**Version Control**

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| --- | --- | --- | --- |
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**By:**

**Vaheedbasha Shaik & Dr.Natarajan K**

**Purpose:** To reproduce the proposed methodology this document has been prepared.

**Observations:**

1. These steps are prepared by decoding the algorithm and for manual execution. You might see more series of steps in the screenshots. So, please compare only the series of steps of algorithm and Manual executions.
2. After every step execution the server screenshot provided, and the same text copied also copied in the text format.

**Code:** The github has these operations are automated, no manual execution required. These steps are for reader’s understanding.

**Software:** Please use Oracle Cloud Infrastructure with Oracle database.

**Infrastructure:**

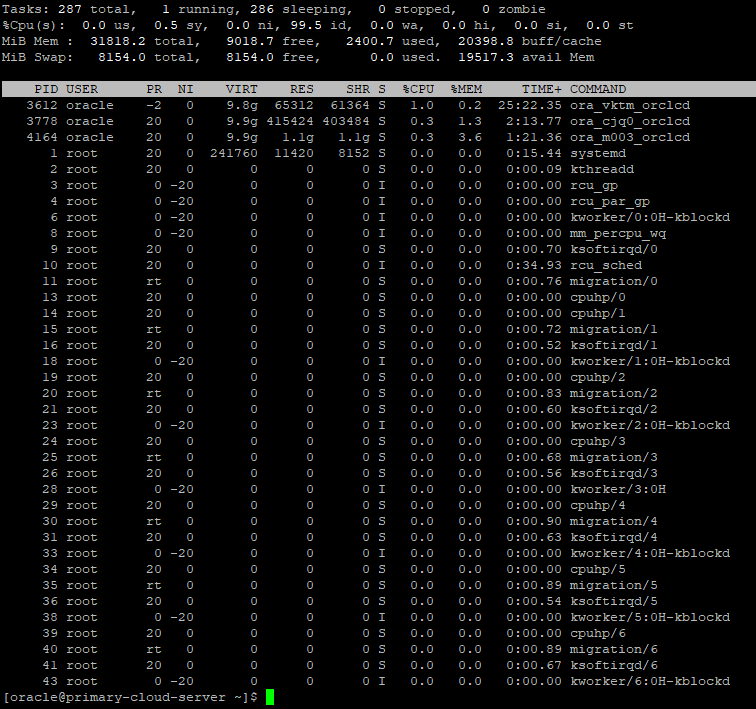
| Server Type | Resource Configurations | | |
| --- | --- | --- | --- |
| CPU’s | RAM | SWAP |
| Active/Primary | 8 | 31 | 7 |
| Passive/Standby | 2 | 6 | 3 |

**Keywords:**

1. Active or Primary database refers to the same word.
2. Passive or standby refers to the same word.

**Step 1: Installation of Configuration of Active server on Cloud**

Primary CPU:



[oracle@primary-cloud-server ~]$ lscpu

Architecture: x86\_64

CPU op-mode(s): 32-bit, 64-bit

Byte Order: Little Endian

CPU(s): 8

On-line CPU(s) list: 0-7

Thread(s) per core: 2

Core(s) per socket: 4

Socket(s): 1

NUMA node(s): 1

Vendor ID: AuthenticAMD

CPU family: 23

Model: 1

Model name: AMD EPYC 7551 32-Core Processor

Stepping: 2

CPU MHz: 1996.249

BogoMIPS: 3992.49

Hypervisor vendor: KVM

Virtualization type: full

L1d cache: 64K

L1i cache: 64K

L2 cache: 512K

L3 cache: 16384K

NUMA node0 CPU(s): 0-7

Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr\_opt pdpe1gb rdtscp lm rep\_good nopl cpuid extd\_apicid tsc\_known\_freq pni pclmulqdq ssse3 fma cx16 sse4\_1 sse4\_2 x2apic movbe popcnt tsc\_deadline\_timer aes xsave avx f16c rdrand hypervisor lahf\_lm cmp\_legacy cr8\_legacy abm sse4a misalignsse 3dnowprefetch osvw topoext perfctr\_core ssbd ibpb vmmcall fsgsbase tsc\_adjust bmi1 avx2 smep bmi2 rdseed adx smap clflushopt sha\_ni xsaveopt xsavec xgetbv1 xsaves nt\_good clzero xsaveerptr virt\_ssbd arat arch\_capabilities

