

RMAN Backup Practice for Oracle Database 19c

General Objective:

Implement an efficient backup and recovery strategy using Oracle RMAN (Recovery Manager) to ensure the availability, integrity, and rapid recovery of critical data, minimizing the impact on database performance and meeting RTO and RPO SLAs.

Specific Objectives with RMAN:

- Automate and optimize backups with RMAN
- Configure RMAN scripts to perform automated full, incremental, and differential backups.
- Take advantage of RMAN's compression and encryption features to reduce storage space and improve security.
- Use the Fast Recovery Area (FRA) to efficiently manage backup files and redo logs.

1. Initial setup

```

[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Tue May 13 08:39:37 2025
Version 19.3.0.0.0

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Connected to an idle instance.

SQL> startup
ORACLE instance started.

Total System Global Area 1627387152 bytes
Fixed Size 9135376 bytes
Variable Size 973078528 bytes
Database Buffers 637534208 bytes
Redo Buffers 7639040 bytes
Base de datos montada.
Base de datos abierta.

```

-- Check the archivelog mode

SELECT log_mode FROM v\$database;

```

SQL> select log_mode from v$database;

LOG_MODE
-----
NOARCHIVELOG

```

-- Configure ARCHIVELOG (requires reboot)

SHUTDOWN IMMEDIATE;

```

SQL> SHUTDOWN IMMEDIATE;
Base de datos cerrada.
Base de datos desmontada.
Instancia ORACLE cerrada.
SQL> █

```

STARTUP MOUNT;

```
SQL> STARTUP MOUNT
Instancia ORACLE iniciada.

Total System Global Area 1627387152 bytes
Fixed Size                 9135376 bytes
Variable Size              973078528 bytes
Database Buffers           637534208 bytes
Redo Buffers                7639040 bytes
Base de datos montada.
SQL> █
```

ALTER DATABASE ARCHIVELOG;

```
SQL> ALTER DATABASE ARCHIVELOG;

Base de datos modificada.

SQL> █
```

-- We check

```
SQL> SELECT LOG_MODE FROM V$DATABASE;

LOG_MODE
-----
ARCHIVELOG

SQL> █
```

ALTER DATABASE OPEN;

```
SQL> ALTER DATABASE OPEN;

Base de datos modificada.

SQL> █
```

-- Configure recommended parameters

ALTER SYSTEM SET db_recovery_file_dest_size=20G SCOPE=BOTH;

```
SQL> ALTER SYSTEM SET db_recovery_file_dest_size=20G SCOPE=BOTH;

Sistema modificado.

SQL> █
```

```
ALTER SYSTEM SET db_recovery_file_dest='/u01/app/oracle/fast_recovery_area'
SCOPE=BOTH;
```

For this instruction we must check if the directory exists, otherwise create it.

For this we must open an alternate window on our server and give the following command

```
[oracle@localhost ~]$ ls -l /u01/app/oracle
total 4
drwxrwxrwx. 3 oracle oinstall 18 feb 22 17:02 admin
drwxrwxrwx. 3 oracle oinstall 18 feb 22 17:07 audit
drwxrwxrwx. 5 oracle oinstall 47 feb 22 17:07 cfgtoollogs
drwxrwxrwx. 2 oracle oinstall 6 feb 22 16:46 checkpoints
drwxrwxrwx. 23 oracle oinstall 4096 feb 22 16:46 diag
drwxrwxrwx. 3 oracle oinstall 18 feb 22 17:02 oradata
drwxrwxrwx. 3 oracle oinstall 18 feb 22 15:44 product
[oracle@localhost ~]$ █
```

As you can see, there is no directory named /u01/app/oracle/fast_recovery_area, it must be created

```
[oracle@localhost ~]$ mkdir -p /u01/app/oracle/fast_recovery_area/ORCL
[oracle@localhost ~]$ █
```

We check

```
[oracle@localhost ~]$ ls -l /u01/app/oracle
total 4
drwxrwxrwx. 3 oracle oinstall 18 feb 22 17:02 admin
drwxrwxrwx. 3 oracle oinstall 18 feb 22 17:07 audit
drwxrwxrwx. 5 oracle oinstall 47 feb 22 17:07 cfgtoollogs
drwxrwxrwx. 2 oracle oinstall 6 feb 22 16:46 checkpoints
drwxrwxrwx. 23 oracle oinstall 4096 feb 22 16:46 diag
drwxr-xr-x. 2 oracle oinstall 6 may 13 09:23 fast_recovery_area
drwxrwxrwx. 3 oracle oinstall 18 feb 22 17:02 oradata
drwxrwxrwx. 3 oracle oinstall 18 feb 22 15:44 product
[oracle@localhost ~]$ █
```

