DBAII_Lab2

1) open the database if not open >>>>> Done

2) start the listener and make sure is listen for your catalog database (or target if you use it as catalog)

```
[oracle@node1 ~]$ lsnrctl status

LSNRCTL for Linux: Version 19.0.0.0.0 - Production on 03-APR-2024 00:38:35

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Connecting to (DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=node1.mdp.local)(PORT=1521)))
STATUS of the LISTENER
------------------------
Alias                     LISTENER
Version                   TNSLSNR for Linux: Version 19.0.0.0.0 - Production
Start Date                03-APR-2024 00:14:35
Uptime                    0 days 0 hr. 24 min. 1 sec
Trace Level               off
Security                  ON: Local OS Authentication
SNMP                      OFF
Listener Parameter File   /u01/app/oracle/product/19c/db_home/network/admin/listener.ora
Listener Log File         /u01/app/oracle/diag/tnslsnr/node1/listener/alert/log.xml
Listening Endpoints Summary...
  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=node1.mdp.local)(PORT=1521)))
  (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc)(KEY=EXTPROC1521)))
Services Summary...
Service "ITI" has 1 instance(s).
  Instance "ITI", status READY, has 1 handler(s) for this service...
The command completed successfully
```

3) Connect to the target DB in catalog mode and Show all RMAN configurations

```
[oracle@node1 ~]$ rman target / CATALOG nada/nada

Recovery Manager: Release 19.0.0.0.0 - Production on Wed Apr 3 00:32:22 2024
Version 19.3.0.0.0

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connected to target database: ITI (DBID=2732047794)
connected to recovery catalog database

RMAN> SHOW ALL;

RMAN configuration parameters for database with db_unique_name ITI are:
CONFIGURE RETENTION POLICY TO REDUNDANCY 1; # default
CONFIGURE BACKUP OPTIMIZATION OFF; # default
CONFIGURE DEFAULT DEVICE TYPE TO DISK; # default
CONFIGURE CONTROLFILE AUTOBACKUP ON; # default
CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO '%F'; # default
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/19c/db_home/dbs/snapcf_ITI.f'; # default
```

4) Create directory "/rman_backup" <the directory should be owned by oracle user and oinstall group> then do the followings using RMAN "configure" command:

```
[root@node1 ~]# mkdir /rman_backup
[root@node1 ~]# chown oracle:oinstall /rman_backup
[root@node1 ~]# chmod -R 770 /rman_backup
[root@node1 ~]#
```

```
SQL> create directory rman_backup as '/rman/backup'
  2  ;

Directory created.

SQL> grant read, write on directory rman_backup to nada
  2  ;

Grant succeeded.

SQL>
```

```
SQL>  create directory dir as '/opt/rman_backup'
  2  ;

Directory created.

SQL> grant read, write on directory dir to nada;

Grant succeeded.

SQL>
```

a. Force RMAN to keep backups from six days ago.

```
RMAN> CONFIGURE RETENTION POLICY TO RECOVERY WINDOW OF 6 DAYS;

new RMAN configuration parameters:
CONFIGURE RETENTION POLICY TO RECOVERY WINDOW OF 6 DAYS;
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

b. Force RMAN to skip backing up unchanged data.

```
RMAN> CONFIGURE BACKUP OPTIMIZATION ON;

new RMAN configuration parameters:
CONFIGURE BACKUP OPTIMIZATION ON;
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

c. Force RMAN to use "/rman_backup" when backing up your DB files on disk.

```
RMAN> CONFIGURE CHANNEL DEVICE TYPE DISK FORMAT '/rman_backup/%U';

new RMAN configuration parameters:
CONFIGURE CHANNEL DEVICE TYPE DISK FORMAT   '/rman_backup/%U';
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

d. configure a maximum size of 2 GB for your backup set.

```
RMAN> CONFIGURE CHANNEL DEVICE TYPE DISK MAXPIECESIZE 2G;

starting full resync of recovery catalog
full resync complete
old RMAN configuration parameters:
CONFIGURE CHANNEL DEVICE TYPE DISK MAXPIECESIZE 2 G;
new RMAN configuration parameters:
CONFIGURE CHANNEL DEVICE TYPE DISK MAXPIECESIZE 2 G;
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

e. Force RMAN to backup your DB files on tape when not specifying the device type to use.

```
RMAN> CONFIGURE DEFAULT DEVICE TYPE TO sbt;

new RMAN configuration parameters:
CONFIGURE DEFAULT DEVICE TYPE TO 'SBT_TAPE';
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

f. Force RMAN to create four channels when backing up your DB files on both disk and tape.

