# ASM BASED TABLESPACES BACKUP WITH RMAN FOR LONG TERM OFFLINE STORING

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# TEST OBJECTIVES

The purpose of this test is to check options for using Rman to manage offline tablespaces backups, store them and being able to restore them at will whenever required, without needing to perform recovery..

The following approaches were evaluated:

1. Using transportable tablespaces.

   In this case a metadata dump file is produced + a datafile backup as copy.

2. Using offline tablespaces and removing the underlying datafiles.

In this case the tablespaces where the datafiles belong are placed offline while the datafiles themselves are removed from the database to regain the space allocated to them.

In both cases afterwards we should be able to restore and online these tablespaces whenever required, executing an Rman restore and without performing recovery.

## COMMENTS

- Both methods are addequate to accomplish the purpose of having offline backups that can be restored at any point in time without performing recovery.
- The tranportable tablespace method keeps the database in a consistent state. All objects on the data dictionary are accessible.
- On the Offline tablespace method, all objects on the offilined tablespaces can still be referenced but not accessed, applications trying to access these objects will get an error message.
- A third option, not covered here, is to move the tablespaces to historical databases where the data can be compressed and kept online using cheaper storage.

## DESCRIPTION OF THE TESTS

### *1) TEST USING TRANSPORTABLE TABLESPACES*

- Preliminary steps for using data pump are executed: Create a Directory and grant privileges on it
- A tablespace is created and data is inserted into a control table.
- Redo logs are flushed to disk and the tablespace is set read only.
- The tablespace is checked to confirm can be part of a transportable tablespace set
- A Data Pump metadata export is produced
- The tablespace is set offline
- A backup as copy of the tablespace datafiles is created with a tag for easy reference and a keep until time set of 2 years with nolog option.
- The tablespace is removed from the database including contents and datafiles.

**To restore the tablespace the following steps are implemented**

- The datafiles are restored into ASM using Rman
- The metadata is imported into the database
- The tablespace is set online
- The control table is queried to confirm successful implementation

### *2) TEST USING OFFLINE TABLESPACES*

- A tablespace is created and data is inserted into a control table.
- Redo logs are flushed to disk and the tablespace is set offline.
- A compressed backupset of the tablespace is created with a tag for easy reference.
- The backupset is kept until time set to 2 years with the nolog option.
- The datafiles of the tablespace are removed from ASM

**To restore the tablespace the following steps are implemented**

- The tablespace is restored using Rman
- The tablespace is set online
- The control table is queried to confirm successful implementation

## THE TEST ENVIRONMENT

The test was made on a 10g R2 database on Oracle Enterprise Linux 5 with ASM 11g storage.

# TEST USING TRANSPORTABLE TABLESPACES, STEP BY STEP

1. Create tablespace accounts
2. Create table accounts on tablespace accounts, insert some records on it
3. Create a Directory for Data Pump and grant privileges on it to Public
4. Check that the tablespace can be part of a transportable tablespace set
5. Flush online logs to disk
6. Set tablespace accounts read only
7. Export tablespace accounts using data pump
8. Set tablespace accounts offline
9. Backup the tablespace using Rman backup as copy set keep until sysdate + 2 years
10. Drop tablespace accounts including datafiles
11. Confirm that you cannot access the table on the dropped tablespace

**Restore tablespace steps**

12. Restore the datafile backup to ASM
13. Import tablespace accounts back into the database using data pump
14. Set tablespace accounts online and check the control table

## *1. Create tablespace accounts*

```
SQL> create tablespace accounts;

Tablespace created.

SQL> select file_name from dba_data_files where tablespace_name='ACCOUNTS';

FILE_NAME
-----------------------------------------------
```

```
+DB1DATADG/redx/datafile/accounts.287.642998077
```

## 2. Create table accounts on tablespace accounts, insert some records on it

```
SQL> conn avargas/oracle
Connected.

SQL> create table accounts tablespace accounts as select * from dba_users;

Table created.

SQL> insert into accounts select * from accounts;

15 rows created.

SQL> /

30 rows created.

SQL> commit;

Commit complete.

SQL> select count(*) from accounts;

  COUNT(*)
----------
        60
```