Ok now we apply the command

```
SQL> ALTER SYSTEM SET db_recovery_file_dest='/u01/app/oracle/fast_recovery_area' SCOPE=BOTH;

Sistema modificado.

SQL> █
```

2. Perform full and incremental backups with RMAN

Connect to RMAN

For this you must do it from the operating system

rman target /

```
[oracle@localhost ~]$ rman target /  
  
Recovery Manager: Release 19.0.0.0.0 - Production on Tue May 13 10:35:33 2025  
Version 19.3.0.0.0  
  
Copyright (c) 1982, 2019, Oracle and/or its affiliates. All rights reserved.  
connected to target database: ORCL (DBID=1721544749)  
  
RMAN> 
```

Full Backup

RMAN> BACKUP DATABASE PLUS ARCHIVELOG;

```
Starting backup at 13-MAY-25  
current log archived  
using channel ORA_DISK_1  
channel ORA_DISK_1: starting archived log backup set  
channel ORA_DISK_1: specifying archived log(s) in backup set  
input archived log thread=1 sequence=16 RECID=2 STAMP=1200998463  
channel ORA_DISK_1: starting piece 1 at 13-MAY-25  
channel ORA_DISK_1: finished piece 1 at 13-MAY-25  
piece handle=/u01/app/oracle/fast_recovery_area/ORCL/backupset/2025_05_13/01_mf_0nnnn_TAG20250513T104103_n26xjzym_.b  
kp tag=TAG20250513T104103 comment=NONE  
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:01  
Finished backup at 13-MAY-25  
  
Starting Control File and SPFILE Autobackup at 13-MAY-25  
piece handle=/u01/app/oracle/fast_recovery_area/ORCL/autobackup/2025_05_13/01_mf_s_1200998465_n26xk2py_.bkp comment=  
NONE  
Finished Control File and SPFILE Autobackup at 13-MAY-25  
  
RMAN> 
```

Incremental backup level 1

RMAN> BACKUP INCREMENTAL LEVEL 1 DATABASE PLUS ARCHIVELOG;

```

Starting backup at 13-MAY-25
current log archived
using channel ORA_DISK_1
channel ORA_DISK_1: starting archived log backup set
channel ORA_DISK_1: specifying archived log(s) in backup set
input archived log thread=1 sequence=18 RECID=4 STAMP=1200998791
channel ORA_DISK_1: starting piece 1 at 13-MAY-25
channel ORA_DISK_1: finished piece 1 at 13-MAY-25
piece handle=/u01/app/oracle/fast_recovery_area/ORCL/backupset/2025_05_13/o1_mf_annnn_TAG20250513T104631_n26xv7lp_.b
kp tag=TAG20250513T104631 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:01
Finished backup at 13-MAY-25

Starting Control File and SPFILE Autobackup at 13-MAY-25
piece handle=/u01/app/oracle/fast_recovery_area/ORCL/autobackup/2025_05_13/o1_mf_s_1200998792_n26xvb5f_.bkp comment=
NONE
Finished Control File and SPFILE Autobackup at 13-MAY-25

RMAN>

```

Differential incremental backup

RMAN> BACKUP INCREMENTAL LEVEL 1 CUMULATIVE DATABASE PLUS ARCHIVELOG;

```

Starting backup at 13-MAY-25
current log archived
using channel ORA_DISK_1
channel ORA_DISK_1: starting archived log backup set
channel ORA_DISK_1: specifying archived log(s) in backup set
input archived log thread=1 sequence=20 RECID=6 STAMP=1200999115
channel ORA_DISK_1: starting piece 1 at 13-MAY-25
channel ORA_DISK_1: finished piece 1 at 13-MAY-25
piece handle=/u01/app/oracle/fast_recovery_area/ORCL/backupset/2025_05_13/o1_mf_annnn_TAG20250513T105155_n26y5ctw_.b
kp tag=TAG20250513T105155 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:01
Finished backup at 13-MAY-25

Starting Control File and SPFILE Autobackup at 13-MAY-25
piece handle=/u01/app/oracle/fast_recovery_area/ORCL/autobackup/2025_05_13/o1_mf_s_1200999117_n26y5g5o_.bkp comment=
NONE
Finished Control File and SPFILE Autobackup at 13-MAY-25

RMAN>