```
RMAN> CONFIGURE DEVICE TYPE DISK PARALLELISM 4;

new RMAN configuration parameters:
CONFIGURE DEVICE TYPE DISK PARALLELISM 4 BACKUP TYPE TO BACKUPSET;
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

```
RMAN>
new RMAN configuration parameters:
CONFIGURE DEVICE TYPE 'SBT_TAPE' PARALLELISM 4 BACKUP TYPE TO BACKUPSET;
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

g. Force RMAN to backup your control files after each performed backup to a specific location.

```
RMAN> CONFIGURE CONTROLFILE AUTOBACKUP ON;


new RMAN configuration parameters:
CONFIGURE CONTROLFILE AUTOBACKUP ON;
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete

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

RMAN>
new RMAN configuration parameters:
CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO '/rman_backup_%F';
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

h. Go back with your retention policy to the default value.

```
RMAN> CONFIGURE RETENTION POLICY CLEAR;

old RMAN configuration parameters:
CONFIGURE RETENTION POLICY TO RECOVERY WINDOW OF 6 DAYS;
RMAN configuration parameters are successfully reset to default value
starting full resync of recovery catalog
full resync complete
```

5) Change your flash_recovery_area to be "/rman_backup" and size to be 5G

```
SQL> ALTER SYSTEM SET DB_RECOVERY_FILE_DEST='/rman_backup' SCOPE=BOTH;

System altered.

SQL>
ALTER SYSTEM SET DB_RECOVERY_FILE_DEST_SIZE=5G SCOPE=BOTH;
SQL>
System altered.

SQL>
```

6) Ensure that your target database is in archive log mode and then enable block change tracking

```
SQL> select log_mode from v$database
  2  ;

LOG_MODE
------------
ARCHIVELOG

SQL>
```

7) Execute the following RMAN script with catalog connection (DB should be in mount mode)

```
run
{
allocate channel ch1 device type disk format '/rman_backup/bkp_%U';
recover copy of database with tag 'ITI';
backup incremental level 1 for recover of copy with tag 'ITI' database;
}
```

```
SQL> shutdown immediate;
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL> startup mount;
ORACLE instance started.

Total System Global Area 1073737800 bytes
Fixed Size                  8904776 bytes
Variable Size            1006632960 bytes
Database Buffers           50331648 bytes
Redo Buffers                7868416 bytes
Database mounted.
SQL>  ALTER DATABASE ARCHIVELOG
  2  ;

Database altered.

SQL> ALTER DATABASE OPEN
  2  ;

Database altered.
```

```
connected to target database: ITI (DBID=2732047794)
connected to recovery catalog database

RMAN> run
{
allocate channel ch1 device type disk format '/rman_backup/bkp_%U';
recover copy of database with tag 'ITI';
backup incremental level 1 for recover of copy with tag 'ITI' database;
}2> 3> 4> 5> 6>

allocated channel: ch1
channel ch1: SID=20 device type=DISK

Starting recover at 04-APR-24
no copy of datafile 10 found to recover
channel ch1: starting incremental datafile backup set restore
channel ch1: specifying datafile copies to recover
recovering datafile copy file number=00001 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-SYSTEM_FNO-1_012ndkhr
recovering datafile copy file number=00002 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-SYSAUX_FNO-2_022ndkjt
recovering datafile copy file number=00003 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-UNDOTBS1_FNO-3_032ndkl1
recovering datafile copy file number=00004 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-USERS_FNO-4_0b2ndknq
recovering datafile copy file number=00005 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI_DATA_FNO-5_062ndkn6
recovering datafile copy file number=00006 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI_DATA_FNO-6_072ndkn9
recovering datafile copy file number=00007 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-NADA_UNDO_TABLESPACE_FNO-7
```