[oracle@primary-cloud-server ~]$ nproc

8

[oracle@primary-cloud-server ~]$ free -g

total used free shared buff/cache available

Mem: 31 2 8 9 19 19

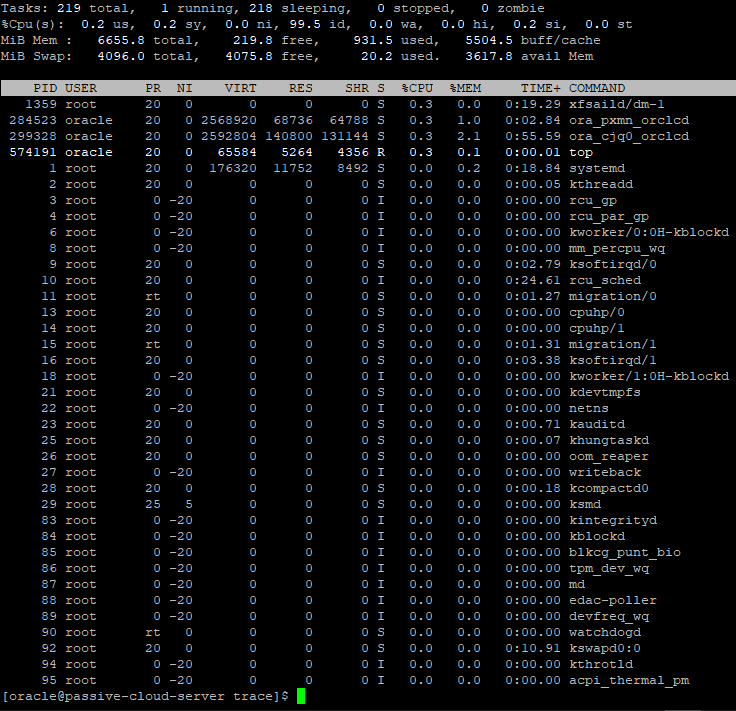
Swap: 7 0 7

[oracle@primary-cloud-server ~]$



**Step 2: Installation of Configuration of Passive server on Cloud**

Passive CPU:



[oracle@passive-cloud-server trace]$ lscpu

Architecture: x86\_64

CPU op-mode(s): 32-bit, 64-bit

Byte Order: Little Endian

CPU(s): 2

On-line CPU(s) list: 0,1

Thread(s) per core: 2

Core(s) per socket: 1

Socket(s): 1

NUMA node(s): 1

Vendor ID: GenuineIntel

CPU family: 6

Model: 63

Model name: Intel(R) Xeon(R) CPU E5-2699 v3 @ 2.30GHz

Stepping: 2

CPU MHz: 2294.876

BogoMIPS: 4589.75

Virtualization: VT-x

Hypervisor vendor: KVM

Virtualization type: full

L1d cache: 32K

L1i cache: 32K

L2 cache: 4096K

L3 cache: 16384K

NUMA node0 CPU(s): 0,1

Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ss ht syscall nx pdpe1gb rdtscp lm constant\_tsc arch\_perfmon rep\_good nopl xtopology cpuid tsc\_known\_freq pni pclmulqdq vmx ssse3 fma cx16 pdcm pcid sse4\_1 sse4\_2 x2apic movbe popcnt tsc\_deadline\_timer aes xsave avx f16c rdrand hypervisor lahf\_lm abm cpuid\_fault invpcid\_single pti ssbd ibrs ibpb stibp tpr\_shadow vnmi flexpriority ept vpid ept\_ad fsgsbase tsc\_adjust bmi1 avx2 smep bmi2 erms invpcid xsaveopt arat umip md\_clear arch\_capabilities

[oracle@passive-cloud-server trace]$ nproc

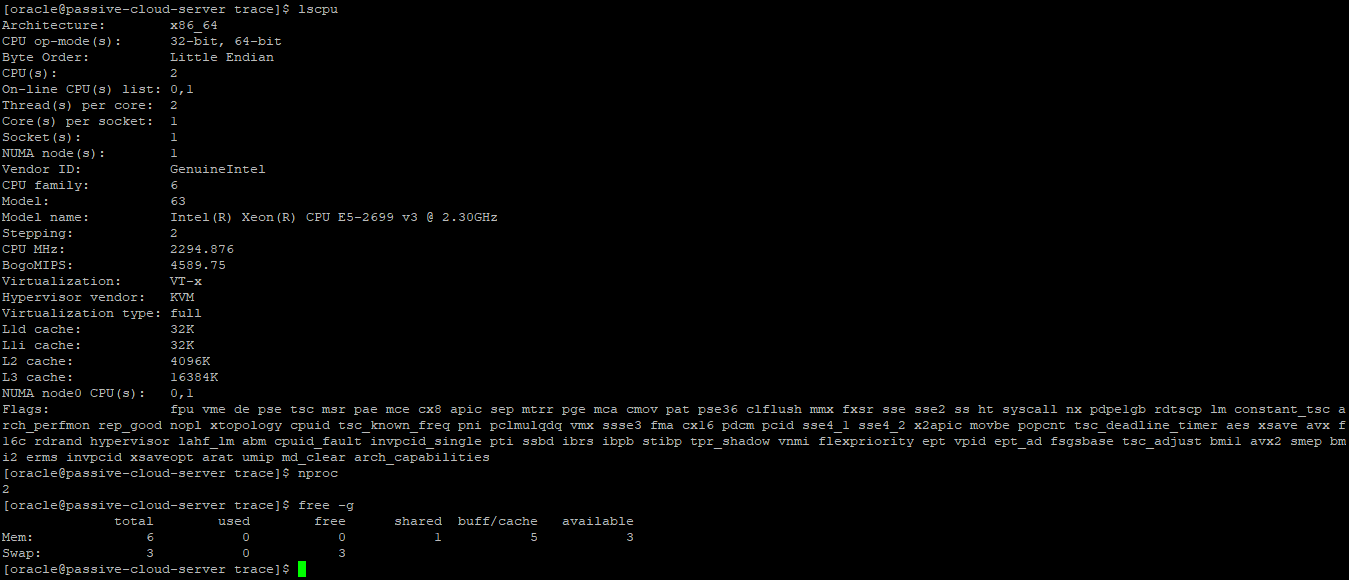
2

[oracle@passive-cloud-server trace]$ free -g

total used free shared buff/cache available

Mem: 6 0 0 1 5 3

Swap: 3 0 3



**Step 3: Active or Primary database configuration on Cloud**

Primary database:

HOST\_NAME INSTANCE\_N STATUS LOGINS DATABASE\_S ACTIVE\_STA NAME DATABASE\_ROLE VERSION OPEN\_MODE STARTUP\_TIME

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primary-cloud-server ORCLCDB OPEN ALLOWED ACTIVE NORMAL ORCLCDB PRIMARY 21.0.0.0.0 READ WRITE 06-JUL-22 10:38:44



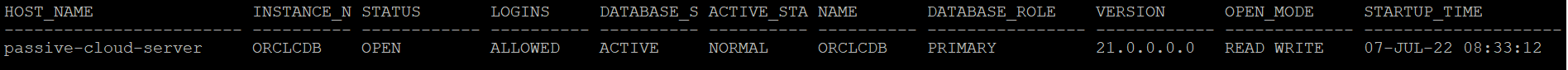
**Step 4: Active or Primary database configuration on Cloud**

Passive Database:

HOST\_NAME INSTANCE\_N STATUS LOGINS DATABASE\_S ACTIVE\_STA NAME DATABASE\_ROLE VERSION OPEN\_MODE STARTUP\_TIME

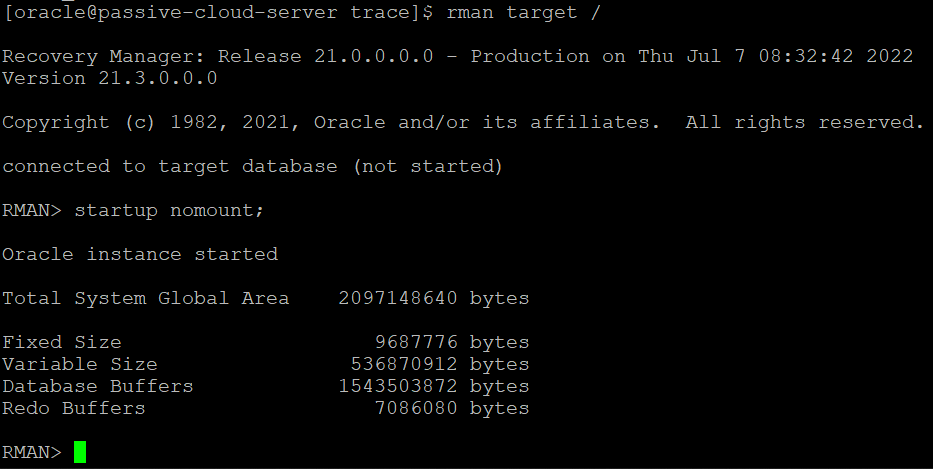
------------------------ ---------- ------------ ---------- ---------- ---------- ---------- ---------------- ------------ ------------- --------------------

passive-cloud-server ORCLCDB OPEN ALLOWED ACTIVE NORMAL ORCLCDB PRIMARY 21.0.0.0.0 READ WRITE 07-JUL-22 08:33:12

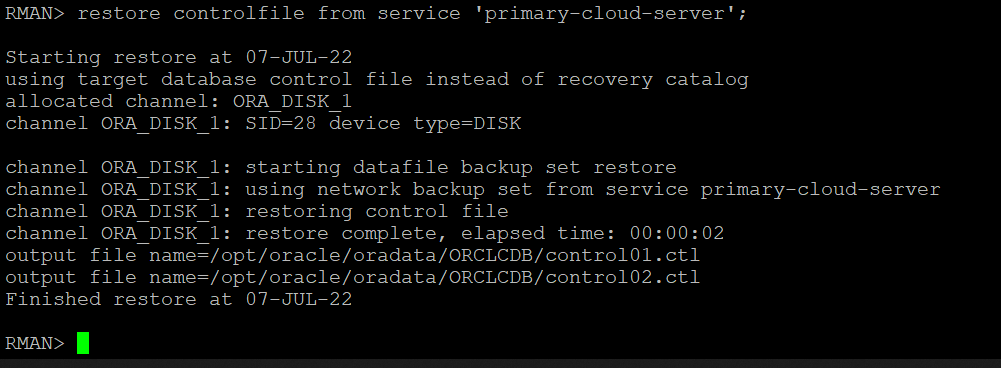


**Step 5: Full restoration of passive server on Cloud**

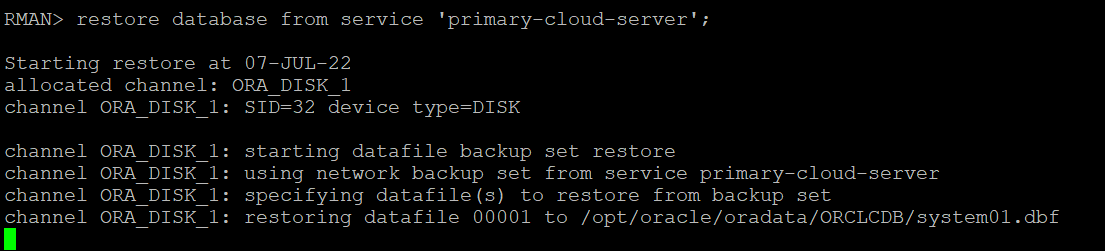
RMAN> startup nomount;