```

Backup of controlfile and spfile

RMAN> BACKUP CURRENT CONTROLFILE;

```

RMAN> BACKUP CURRENT CONTROLFILE;

Starting backup at 13-MAY-25
using channel ORA_DISK_1
channel ORA_DISK_1: starting full datafile backup set
channel ORA_DISK_1: specifying datafile(s) in backup set
including current control file in backup set
channel ORA_DISK_1: starting piece 1 at 13-MAY-25
channel ORA_DISK_1: finished piece 1 at 13-MAY-25
piece handle=/u01/app/oracle/fast_recovery_area/ORCL/backupset/2025_05_13/o1_mf_ncnnf_TAG20250513T105454_n26ybzp7_.b
kp tag=TAG20250513T105454 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:01
Finished backup at 13-MAY-25

Starting Control File and SPFILE Autobackup at 13-MAY-25
piece handle=/u01/app/oracle/fast_recovery_area/ORCL/autobackup/2025_05_13/o1_mf_s_1200999297_n26yc1fp_.bkp comment=
NONE
Finished Control File and SPFILE Autobackup at 13-MAY-25

RMAN>

```

RMAN> BACKUP SPFILE;

```

RMAN> BACKUP SPFILE;

Starting backup at 13-MAY-25
using channel ORA_DISK_1
channel ORA_DISK_1: starting full datafile backup set
channel ORA_DISK_1: specifying datafile(s) in backup set
including current SPFILE in backup set
channel ORA_DISK_1: starting piece 1 at 13-MAY-25
channel ORA_DISK_1: finished piece 1 at 13-MAY-25
piece handle=/u01/app/oracle/fast_recovery_area/ORCL/backupset/2025_05_13/o1_mf_nnsnf_TAG20250513T105613_n26yffy1_.bkp tag=TAG20250513T105613 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:01
Finished backup at 13-MAY-25

Starting Control File and SPFILE Autobackup at 13-MAY-25
piece handle=/u01/app/oracle/fast_recovery_area/ORCL/autobackup/2025_05_13/o1_mf_s_1200999375_n26yfh6_.bkp comment=NONE
Finished Control File and SPFILE Autobackup at 13-MAY-25

RMAN> █

```

3. Configure retention and automation policies

Configure retention policy (7 days)

RMAN> CONFIGURE RETENTION POLICY TO RECOVERY WINDOW OF 7 DAYS;

```

RMAN> CONFIGURE RETENTION POLICY TO RECOVERY WINDOW OF 7 DAYS;

new RMAN configuration parameters:
CONFIGURE RETENTION POLICY TO RECOVERY WINDOW OF 7 DAYS;
new RMAN configuration parameters are successfully stored

RMAN> █

```

Configure backup automation

RMAN> CONFIGURE CONTROLFILE AUTOBACKUP ON;

```

RMAN> CONFIGURE CONTROLFILE AUTOBACKUP ON;

new RMAN configuration parameters:
CONFIGURE CONTROLFILE AUTOBACKUP ON;
new RMAN configuration parameters are successfully stored

RMAN> █

```

RMAN> CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO '/backups/%F';

```

RMAN> CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO '/backups/%F';

new RMAN configuration parameters:
CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO '/backups/%F';
new RMAN configuration parameters are successfully stored

RMAN> █

```

List settings

RMAN> SHOW ALL;

```
RMAN> SHOW ALL;

RMAN configuration parameters for database with db_unique_name ORCL are:
CONFIGURE RETENTION POLICY TO RECOVERY WINDOW OF 7 DAYS;
CONFIGURE BACKUP OPTIMIZATION OFF; # default
CONFIGURE DEFAULT DEVICE TYPE TO DISK; # default
CONFIGURE CONTROLFILE AUTOBACKUP ON;
CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO '/backups/%F';
CONFIGURE DEVICE TYPE DISK PARALLELISM 1 BACKUP TYPE TO BACKUPSET; # default
CONFIGURE DATAFILE BACKUP COPIES FOR DEVICE TYPE DISK TO 1; # default
CONFIGURE ARCHIVELOG BACKUP COPIES FOR DEVICE TYPE DISK TO 1; # default
CONFIGURE MAXSETSIZE TO UNLIMITED; # default
CONFIGURE ENCRYPTION FOR DATABASE OFF; # default
CONFIGURE ENCRYPTION ALGORITHM 'AES128'; # default
CONFIGURE COMPRESSION ALGORITHM 'BASIC' AS OF RELEASE 'DEFAULT' OPTIMIZE FOR LOAD TRUE ; # default
CONFIGURE RMAN OUTPUT TO KEEP FOR 7 DAYS; # default
CONFIGURE ARCHIVELOG DELETION POLICY TO NONE; # default
CONFIGURE SNAPSHOT CONTROLFILE NAME TO '/u01/app/oracle/product/19.3/dbhome_1/dbs/snapcf_orcl.f'; # default

RMAN> 
```