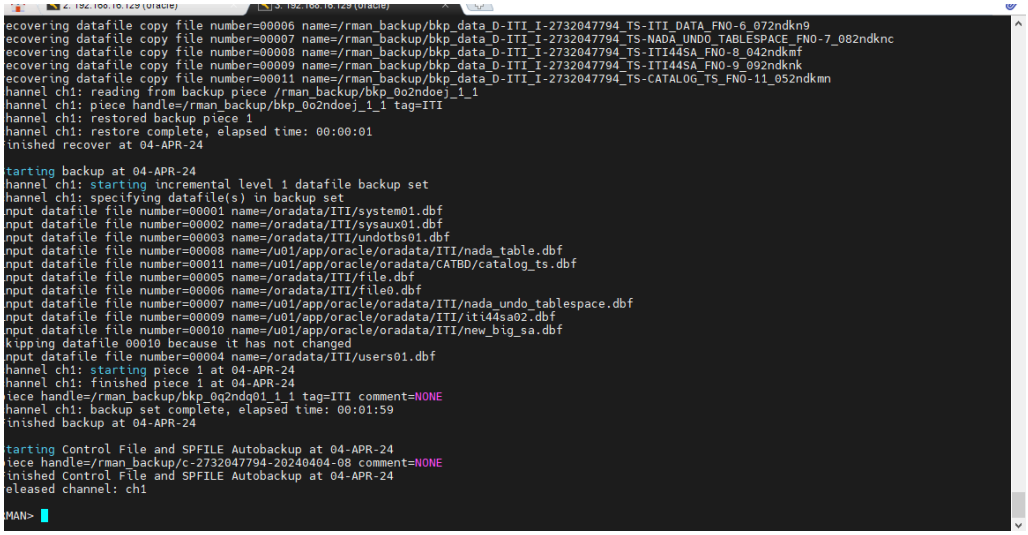
Get error

```
RMAN-00569: =============== ERROR MESSAGE STACK FOLLOWS ===============
RMAN-00571: ===========================================================
RMAN-03009: failure of Control File and SPFILE Autobackup command on ch1 channel at 04/04/2024 15:31:04
ORA-19504: failed to create file "/rman_backup_c-2732047794-20240404-07"
ORA-27041: unable to open file
Linux-x86_64 Error: 2: No such file or directory
Additional information: 9

RMAN>
RMAN>

RMAN> show all;

RMAN configuration parameters for database with db_unique_name ITI are:
CONFIGURE RETENTION POLICY TO REDUNDANCY 1; # default
CONFIGURE BACKUP OPTIMIZATION ON;
CONFIGURE DEFAULT DEVICE TYPE TO 'SBT_TAPE';
CONFIGURE CONTROLFILE AUTOBACKUP ON;
CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO '/rman_backup_%F';
RMAN-06908: warning: operation will not run in parallel on the allocated channels
RMAN-06909: warning: parallelism require Enterprise Edition
CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE SBT_TAPE TO '%F'; # default
CONFIGURE DEVICE TYPE DISK PARALLELISM 4 BACKUP TYPE TO BACKUPSET;
CONFIGURE DEVICE TYPE 'SBT_TAPE' PARALLELISM 4 BACKUP TYPE TO BACKUPSET;
CONFIGURE DATAFILE BACKUP COPIES FOR DEVICE TYPE DISK TO 1; # default
CONFIGURE DATAFILE BACKUP COPIES FOR DEVICE TYPE SBT_TAPE TO 1; # default
CONFIGURE ARCHIVELOG BACKUP COPIES FOR DEVICE TYPE DISK TO 1; # default
CONFIGURE ARCHIVELOG BACKUP COPIES FOR DEVICE TYPE SBT_TAPE TO 1; # default
CONFIGURE CHANNEL DEVICE TYPE DISK MAXPIECESIZE 2 G;
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/19c/db_home/dbs/snapcf_ITI.f'; # default

RMAN>
```

Solution

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

old RMAN configuration parameters:
CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO '/rman_backup_%F';
new RMAN configuration parameters:
CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO '/rman_backup/%F';
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

Run output



8) Create new schema rmantst_1 with default tablespace USERS then do the necessary steps for rmantst_1 schema to be able to do the following

```
SQL> CREATE USER rmantst_1 IDENTIFIED BY password DEFAULT TABLESPACE USERS;

User created.

SQL> GRANT CREATE SESSION, CREATE TABLE TO rmantst_1;

Grant succeeded.

SQL> GRANT SELECT ON sys.dba_segments TO rmantst_1;

Grant succeeded.
```

SQL> create table segs as select * from sys.dba_segments;

```
SQL> GRANT CREATE TABLE TO rmantst_1;

Grant succeeded.

SQL> GRANT UNLIMITED TABLESPACE TO rmantst_1;

Grant succeeded.

SQL> CREATE TABLE segs AS SELECT * FROM sys.dba_segments;

Table created.
```