RMAN> restore controlfile from service 'primary-cloud-server';

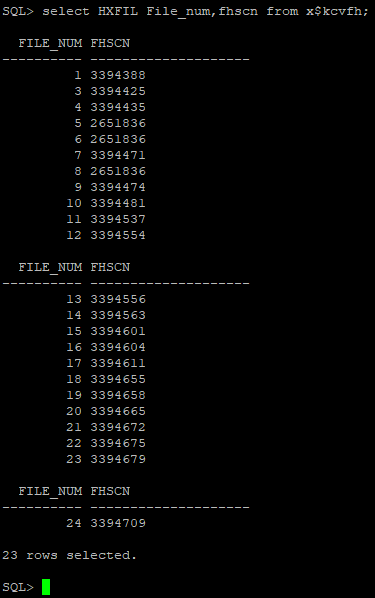


RMAN> restore database from service 'primary-cloud-server';

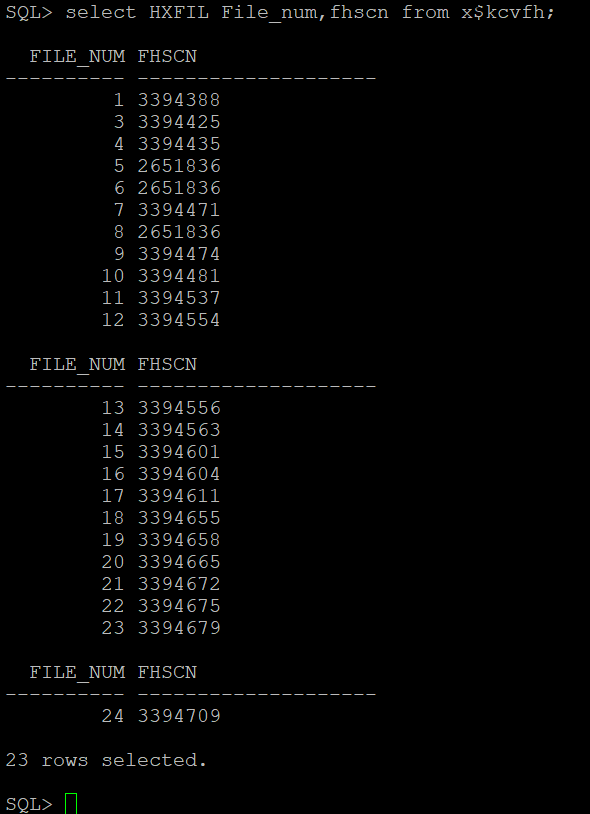


**Step 6: Compare Active and Passive databases data files after Full restoration of passive database on Cloud.**

Primary: SQL> select HXFIL File\_num,fhscn from x$kcvfh;



Standby Level 0 restore: SQL> select HXFIL File\_num,fhscn from x$kcvfh;



**Step 7: Perform some DDL & DML commands on active database to simulate the transactions on active database.**

Primary :performed some changes for level 1 recovery

SQL> alter session set container =ORCLPDB1;

Session altered.

SQL> create table test1.t as select \* from dba\_users;

Table created.

SQL> create table test1.t2 as select \* from dba\_tables;

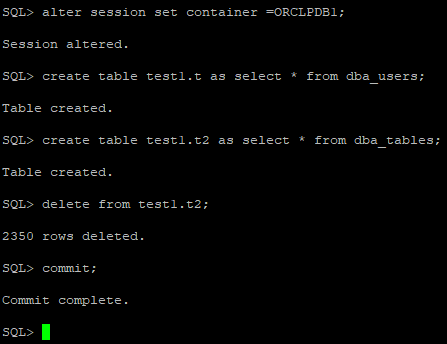
Table created.

SQL> delete from test1.t2;

2350 rows deleted.

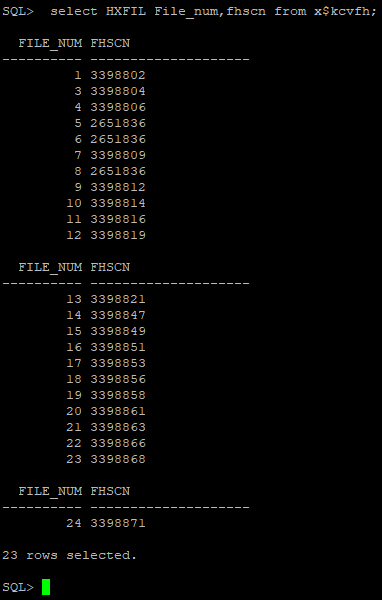
SQL> commit;

Commit complete.