4. Full Recovery Practice

Simulate loss of data files

RMAN> SHUTDOWN IMMEDIATE;

```
RMAN> SHUTDOWN IMMEDIATE;

database closed
database dismounted
Oracle instance shut down

RMAN> 
```

RMAN> STARTUP MOUNT;

```
RMAN> STARTUP MOUNT;

connected to target database (not started)
Oracle instance started
database mounted

Total System Global Area      1627387152 bytes

Fixed Size                     9135376 bytes
Variable Size                  939524096 bytes
Database Buffers               671088640 bytes
Redo Buffers                   7639040 bytes

RMAN> 
```


RMAN> RESTORE DATABASE;

```
RMAN> RESTORE DATABASE;

Starting restore at 13-MAY-25
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=23 device type=DISK

skipping datafile 5; already restored to file /u01/app/oracle/oradata/ORCL/pdbseed/system01.dbf
skipping datafile 6; already restored to file /u01/app/oracle/oradata/ORCL/pdbseed/sysaux01.dbf
skipping datafile 8; already restored to file /u01/app/oracle/oradata/ORCL/pdbseed/undotbs01.dbf
skipping datafile 9; already restored to file /u01/app/oracle/oradata/ORCL/orclpdb/system01.dbf
skipping datafile 10; already restored to file /u01/app/oracle/oradata/ORCL/orclpdb/sysaux01.dbf
skipping datafile 11; already restored to file /u01/app/oracle/oradata/ORCL/orclpdb/undotbs01.dbf
skipping datafile 12; already restored to file /u01/app/oracle/oradata/ORCL/orclpdb/users01.dbf
channel ORA_DISK_1: starting datafile backup set restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup set
channel ORA_DISK_1: restoring datafile 00001 to /u01/app/oracle/oradata/ORCL/system01.dbf
channel ORA_DISK_1: restoring datafile 00003 to /u01/app/oracle/oradata/ORCL/sysaux01.dbf
channel ORA_DISK_1: restoring datafile 00004 to /u01/app/oracle/oradata/ORCL/undotbs01.dbf
channel ORA_DISK_1: restoring datafile 00007 to /u01/app/oracle/oradata/ORCL/users01.dbf
channel ORA_DISK_1: reading from backup piece /u01/app/oracle/fast_recovery_area/ORCL/backupset/2025_05_13/o1_mf_nnn
d0_TAG20250513T104502_n26xrh7l_.bkp
channel ORA_DISK_1: piece handle=/u01/app/oracle/fast_recovery_area/ORCL/backupset/2025_05_13/o1_mf_nnnd0_TAG2025051
3T104502_n26xrh7l_.bkp tag=TAG20250513T104502
channel ORA_DISK_1: restored backup piece 1
channel ORA_DISK_1: restore complete, elapsed time: 00:00:45
Finished restore at 13-MAY-25

RMAN> █
```

RMAN> RECOVER DATABASE;

```
RMAN> RECOVER DATABASE;

Starting recover at 13-MAY-25
using channel ORA_DISK_1
channel ORA_DISK_1: starting incremental datafile backup set restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup set
destination for restore of datafile 00001: /u01/app/oracle/oradata/ORCL/system01.dbf
destination for restore of datafile 00003: /u01/app/oracle/oradata/ORCL/sysaux01.dbf
destination for restore of datafile 00004: /u01/app/oracle/oradata/ORCL/undotbs01.dbf
destination for restore of datafile 00007: /u01/app/oracle/oradata/ORCL/users01.dbf
channel ORA_DISK_1: reading from backup piece /u01/app/oracle/fast_recovery_area/ORCL/backupset/2025_05_13/o1_mf_nnn
d1_TAG20250513T105128_n26y4k8b_.bkp
channel ORA_DISK_1: piece handle=/u01/app/oracle/fast_recovery_area/ORCL/backupset/2025_05_13/o1_mf_nnnd1_TAG2025051
3T105128_n26y4k8b_.bkp tag=TAG20250513T105128
channel ORA_DISK_1: restored backup piece 1
channel ORA_DISK_1: restore complete, elapsed time: 00:00:01

starting media recovery
media recovery complete, elapsed time: 00:00:05

Finished recover at 13-MAY-25

RMAN> █
```

