039225016_19211946_8

RMAN>

```

```

RMAN> BACKUP INCREMENTAL LEVEL 1 DEVICE TYPE SBT FILESPERSET 1 DATAFILE 1 TAG 'BKP-DB';

```

```

Starting backup at 22-12-2019 22:08:43
allocated channel: ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: SID=84 device type=SBT_TAPE
channel ORA_SBT_TAPE_1: RA Library (ZDLRAS1) SID=9A5250DE33813FE9E053010310AC4FCE
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/ORCL19/system01.dbf
channel ORA_SBT_TAPE_1: starting piece 1 at 22-12-2019 22:08:46
...

```

```

Finished Control File and SPFILE Autobackup at 22-12-2019 22:09:02

```

```

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>

```






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