9) Execute the following RMAN script with catalog connection (DB should be in open mode)

```
run
{
allocate channel ch1 device type disk format '/rman_backup/bkp_%U';
backup incremental level 1 for recover of copy with tag 'ITI' database;
}
```

```
RMAN> run
{
allocate channel ch1 device type disk format '/rman_backup/bkp_%U';
backup incremental level 1 for recover of copy with tag 'ITI' database;
}
2> 3> 4> 5>
allocated channel: ch1
channel ch1: SID=195 device type=DISK

Starting backup at 04-APR-24
channel ch1: starting incremental level 1 datafile backup set
channel ch1: specifying datafile(s) in backup set
input datafile file number=00001 name=/oradata/ITI/system01.dbf
input datafile file number=00002 name=/oradata/ITI/sysaux01.dbf
input datafile file number=00003 name=/oradata/ITI/undotbs01.dbf
input datafile file number=00008 name=/u01/app/oracle/oradata/ITI/nada_table.dbf
input datafile file number=00011 name=/u01/app/oracle/oradata/CATBD/catalog_ts.dbf
input datafile file number=00005 name=/oradata/ITI/file.dbf
input datafile file number=00006 name=/oradata/ITI/file0.dbf
input datafile file number=00007 name=/u01/app/oracle/oradata/ITI/nada_undo_tablespace.dbf
input datafile file number=00009 name=/u01/app/oracle/oradata/ITI/iti44sa02.dbf
input datafile file number=00010 name=/u01/app/oracle/oradata/ITI/new_big_sa.dbf
skipping datafile 00010 because it has not changed
input datafile file number=00004 name=/oradata/ITI/users01.dbf
channel ch1: starting piece 1 at 04-APR-24
channel ch1: finished piece 1 at 04-APR-24
piece handle=/rman_backup/bkp_0s2ndqg0_1_1 tag=ITI comment=NONE
channel ch1: backup set complete, elapsed time: 00:02:12
Finished backup at 04-APR-24

Starting Control File and SPFILE Autobackup at 04-APR-24
piece handle=/rman_backup/c-2732047794-20240404-09 comment=NONE
Finished Control File and SPFILE Autobackup at 04-APR-24
released channel: ch1
```

10) Do the necessary steps for rmantst_1 schema to be able to do "create table exts as select * from sys.dba_extents;

```
SQL> -- Grant CREATE TABLE and SELECT privileges
GRANT CREATE TABLE TO rmantst_1;
GRANT SELECT ON sys.dba_extents TO rmantst_1;
SQL>
Grant succeeded.

SQL>
Grant succeeded.
```

Then execute the following RMAN script with catalog connection (DB should be in open mode)

run

{

allocate channel ch1 device type disk format '/rman_backup/bkp_%U';

recover copy of database with tag 'ITI';

