ORACLE DATA GUARD

REAL WORLD EXAMPLES AND TROUBLESHOOTING
AGENDA

• Brief overview Scenario High Availability
• Architecture  Data Guard Until today Oracle 18c
• Best Practices for Creating /Monitoring/Troubleshooting /Testing
HIGH AVAILABILITY

RPO (Recovery Point Objective) – How much data can you afford to lose?
RTO (Recovery Time Objective) – Without data access what time can you stand?
Over 20 years of experience in Oracle, started in 1996. President Oracle User group in Guatemala.

Member of LAOUC (Latin America Oracle User Community) Since 2012
Distinguished Member of Oracle Hispanic community Latin America
(http://comunidadoraclehispana.ning.com)

Wrote Co-Blog Partner Fernando Garcia—Argentina Oracle Ace
(https://oracleconprecision.wordpress.com/about)

...👋...In summary a self study Person like you
HIGH AVAILABILITY

ORACLE 8i
- Read-Only Standby Database
- Managed recovery
- Remote archiving redo log files

ORACLE 9i
- "Zero Data Loss" Integration
- Data Guard Broker and Data Guard Manager GUI
- Swithcover and Failover operations
- Automatical synchronous
- Logical Standby Database
- Maximum Protection

ORACLE 10g
- Real-Time Apply
- Forced support for Oracle RAC
- Fast-Start Failover
- Asynchronous redo transfer
- Flashback Database

ORACLE 11g
- Active Standby Database (Active Data Guard)
- Snapshot Standby
- Heterogeneous platform support (Production – Linux, Standby – Windows)

Oracle 12c
- create a physical standby of a multitenant container database (CDB).
- DML operations are allowed on global temporary tables
- Fast-start failover to physical standbys in maximum availability (RAC)

Oracle 7.3 Standby Database
HIGH AVAILABILITY

Global
Local
Logical
Real Time
Physical
Redo Log apply
Cascade
Sql Apply

Scope
Replication
Performance

Recovery
Redo
Logical Replication
Real Time
Redo Log apply
Cascade
Sql Apply

Increasing Transformation
Decreasing Latency

Disaster Recovery & Data Protection
Direct Memory Access
Direct Write to Logs

Real Time Data Integration & High Availability
Read On-Disk Logs
Fast SQL

Data Integration for Data Warehouse & SOA
Read

Oracle GoldenGate
ORACLE Data Integrator
SQL Query
ORACLE Active Data Guard

ORACLE GoldenGate
ORACLE Data Integrator
Self-based, Complex SQL

Enterprise Manager Cloud Control
Site Guard, Coordinated Site Failover

Production Site

Active Standby Site

RAC / RAC One
- Scalability
- Server HA

Flashback
- Human error correction

Application Continuity
- Application HA

ASM
- Local storage protection

Edition-based Redefinition,
Online Redefinition, Data Guard, GoldenGate
- Minimal downtime maintenance, upgrades, migrations

Global Data Services
- Service Failover / Load Balancing

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

Active Data Guard
- Data Protection, DR
- Query Offload

GoldenGate
- Active-active replication
- Heterogeneous
HIGH AVAILABILITY IN THE REAL WORD

Licensing
Patching Level on Both sides or Multiple Sides
Hardware resources Memory/Network/Storage/cpu
Average Work Load supported (Active Sessions on Emergency)
Recovery Simulation Test (Partial/Total)
Capacity Plan for all the Databases
Guideline of Security Access, Authentications, Backups

Well Defined Process, Roles, Deliverables
ARCHITECTURE DATA GUARD
**Cascade Standby without Broker (Oracle 12c Only)**

- `LOG_ARCHIVE_DEST2='SERVICE=LAYER1,SYNC AFFIRM VALID_FOR=(ONLINE_LOGFILES,PRIMARY_ROLE)'`

- `LOG_ARCHIVE_DEST2='SERVICE=LAYER2,ASYNC NOAFFIRM VALID_FOR=(STANDBY_LOGFILES,STANDBY_ROLE)'`
ARCHITECTURE DATA GUARD

Appendix: New High Availability Features in Oracle Database 18c

<table>
<thead>
<tr>
<th>FEATURE</th>
<th>DESCRIPTION OF NEW OR ENHANCED FUNCTIONALITY IN ORACLE DATABASE 18C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle Sharding</td>
<td>User-defined sharding, support for PDBs as shards, support of GoldenGate replication with sharding, optimizer enhancements for multi-shard queries are some of the capabilities in Oracle Database 18c.</td>
</tr>
</tbody>
</table>

- Global Temporary Table creation is supported with standby databases.
- You can even do DML operations on standby which gets redirected to primary without ACID compromise.
- Preservation of buffer cache during role change.
- No-logging enhancements with two new modes to choose from performance or availability.
- Multi-Instance Redo Apply support with In-Memory Database.
- Multi-Instance Redo Apply support with Block Change Tracking.