RMAN> ALTER DATABASE OPEN;

```
RMAN> ALTER DATABASE OPEN;

Statement processed

RMAN>
```

5. Point-in-Time Recovery (PITR)

Determine recovery point

RMAN> LIST BACKUP SUMMARY;

```
List of Backups
=====
```

Key	TY	LV	S	Device	Type	Completion Time	#Pieces	#Copies	Compressed	Tag
1	B	A	A	DISK		13-MAY-25	1	1	NO	TAG20250513T103922
2	B	F	A	DISK		13-MAY-25	1	1	NO	TAG20250513T103925
3	B	F	A	DISK		13-MAY-25	1	1	NO	TAG20250513T103925
4	B	F	A	DISK		13-MAY-25	1	1	NO	TAG20250513T103925
5	B	A	A	DISK		13-MAY-25	1	1	NO	TAG20250513T104103
6	B	F	A	DISK		13-MAY-25	1	1	NO	TAG20250513T104105
7	B	A	A	DISK		13-MAY-25	1	1	NO	TAG20250513T104500
8	B	0	A	DISK		13-MAY-25	1	1	NO	TAG20250513T104502
9	B	0	A	DISK		13-MAY-25	1	1	NO	TAG20250513T104502
10	B	0	A	DISK		13-MAY-25	1	1	NO	TAG20250513T104502
11	B	1	A	DISK		13-MAY-25	1	1	NO	TAG20250513T104502
12	B	A	A	DISK		13-MAY-25	1	1	NO	TAG20250513T104631
13	B	F	A	DISK		13-MAY-25	1	1	NO	TAG20250513T104632
14	B	A	A	DISK		13-MAY-25	1	1	NO	TAG20250513T105126
15	B	1	A	DISK		13-MAY-25	1	1	NO	TAG20250513T105128
16	B	A	A	DISK		13-MAY-25	1	1	NO	TAG20250513T105155
17	B	F	A	DISK		13-MAY-25	1	1	NO	TAG20250513T105157
18	B	F	A	DISK		13-MAY-25	1	1	NO	TAG20250513T105454
19	B	F	A	DISK		13-MAY-25	1	1	NO	TAG20250513T105457
20	B	F	A	DISK		13-MAY-25	1	1	NO	TAG20250513T105613
21	B	F	A	DISK		13-MAY-25	1	1	NO	TAG20250513T105615

```
RMAN> 
```

RMAN> LIST ARCHIVELOG ALL;

```
RMAN> LIST ARCHIVELOG ALL;

List of Archived Log Copies for database with db_unique_name ORCL
=====
```

Key	Thrd	Seq	S	Low Time
1	1	15	A	13-MAY-25
				Name: /u01/app/oracle/fast_recovery_area/ORCL/archivelog/2025_05_13/o1_mf_1_15_n26xfpw4_.arc
2	1	16	A	13-MAY-25
				Name: /u01/app/oracle/fast_recovery_area/ORCL/archivelog/2025_05_13/o1_mf_1_16_n26xjyyp_.arc
3	1	17	A	13-MAY-25
				Name: /u01/app/oracle/fast_recovery_area/ORCL/archivelog/2025_05_13/o1_mf_1_17_n26xrddj_.arc
4	1	18	A	13-MAY-25
				Name: /u01/app/oracle/fast_recovery_area/ORCL/archivelog/2025_05_13/o1_mf_1_18_n26xv6z2_.arc
5	1	19	A	13-MAY-25
				Name: /u01/app/oracle/fast_recovery_area/ORCL/archivelog/2025_05_13/o1_mf_1_19_n26y4gml_.arc
6	1	20	A	13-MAY-25
				Name: /u01/app/oracle/fast_recovery_area/ORCL/archivelog/2025_05_13/o1_mf_1_20_n26y5c83_.arc

```
RMAN> 
```

Run PITR (example up to a specific SCN)

For this we will need to verify incarnation

```
RMAN> LIST INCARNATION;
```

List of Database Incarnations

DB Key	Inc Key	DB Name	DB ID	STATUS	Reset SCN	Reset Time
1	1	ORCL	1721544749	PARENT	1	17-APR-19
2	2	ORCL	1721544749	CURRENT	1920977	22-FEB-25

```
RMAN> 
```