}

```
RMAN> run
{
allocate channel ch1 device type disk format '/rman_backup/bkp_%U';
recover copy of database with tag 'ITI';
}
2> 3> 4> 5>
allocated channel: ch1
channel ch1: SID=195 device type=DISK

Starting recover at 04-APR-24
no copy of datafile 10 found to recover
channel ch1: starting incremental datafile backup set restore
channel ch1: specifying datafile copies to recover
recovering datafile copy file number=00001 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-SYSTEM_FNO-1_012ndkhr
recovering datafile copy file number=00002 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-SYSAUX_FNO-2_022ndkjt
recovering datafile copy file number=00003 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-UNDOTBS1_FNO-3_032ndkl1
recovering datafile copy file number=00004 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-USERS_FNO-4_0b2ndknq
recovering datafile copy file number=00005 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI_DATA_FNO-5_062ndkn6
recovering datafile copy file number=00006 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI_DATA_FNO-6_072ndkn9
recovering datafile copy file number=00007 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-NADA_UNDO_TABLESPACE_FNO-7_082ndknc
recovering datafile copy file number=00008 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI44SA_FNO-8_042ndkmf
recovering datafile copy file number=00009 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI44SA_FNO-9_092ndknk
```

```
recovering datafile copy file number=00001 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-SYSTEM_FNO-1_012ndkhr
recovering datafile copy file number=00002 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-SYSAUX_FNO-2_022ndkjt
recovering datafile copy file number=00003 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-UNDOTBS1_FNO-3_032ndkl1
recovering datafile copy file number=00004 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-USERS_FNO-4_0b2ndknq
recovering datafile copy file number=00005 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI_DATA_FNO-5_062ndkn6
recovering datafile copy file number=00006 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI_DATA_FNO-6_072ndkn9
recovering datafile copy file number=00007 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-NADA_UNDO_TABLESPACE_FNO-7_082ndknc
recovering datafile copy file number=00008 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI44SA_FNO-8_042ndkmf
recovering datafile copy file number=00009 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI44SA_FNO-9_092ndknk
recovering datafile copy file number=00011 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-CATALOG_TS_FNO-11_052ndkmn
channel ch1: reading from backup piece /rman_backup/bkp_0q2ndq01_1_1
channel ch1: piece handle=/rman_backup/bkp_0q2ndq01_1_1 tag=ITI
channel ch1: restored backup piece 1
channel ch1: restore complete, elapsed time: 00:00:01
channel ch1: starting incremental datafile backup set restore
channel ch1: specifying datafile copies to recover
recovering datafile copy file number=00001 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-SYSTEM_FNO-1_012ndkhr
recovering datafile copy file number=00002 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-SYSAUX_FNO-2_022ndkjt
recovering datafile copy file number=00003 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-UNDOTBS1_FNO-3_032ndkl1
recovering datafile copy file number=00004 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-USERS_FNO-4_0b2ndknq
recovering datafile copy file number=00005 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI_DATA_FNO-5_062ndkn6
recovering datafile copy file number=00006 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI_DATA_FNO-6_072ndkn9
recovering datafile copy file number=00007 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-NADA_UNDO_TABLESPACE_FNO-7_082ndknc
recovering datafile copy file number=00008 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI44SA_FNO-8_042ndkmf
recovering datafile copy file number=00009 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI44SA_FNO-9_092ndknk
recovering datafile copy file number=00011 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-CATALOG_TS_FNO-11_052ndkmn
channel ch1: reading from backup piece /rman_backup/bkp_0s2ndqg0_1_1
channel ch1: piece handle=/rman_backup/bkp_0s2ndqg0_1_1 tag=ITI
channel ch1: restored backup piece 1
channel ch1: restore complete, elapsed time: 00:00:01
Finished recover at 04-APR-24

Starting Control File and SPFILE Autobackup at 04-APR-24
piece handle=/rman_backup/c-2732047794-20240404-0a comment=NONE
Finished Control File and SPFILE Autobackup at 04-APR-24
released channel: ch1

RMAN>
```

11) execute: SQL> select name,status from v$datafile

```
NAME                                               STATUS
-------------------------------------------------- ---------------
/oradata/ITI/system01.dbf                          SYSTEM
/oradata/ITI/sysaux01.dbf                          ONLINE
/oradata/ITI/undotbs01.dbf                         ONLINE
/oradata/ITI/users01.dbf                           ONLINE
/oradata/ITI/file.dbf                              ONLINE
/oradata/ITI/file0.dbf                             ONLINE
/u01/app/oracle/oradata/ITI/nada_undo_tablespace.d ONLINE
bf

/u01/app/oracle/oradata/ITI/nada_table.dbf         ONLINE
/u01/app/oracle/oradata/ITI/iti44sa02.dbf          ONLINE

NAME                                               STATUS
-------------------------------------------------- ---------------
/u01/app/oracle/oradata/ITI/new_big_sa.dbf         OFFLINE
/u01/app/oracle/oradata/CATBD/catalog_ts.dbf       ONLINE

11 rows selected.
```

12) Let us simulate a database failure by removing datafiles at the OS level (i.e rm one ore more datafile from the target db)

```
SQL> exit
Disconnected from Oracle Database 19c Standard Edition 2 Release 19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@node1 ~]$ rm /u01/app/oracle/oradata/ITI/iti44sa02.dbf
[oracle@node1 ~]$  sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Apr 4 20:39:54 2024
Version 19.3.0.0.0
```

13) do "shut abort" then "startup"

```
SQL> SHUTDOWN ABORT;
ORACLE instance shut down.
SQL> STARTUP;

ORACLE instance started.
```