RMAn enhancements
Multitenant PDB backups are made usable after that PDB is plugged into another CDB. PDB cloning to another CSB capability using RMAn DUPLICATE has been added. Encryption and decryption of database during backups has been introduced. You can refresh the standby database from either the primary database or a backup using a single RECOVER command. Oracle RMAn cloud module now supports Oracle Cloud Infrastructure Archive Storage Classic where you can backup and keep it there for longer time with a very low cost of $0.001/GB per month.

Application Continuity
Transparent Application Continuity (TAC) is introduced which is fully automated and transparently tracks and records session and transactional state, and thus recoverable outages are hidden from users.

Real Application Clusters
- The new architecture called Oracle Cluster Domain trees individual clusters to dedicate all its resources to the database or application as management tasks like deployment, storage management, performance monitoring is delegated to run on a pre-defined Cluster called the Domain Services Cluster.
- Customers can now convert to the Flex Disk Group and take advantage of the enhanced management capabilities of Flex Disk Group like (a) modifiable redundancy at individual database file level via File Groups (b) snapshot capabilities and (c) quota management at the database level for consolidated environments.

LIFE CYCLE OF DATA GUARD

START

Create Standby Physical DB

Backup Production

Activate Standby

MRP (Log Shipping)

Monitor Gaps/Errors/Performance
LIFE CYCLE OF DATA GUARD

- Create Standby Physical Database (New Users in 12c)
  
  $sqlplus sys / as sysdg$
  
  **SYSBACKUP** will be used to perform all **backup and recovery** related operations either via RMAN or SQL*PLUS

**SYSDG** is in place to separate the **Data Guard** related operations from other activities.

RMAN target sysdg/xxxx @Production target auxiliary sysdg/xxxx@CloneDB

**Duplicate target database for standby from active database nofilenamecheck**;
SQL> SELECT PROCESS, STATUS, SEQUENCE#, THREAD#
FROM V$MANAGED_STANDBY;

<table>
<thead>
<tr>
<th>PROCESS</th>
<th>CLIENT_P</th>
<th>SEQUENCE#</th>
<th>STATUS</th>
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<td>136626</td>
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<td>MRPO</td>
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<th>SEQUENCE#</th>
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<tr>
<td>MRPO</td>
<td>APPLYING LOG</td>
<td>51012</td>
</tr>
</tbody>
</table>
MONITORING TRANSPORT

**SQL**>

```
SELECT dest_id, status, error
FROM v$archive_dest
WHERE target = 'STANDBY';
```

Review the alert

**STATUS=VALID**

SOURCE

Review the alert

TARGET

Review the alert

YES

NO
STATICS OF PROCESS

Select name,value,datum_time,time_computed from V$dataguard_stats;

Name of the metric:

- **APPLY FINISH TIME** - An estimate of the time needed to apply all received, but unapplied redo from the primary database. If there are one or more redo gaps on the standby database, an estimate of the time needed to apply all received, but unapplied redo up to the end of the last archived redo log before the beginning of the earliest redo gap.

- **APPLY LAG** - Apply lag is a measure of the degree to which the data in a standby database lags behind the data in the primary database, due to delays in propagating and applying redo to the standby database. This value is relevant only to the applying instance.

- **TRANSPORT LAG** - Transport lag is a measure of the degree to which the transport of redo to the standby database lags behind the generation of redo on the primary database. If there are one or more redo gaps on the standby database, the transport lag is calculated as if no redo has been received after the beginning of the earliest redo gap.

- **ESTIMATED STARTUP TIME** - An estimate of the time needed to start and open the database.
DASH BOARD DATA GUARD
RESOLVE THE LOG GAPS

**Oracle 12c/18c**

✓ RMAN> Recover Database from Service SOURCE using Compressed backupset section size 200M;
✓ RMAN> Restore Standby Controlfile from Sourse;

**Oracle 11g and Older**

select current_scn from standby;
BACKUP INCREMENITAL FROM SCN 7381947 DATABASE FORMAT 'C:\DBDR\DBDR_%U' tag 'Archive_Gap';
SWITCHOVER/ACTIVATE DATA GUARD

- Alter Database commit to switchover to Standby with Session Shutdown.
- Alter Database commit to Switchover to Primary with Session shutdown.
- ALTER DATABASE RECOVER MANAGED STANDBY DATABASE FINISH;
- ALTER DATABASE ACTIVATE PHYSICAL STANDBY DATABASE;
RMAN-00571:=============================================================
RMAN-00569: =============== ERROR MESSAGE STACK FOLLOWS ===============
RMAN-00571:=============================================================
RMAN-03002: failure of Duplicate Db command
RMAN-05501: aborting duplication of target database
ORA-17629: Cannot connect to the remote database server
ORA-17630: Mismatch in the remote file protocol version client 2 server 3

• **MOS Note 1918906.1 (Copying File Across Remote Servers)**
BEST PRACTICES

Monitoring Alert/warnings/Errors by Email (frequently)

- review the alert.log
- Select * from V$archive_gap
- Select * from V$recovery_Area_usage (Source - Target)
- After every shutdown, double check DB.Unique_Name and Log_Archive_Dest match
- avoid ORA 16047

http://dba86.com/docs/oracle/12.1/DGBK/R/troubleshooting.htm#DGBK/R1020