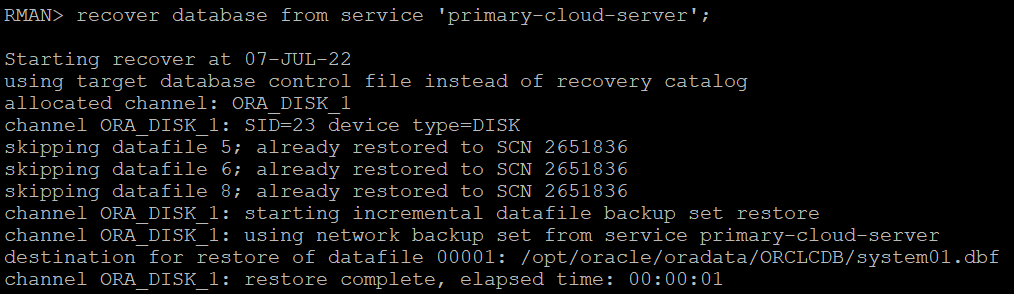
**Step 8: After new transactions, check the modified File Header System Change Number(FHSCN)on active database.**

Primary: fhscn numbers at level -1 recovery in primary



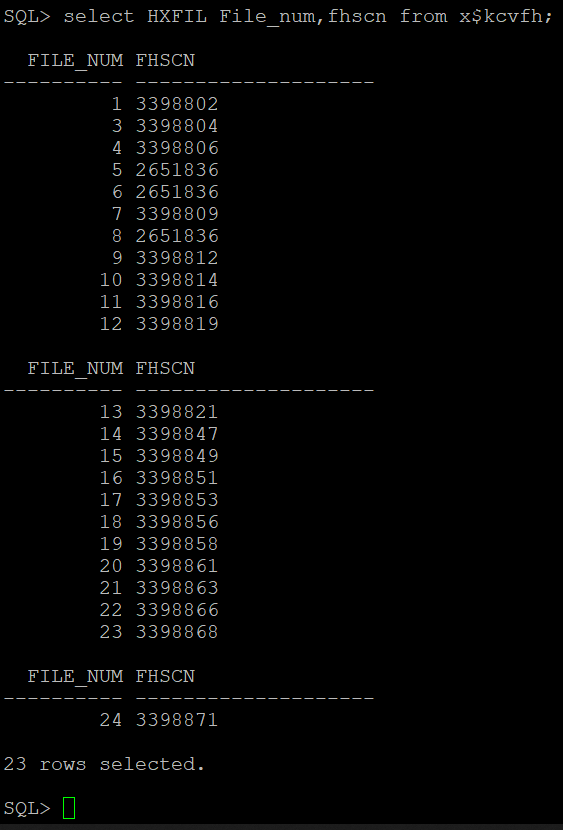
**Step 9: Initiate the 1st Iteration of the Recovery on Passive database.**

Standby: level-1 recover after sql updates in primary:



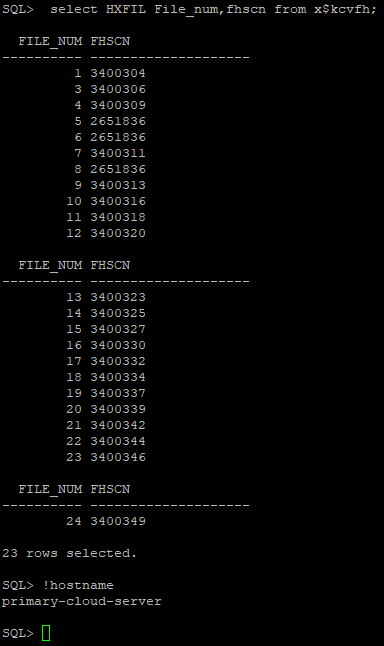
**Step 10: Check the synchronized FHSCN values on Passive database with Step 8 results of active database.**

standby: fhscn numbers after level -1 recovery in standby



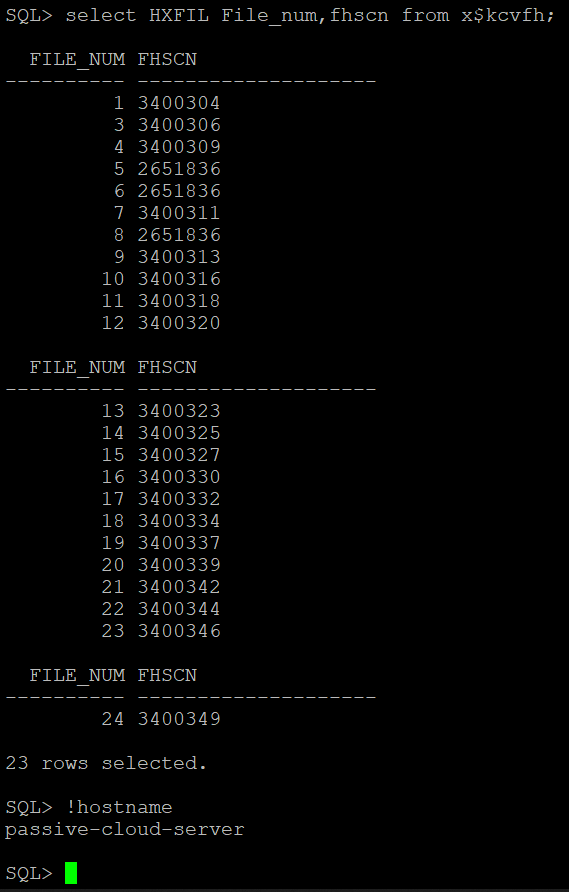
**Step 11: Continue with the step 8,9, and 10 till the cutover data or Last iteration of restoration on passive database.**