14) execute: RMAN> switch database to copy;

```
[oracle@node1 ~]$ rman target /

Recovery Manager: Release 19.0.0.0.0 - Production on Thu Apr 4 20:52:47 2024
Version 19.3.0.0.0

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connected to target database: ITI (DBID=2732047794, not open)

RMAN> SWITCH DATABASE TO COPY;

using target database control file instead of recovery catalog
datafile 1 switched to datafile copy "/rman_backup/bkp_data_D-ITI_I-2732047794_TS-SYSTEM_FNO-1_012ndkhr"
datafile 2 switched to datafile copy "/rman_backup/bkp_data_D-ITI_I-2732047794_TS-SYSAUX_FNO-2_022ndkjt"
datafile 3 switched to datafile copy "/rman_backup/bkp_data_D-ITI_I-2732047794_TS-UNDOTBS1_FNO-3_032ndkl1"
datafile 4 switched to datafile copy "/rman_backup/bkp_data_D-ITI_I-2732047794_TS-USERS_FNO-4_0b2ndknq"
datafile 5 switched to datafile copy "/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI_DATA_FNO-5_062ndkn6"
datafile 6 switched to datafile copy "/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI_DATA_FNO-6_072ndkn9"
datafile 7 switched to datafile copy "/rman_backup/bkp_data_D-ITI_I-2732047794_TS-NADA_UNDO_TABLESPACE_FNO-7_082ndknc"
datafile 8 switched to datafile copy "/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI44SA_FNO-8_042ndkmf"
datafile 9 switched to datafile copy "/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI44SA_FNO-9_092ndknk"
datafile 10 switched to datafile copy "/rman_backup/bkp_data_D-ITI_I-2732047794_TS-BIG_SA_FNO-10_0a2ndknn"
datafile 11 switched to datafile copy "/rman_backup/bkp_data_D-ITI_I-2732047794_TS-CATALOG_TS_FNO-11_052ndkmn"
```

15) execute: RMAN> recover database;

```
RMAN> RECOVER DATABASE;

Starting recover at 04-APR-24
RMAN-06908: warning: operation will not run in parallel on the allocated channels
RMAN-06909: warning: parallelism require Enterprise Edition
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=184 device type=DISK

starting media recovery
media recovery complete, elapsed time: 00:00:02

Finished recover at 04-APR-24

RMAN>
```

16) execute: SQL> alter database open;

```
SQL> ALTER DATABASE OPEN;

Database altered.

SQL>
```

17) execute: SQL> select name,status from v$datafile;

```
SQL> select name,status from v$datafile
  2  ;

NAME                                               STATUS
-------------------------------------------------- ---------------
/rman_backup/bkp_data_D-ITI_I-2732047794_TS-SYSTEM SYSTEM
_FNO-1_012ndkhr

/rman_backup/bkp_data_D-ITI_I-2732047794_TS-SYSAUX ONLINE
_FNO-2_022ndkjt

/rman_backup/bkp_data_D-ITI_I-2732047794_TS-UNDOTB ONLINE
S1_FNO-3_032ndkl1

/rman_backup/bkp_data_D-ITI_I-2732047794_TS-USERS_ ONLINE
FNO-4_0b2ndknq

NAME                                               STATUS
-------------------------------------------------- ---------------

/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI_DA ONLINE
TA_FNO-5_062ndkn6

/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI_DA ONLINE
TA_FNO-6_072ndkn9

/rman_backup/bkp_data_D-ITI_I-2732047794_TS-NADA_U ONLINE
NDO_TABLESPACE_FNO-7_082ndknc

/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI44S ONLINE

NAME                                               STATUS
```

18) Verify the existance of tables "segs" and "exts" under rmantst_1 schema

```
SQL> select table_name from all_tables where owner='rmantst_1'
  2  ;

no rows selected
```

19) Using catalog connection perform cumulative cold backup (level 0) with tag "Full_db" including archived logs

run

{

allocate channel ch1 device type disk format '/rman_backup/bkp_%U';

backup incremental level 0 database tag ‘ful_db’;

backup archivelog all;