## 3. Create a Directory for Data Pump and grant privileges on it to Public

```
SQL> create or replace directory XTTS as '/oradisk/app01/oracle/scripts/av';
```

```
Directory created.

SQL> grant read, write on directory XTTS to public;

Grant succeeded.
```

### 4. Check that the tablespace can be part of a transportable tablespace set

```
SQL>  EXECUTE sys.DBMS_TTS.TRANSPORT_SET_CHECK('accounts',true);

PL/SQL procedure successfully completed.

SQL> select * from sys.transport_set_violations;

no rows selected
```

### 5. Flush online logs to disk

```
SQL> alter system archive log current;

System altered.
```

### 6. Set tablespace accounts read only

```
SQL> alter tablespace accounts read only;

Tablespace altered.
```

### 7. Export tablespace accounts using data pump

```
{oracle} /oradisk/app01/oracle/scripts/av [pollux.com] > expdp system/oracle
dumpfile=xtts.dmp directory=XTTS transport_tablespaces=accounts

Export: Release 10.2.0.3.0 - Production on Thursday, 03 January, 2008 21:34:20

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Connected to: Oracle Database 10g Enterprise Edition Release 10.2.0.3.0 - Production
With the Partitioning, OLAP and Data Mining options
Starting "SYSTEM"."SYS_EXPORT_TRANSPORTABLE_01":  system/******** dumpfile=xtts.dmp
directory=XTTS transport_tablespaces=accounts
Processing object type TRANSPORTABLE_EXPORT/PLUGTS_BLK
Processing object type TRANSPORTABLE_EXPORT/TABLE
Processing object type TRANSPORTABLE_EXPORT/POST_INSTANCE/PLUGTS_BLK
Master table "SYSTEM"."SYS_EXPORT_TRANSPORTABLE_01" successfully loaded/unloaded
******************************************************************************
Dump file set for SYSTEM.SYS_EXPORT_TRANSPORTABLE_01 is:
  /oradisk/app01/oracle/scripts/av/xtts.dmp
Job "SYSTEM"."SYS_EXPORT_TRANSPORTABLE_01" successfully completed at 21:35:23
```

## 8. *Set tablespace accounts offline*

```
SQL> alter tablespace accounts offline;

Tablespace altered.
```

## 9. *Backup the tablespace using Rman backup as copy*

Note that in order to be able to setup the keep time for a period longer than the setup of the Flash Recovery Area we must make this backup outside the Flash Recovery Area

```
RMAN>  backup as copy datafile '+DB1DATADG/redx/datafile/accounts.287.642998077'
```

```
2> tag accounts_DF_CP
3> format '/oradisk/app01/oracle/scripts/av/%U'
4> keep until time='sysdate + 730' nologs;

Starting backup at 03/01/2008 21:44:33
using channel ORA_DISK_1
backup will be obsolete on date 02/01/2010 21:44:34
archived logs required to recover from this backup will not be kept
channel ORA_DISK_1: starting datafile copy
input datafile fno=00006 name=+DB1DATADG/redx/datafile/accounts.287.642998077
output filename=/oradisk/app01/oracle/scripts/av/data_D-REDX_I-2305343033_TS-
ACCOUNTS_FNO-6_0pj58r62 tag=ACCOUNTS_DF_CP recid=20 stamp=643067094
channel ORA_DISK_1: datafile copy complete, elapsed time: 00:00:26
Finished backup at 03/01/2008 21:45:00
```

## 10. Drop tablespace accounts

```
SQL> drop tablespace accounts including contents and datafiles;

Tablespace dropped.
```

## 11. Confirm that you cannot access the table on the dropped tablespace

```
SQL> select count(*) from accounts;
select count(*) from accounts
                     *
ERROR at line 1:
ORA-00942: table or view does not exist

SQL> select tablespace_name from dba_tablespaces where tablespace_name='ACCOUNTS';

no rows selected
```