**Step 12: Check the Delta changes on active databases before Nth Iteration of recovery.**



**Step 13: Check the applied Delta changes on passive databases after Nth Iteration of recovery.**

standby: fhscn numbers after level Nth recovery in standby



**Step 14: Expected error after Nth Iteration of Passive database recovery.**

Standby:The Expected Error in standby recovery.

unable to find archived log

archived log thread=1 sequence=112

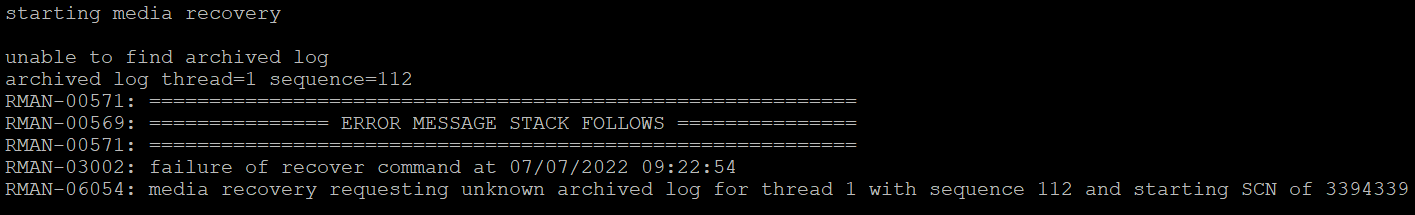
RMAN-00571: ===========================================================

RMAN-00569: =============== ERROR MESSAGE STACK FOLLOWS ===============

RMAN-00571: ===========================================================

RMAN-03002: failure of recover command at 07/07/2022 09:22:54

RMAN-06054: media recovery requesting unknown archived log for thread 1 with sequence 112 and starting SCN of 3394339



**Step 15: To resolve the error on step 14, execute these commands on primary.**

Primary: Perform archivelog switch in primary

SQL> !hostname

primary-cloud-server

SQL> alter system checkpoint;

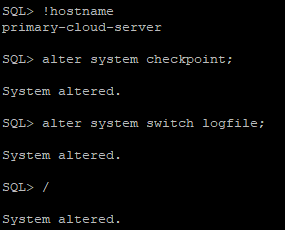
System altered.

SQL> alter system switch logfile;

System altered.

SQL> /

System altered.



**Step 16: To resolve the error on step 14, Perform archivelog transfer to standby/Passive database.**

Primary: Perform archivelog transfer to standby.

[oracle@primary-cloud-server dbs]$ scp arch1\_11\* 10.0.0.213:/opt/oracle/reco/.

arch1\_110\_1107884035.dbf 100% 160MB 70.6MB/s 00:02

arch1\_11\_1107884035.dbf 100% 5632 11.6KB/s 00:00

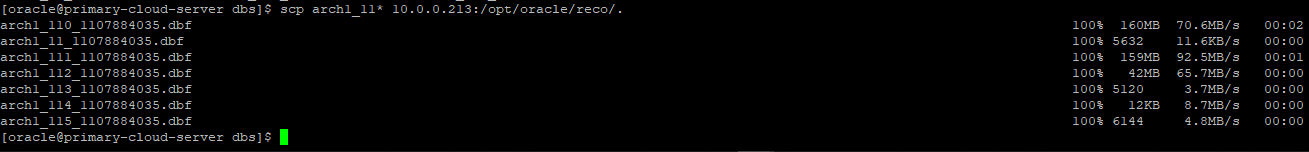
arch1\_111\_1107884035.dbf 100% 159MB 92.5MB/s 00:01

arch1\_112\_1107884035.dbf 100% 42MB 65.7MB/s 00:00

arch1\_113\_1107884035.dbf 100% 5120 3.7MB/s 00:00

arch1\_114\_1107884035.dbf 100% 12KB 8.7MB/s 00:00

arch1\_115\_1107884035.dbf 100% 6144 4.8MB/s 00:00



**Step 17: To resolve the error on step 14, catalog the shipped archive logs on passive database.**

Standby: catalog the archive logs in standby.