}

```
RMAN> BACKUP AS COMPRESSED BACKUPSET DATABASE TAG full_db PLUS ARCHIVELOG;


Starting backup at 04-APR-24
current log archived
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=48 device type=DISK
channel ORA_DISK_1: starting compressed archived log backup set
channel ORA_DISK_1: specifying archived log(s) in backup set
input archived log thread=1 sequence=15 RECID=1 STAMP=1164432570
input archived log thread=1 sequence=30 RECID=2 STAMP=1165422182
input archived log thread=1 sequence=31 RECID=3 STAMP=1165435760
input archived log thread=1 sequence=32 RECID=4 STAMP=1165438425
input archived log thread=1 sequence=33 RECID=5 STAMP=1165441650
input archived log thread=1 sequence=34 RECID=6 STAMP=1165443576
input archived log thread=1 sequence=35 RECID=7 STAMP=1165444439
input archived log thread=1 sequence=36 RECID=8 STAMP=1165444582
input archived log thread=1 sequence=37 RECID=9 STAMP=1165444816
channel ORA_DISK_1: starting piece 1 at 04-APR-24
channel ORA_DISK_1: finished piece 1 at 04-APR-24
piece handle=/u01/app/oracle/product/19c/db_home/dbs/1b2nehmi_1_1 tag=TAG2024040
4T224018 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:07
Finished backup at 04-APR-24

Starting backup at 04-APR-24
using channel ORA_DISK_1
channel ORA_DISK_1: starting compressed full datafile backup set
channel ORA_DISK_1: specifying datafile(s) in backup set
input datafile file number=00001 name=/rman_backup/bkp_data_D-ITI_I-2732047794_T
S-SYSTEM_FNO-1_012ndkhr
input datafile file number=00002 name=/rman_backup/bkp_data_D-ITI_I-2732047794_T
S-SYSAUX_FNO-2_022ndkjt
input datafile file number=00003 name=/rman_backup/bkp_data_D-ITI_I-2732047794_T
S-UNDOTBS1_FNO-3_032ndkl1
```

```
S-ITI44SA_FNO-8_042ndkmf
input datafile file number=00011 name=/rman_backup/bkp_data_D-ITI_I-2732047794_T
S-CATALOG_TS_FNO-11_052ndkmn
input datafile file number=00005 name=/rman_backup/bkp_data_D-ITI_I-2732047794_T
S-ITI_DATA_FNO-5_062ndkn6
input datafile file number=00006 name=/rman_backup/bkp_data_D-ITI_I-2732047794_T
S-ITI_DATA_FNO-6_072ndkn9
input datafile file number=00007 name=/rman_backup/bkp_data_D-ITI_I-2732047794_T
S-NADA_UNDO_TABLESPACE_FNO-7_082ndknc
input datafile file number=00009 name=/rman_backup/bkp_data_D-ITI_I-2732047794_T
S-ITI44SA_FNO-9_092ndknk
input datafile file number=00010 name=/rman_backup/bkp_data_D-ITI_I-2732047794_T
S-BIG_SA_FNO-10_0a2ndknn
input datafile file number=00004 name=/rman_backup/bkp_data_D-ITI_I-2732047794_T
S-USERS_FNO-4_0b2ndknq
channel ORA_DISK_1: starting piece 1 at 04-APR-24
channel ORA_DISK_1: finished piece 1 at 04-APR-24
piece handle=/u01/app/oracle/product/19c/db_home/dbs/1c2nehms_1_1 tag=FULL_DB comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:01:25
Finished backup at 04-APR-24

Starting backup at 04-APR-24
current log archived
using channel ORA_DISK_1
channel ORA_DISK_1: starting compressed archived log backup set
channel ORA_DISK_1: specifying archived log(s) in backup set
input archived log thread=1 sequence=38 RECID=10 STAMP=1165444917
channel ORA_DISK_1: starting piece 1 at 04-APR-24
channel ORA_DISK_1: finished piece 1 at 04-APR-24
piece handle=/u01/app/oracle/product/19c/db_home/dbs/1d2nehpn_1_1 tag=TAG20240404T224159 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:01
Finished backup at 04-APR-24

Starting Control File and SPFILE Autobackup at 04-APR-24
piece handle=/rman_backup/c-2732047794-20240404-10 comment=NONE
Finished Control File and SPFILE Autobackup at 04-APR-24
```

20) Create new schema rmantst_2 with default tablespace USERS then do the necessary steps for rmantst_2 schema to be able to do the following

```
SQL> create user rmantst_2 identified by rman default tablespace USERS;

User created.

SQL> grant create session, table to rmantst_2;
grant create session, table to rmantst_2
                      *
ERROR at line 1:
ORA-01919: role 'TABLE' does not exist


SQL>  grant create session, create  table to rmantst_2;

Grant succeeded.

SQL> grant select on sys.dba_objects to rmantst_2;

Grant succeeded.
```

SQL> create table objs as select * from sys.dba_objects;

```
SQL> GRANT UNLIMITED TABLESPACE TO  rmantst_2;

Grant succeeded.

SQL>
SQL> create table objs as select * from sys.dba_objects;

Table created.
```

21) Perform cumulative hot backup (level 1) using catalog connection

```
RMAN> BACKUP  AS COMPRESSED BACKUPSET INCREMENTAL LEVEL 1  CUMULATIVE DATABASE ;

Starting backup at 04-APR-24
using channel ORA_DISK_1
channel ORA_DISK_1: starting compressed incremental level 1 datafile backup set
channel ORA_DISK_1: specifying datafile(s) in backup set
input datafile file number=00001 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-SYSTEM_FNO-1_012ndkhr
input datafile file number=00002 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-SYSAUX_FNO-2_022ndkjt
input datafile file number=00003 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-UNDOTBS1_FNO-3_032ndkl1
input datafile file number=00008 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI44SA_FNO-8_042ndkmf
input datafile file number=00011 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-CATALOG_TS_FNO-11_052ndkmn
input datafile file number=00005 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI_DATA_FNO-5_062ndkn6
input datafile file number=00006 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI_DATA_FNO-6_072ndkn9
input datafile file number=00007 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-NADA_UNDO_TABLESPACE_FNO-7_082ndknc
input datafile file number=00009 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-ITI44SA_FNO-9_092ndknk
input datafile file number=00010 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-BIG_SA_FNO-10_0a2ndknn
input datafile file number=00004 name=/rman_backup/bkp_data_D-ITI_I-2732047794_TS-USERS_FNO-4_0b2ndknq
channel ORA_DISK_1: starting piece 1 at 04-APR-24
channel ORA_DISK_1: finished piece 1 at 04-APR-24
piece handle=/u01/app/oracle/product/19c/db_home/dbs/1f2nehtj_1_1 tag=TAG20240404T224402 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:01:52
Finished backup at 04-APR-24

Starting Control File and SPFILE Autobackup at 04-APR-24
piece handle=/rman_backup/c-2732047794-20240404-11 comment=NONE
Finished Control File and SPFILE Autobackup at 04-APR-24
```

22) execute the OS command --> export NLS_DATE_FORMAT='dd-MON-yyyy hh24:mi:ss'

```
[oracle@node1 ~]$ export NLS_DATE_FORMAT='dd-MON-yyyy hh24:mi:ss'
[oracle@node1 ~]$
```

23) List all your completed backups and identify the difference between them

```
RMAN> LIST BACKUP SUMMARY;


List of Backups
===============
Key     TY LV S Device Type Completion Time #Pieces #Copies Compressed Tag
------- -- -- - ----------- --------------- ------- ------- ---------- ---
263     B  1  A DISK        04-APR-24       1       1       NO         ITI
311     B  1  A DISK        04-APR-24       1       1       NO         ITI
364     B  1  A DISK        04-APR-24       1       1       NO         ITI
393     B  1  A DISK        04-APR-24       1       1       NO         ITI
446     B  1  A DISK        04-APR-24       1       1       NO         ITI
498     B  1  A DISK        04-APR-24       1       1       NO         ITI
571     B  1  A DISK        04-APR-24       1       1       NO         ITI
609     B  F  A DISK        04-APR-24       1       1       NO         TAG20240404T155746
641     B  1  A DISK        04-APR-24       1       1       NO         ITI
673     B  F  A DISK        04-APR-24       1       1       NO         TAG20240404T160632
741     B  F  A DISK        04-APR-24       1       1       NO         TAG20240404T160835
875     B  F  A DISK        04-APR-24       1       1       NO         TAG20240404T172420
976     B  F  A DISK        04-APR-24       1       1       NO         TAG20240404T201108
987     B  1  A DISK        04-APR-24       1       1       NO         ITI
1007    B  F  A DISK        04-APR-24       1       1       NO         TAG20240404T201613
1029    B  1  A DISK        04-APR-24       1       1       NO         ITI
1050    B  F  A DISK        04-APR-24       1       1       NO         TAG20240404T201845
1191    B  F  A DISK        04-APR-24       1       1       NO         TAG20240404T203001
1365    B  0  A DISK        04-APR-24       1       1       NO         ???FUL_DB???
1384    B  0  A DISK        04-APR-24       1       1       NO         ???FUL_DB???
1412    B  0  A DISK        04-APR-24       1       1       NO         ???FUL_DB???
1441    B  0  A DISK        04-APR-24       1       1       NO         ???FUL_DB???
1505    B  A  A DISK        04-APR-24       1       1       YES        TAG20240404T224018
1537    B  F  A DISK        04-APR-24       1       1       YES        FULL_DB
1568    B  A  A DISK        04-APR-24       1       1       YES        TAG20240404T224159
1591    B  F  A DISK        04-APR-24       1       1       NO         TAG20240404T224201
1607    B  1  A DISK        04-APR-24       1       1       YES        TAG20240404T224402
1633    B  F  A DISK        04-APR-24       1       1       NO         TAG20240404T224600
```

****

Backup types

- Full backup: (level 0)The most basic and comprehensive backup method, where all data is sent to another location.
- Incremental backup: (level 1) Backs up all files that have changed since the last backup occurred.

  and this type has two types:

- Differential backup: Backs up only copies of all files that have changed since the last full backup, take changes from last level 1
- Cumulative backup: take changes from the last level 0