[oracle@passive-cloud-server reco]$ pwd

/opt/oracle/reco

[oracle@passive-cloud-server reco]$ ls -ltrh

total 362M

-rw-r----- 1 oracle oinstall 161M Jul 7 09:35 arch1\_110\_1107884035.dbf

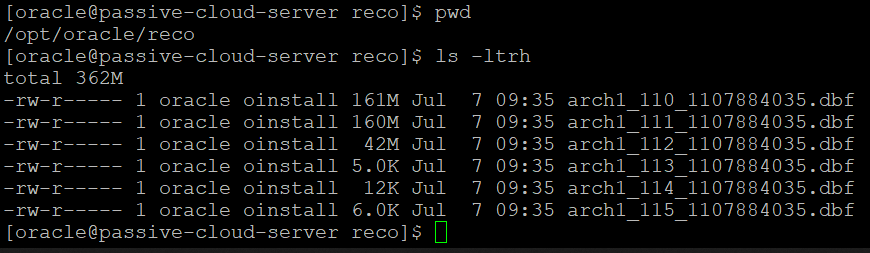
-rw-r----- 1 oracle oinstall 160M Jul 7 09:35 arch1\_111\_1107884035.dbf

-rw-r----- 1 oracle oinstall 42M Jul 7 09:35 arch1\_112\_1107884035.dbf

-rw-r----- 1 oracle oinstall 5.0K Jul 7 09:35 arch1\_113\_1107884035.dbf

-rw-r----- 1 oracle oinstall 12K Jul 7 09:35 arch1\_114\_1107884035.dbf

-rw-r----- 1 oracle oinstall 6.0K Jul 7 09:35 arch1\_115\_1107884035.dbf



[oracle@passive-cloud-server reco]$ rman target /

Recovery Manager: Release 21.0.0.0.0 - Production on Thu Jul 7 09:36:50 2022

Version 21.3.0.0.0

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connected to target database: ORCLCDB (DBID=2878945410, not open)

RMAN> catalog start with '/opt/oracle/reco/';

using target database control file instead of recovery catalog

searching for all files that match the pattern /opt/oracle/reco/

List of Files Unknown to the Database

=====================================

File Name: /opt/oracle/reco/arch1\_110\_1107884035.dbf

File Name: /opt/oracle/reco/arch1\_111\_1107884035.dbf

File Name: /opt/oracle/reco/arch1\_112\_1107884035.dbf

File Name: /opt/oracle/reco/arch1\_113\_1107884035.dbf

File Name: /opt/oracle/reco/arch1\_114\_1107884035.dbf

File Name: /opt/oracle/reco/arch1\_115\_1107884035.dbf

Do you really want to catalog the above files (enter YES or NO)? yes

cataloging files...

cataloging done

List of Cataloged Files

=======================

File Name: /opt/oracle/reco/arch1\_110\_1107884035.dbf

File Name: /opt/oracle/reco/arch1\_111\_1107884035.dbf

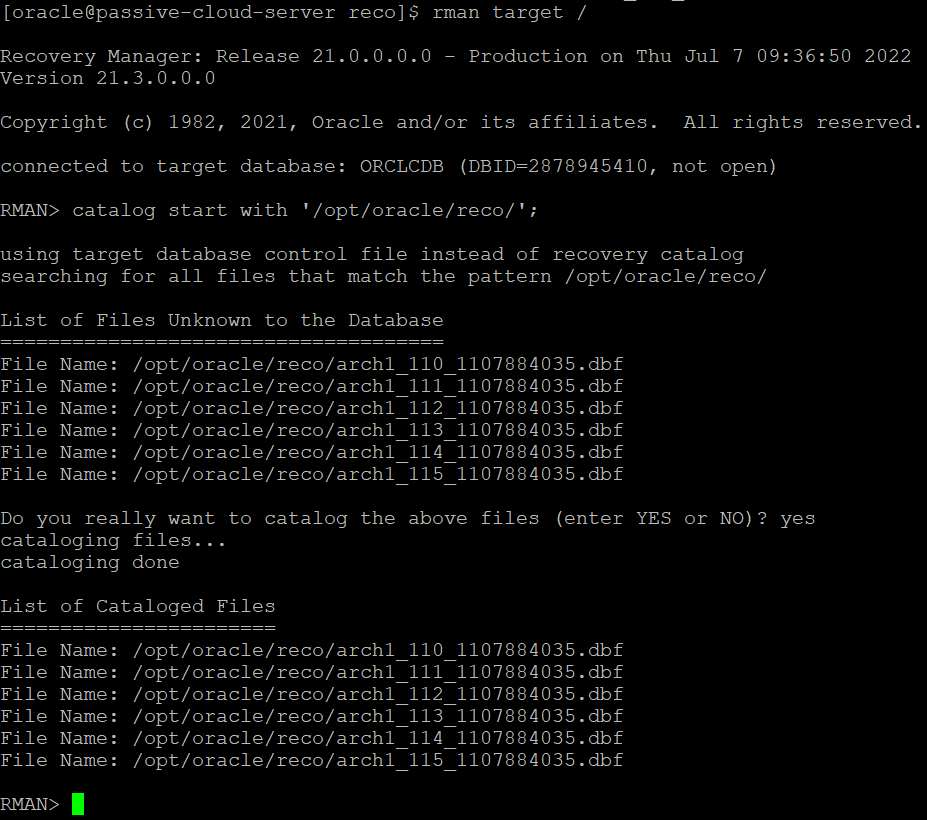
File Name: /opt/oracle/reco/arch1\_112\_1107884035.dbf

File Name: /opt/oracle/reco/arch1\_113\_1107884035.dbf

File Name: /opt/oracle/reco/arch1\_114\_1107884035.dbf

File Name: /opt/oracle/reco/arch1\_115\_1107884035.dbf

RMAN>



**Step 18: To resolve the error on step 14, recover passive database till you receive the message** RMAN-06054**.**

Standby: Recover database:

RMAN> recover database;

Starting recover at 07-JUL-22

allocated channel: ORA\_DISK\_1

channel ORA\_DISK\_1: SID=32 device type=DISK

starting media recovery

archived log for thread 1 with sequence 112 is already on disk as file /opt/oracle/reco/arch1\_112\_1107884035.dbf

archived log for thread 1 with sequence 113 is already on disk as file /opt/oracle/reco/arch1\_113\_1107884035.dbf

archived log for thread 1 with sequence 114 is already on disk as file /opt/oracle/reco/arch1\_114\_1107884035.dbf

archived log for thread 1 with sequence 115 is already on disk as file /opt/oracle/reco/arch1\_115\_1107884035.dbf

archived log file name=/opt/oracle/reco/arch1\_112\_1107884035.dbf thread=1 sequence=112

archived log file name=/opt/oracle/reco/arch1\_113\_1107884035.dbf thread=1 sequence=113

archived log file name=/opt/oracle/reco/arch1\_114\_1107884035.dbf thread=1 sequence=114

archived log file name=/opt/oracle/reco/arch1\_115\_1107884035.dbf thread=1 sequence=115

unable to find archived log

archived log thread=1 sequence=116

RMAN-00571: ===========================================================

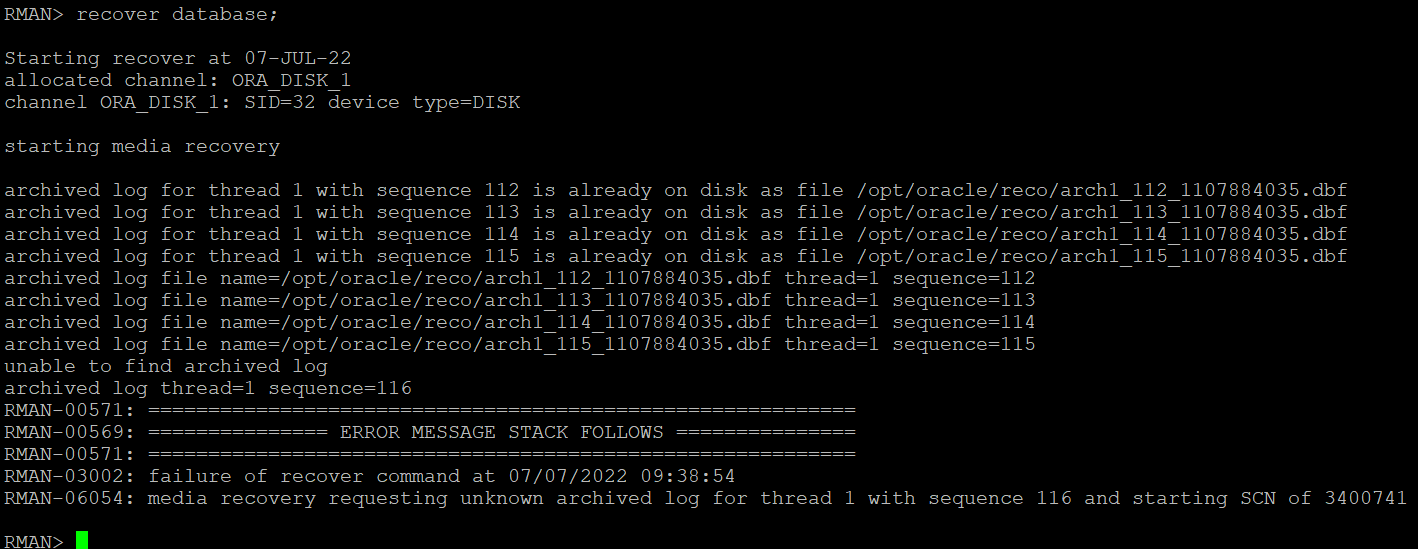
RMAN-00569: =============== ERROR MESSAGE STACK FOLLOWS ===============

RMAN-00571: ===========================================================

RMAN-03002: failure of recover command at 07/07/2022 09:38:54

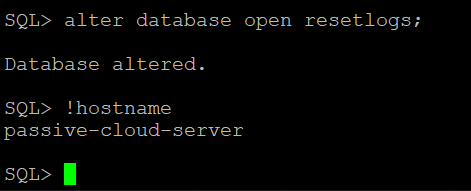
RMAN-06054: media recovery requesting unknown archived log for thread 1 with sequence 116 and starting SCN of 3400741

RMAN>

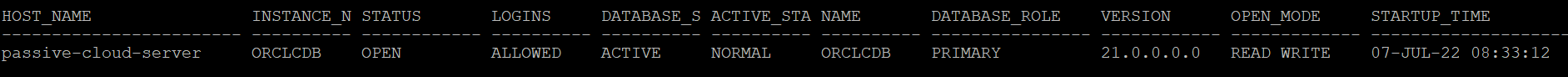


**Step 19: Open the passive database in open state.**

Standby: Open database with resetlogs.



**Step 20: The database is migrated to target side and available for connections.**



**Conclusion:**

The results of the experiments in this paper indicate that the proposed framework appears efficient in a practical situation based on the outcomes.