## 12. *Restore the datafile backup to ASM*

On this step we need to use the Rman copy command instead of restore. Restore do require that the tablespace exist, and we did drop to it as part of the TTS procedure.
Take note of the output filename given by Rman; you will need to use this name on the next step

```
RMAN> copy datafilecopy '/oradisk/app01/oracle/scripts/av/data_D-REDX_I-
2305343033_TS-ACCOUNTS_FNO-6_0pj58r62' to '+DB1DATADG';

Starting backup at 03/01/2008 22:15:35
using channel ORA_DISK_1
channel ORA_DISK_1: starting datafile copy
input is copy of datafile 00006: /oradisk/app01/oracle/scripts/av/data_D-
REDX_I-2305343033_TS-ACCOUNTS_FNO-6_0pj58r62
output filename=+DB1DATADG/redx/datafile/accounts.287.643068939
tag=ACCOUNTS_DF_CP recid=21 stamp=643068957
channel ORA_DISK_1: datafile copy complete, elapsed time: 00:00:26
Finished backup at 03/01/2008 22:16:03
```

## 13. *Import tablespace accounts back into the database using data pump*

```
[pollux.com] > impdp system/oracle dumpfile=xtts.dmp directory=XTTS
transport_datafiles='+DB1DATADG/redx/datafile/accounts.287.643068939'

Import: Release 10.2.0.3.0 - Production on Thursday, 03 January, 2008 22:18:14

Copyright (c) 2003, 2005, Oracle.  All rights reserved.

Connected to: Oracle Database 10g Enterprise Edition Release 10.2.0.3.0 - Production
With the Partitioning, OLAP and Data Mining options
Master table "SYSTEM"."SYS_IMPORT_TRANSPORTABLE_01" successfully loaded/unloaded
```

```
Starting "SYSTEM"."SYS_IMPORT_TRANSPORTABLE_01":  system/******** dumpfile=xtts.dmp
directory=XTTS transport_datafiles=+DB1DATADG/redx/datafile/accounts.287.643068939
Processing object type TRANSPORTABLE_EXPORT/PLUGTS_BLK
Processing object type TRANSPORTABLE_EXPORT/TABLE
Processing object type TRANSPORTABLE_EXPORT/POST_INSTANCE/PLUGTS_BLK
Job "SYSTEM"."SYS_IMPORT_TRANSPORTABLE_01" successfully completed at 22:18:27
```

## *14. Set tablespace accounts online and check the control table*

On the previous check our current log sequence was 27, now we got to sequence 29. This check is made to be sure that despite the database advanced its scn we will not require to do recover of the offline tablespace when seting it online again.

```
SQL> alter tablespace accounts online;

Tablespace altered.

SQL> select count(*) from avargas.accounts;

  COUNT(*)
----------
        60
```

# TEST USING OFFLINE TABLESPACES, STEP BY STEP

1. Create tablespace accounts
2. Create table accounts on tablespace accounts, insert some records on it
3. Check current online log sequences
4. Flush online logs to disk
5. Set tablespace accounts offline
6. Backup the tablespace
7. Change the backup to be kept until sysdate + 2 years
8. Confirm that you cannot access the table on the offline tablespace
9. Remove the datafile from ASM
10. Restore the tablespace from the Rman backup
11. Check current online log sequences
12. Set tablespace accounts online and check the control table

## *1. Create a new tablespace*

```
SQL> create tablespace accounts ;

Tablespace created.

SQL> select file_name from dba_data_files where tablespace_name='ACCOUNTS';

FILE_NAME
-----------------------------------------------
+DB1DATADG/redx/datafile/accounts.287.642994845
```

## *2. Create a control table and insert some records on it*

```
SQL> create table accounts tablespace accounts as select * from dba_users;
```

```
Table created.

SQL> select count(*) from accounts;

  COUNT(*)
----------
        15


SQL> insert into accounts select * from accounts;

15 rows created.

SQL> commit;

Commit complete.

SQL> select count(*) from accounts;

  COUNT(*)
----------
        30
```

### *3. Check current online log sequences*

```
SQL> archive log list;
Database log mode              Archive Mode
Automatic archival             Enabled
Archive destination            USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence     25
Next log sequence to archive   27
Current log sequence           27
```

## 4. *Flush online logs to disk*

```
SQL> alter system archive log current;

System altered.
```

## 5. *Set tablespace accounts offline*

```
SQL> alter tablespace accounts offline;

Tablespace altered.
```

## 6. *Backup the tablespace*

Note that in order to be able to setup the keep time for a period longer than the setup of the Flash Recovery Area we must make this backup outside of it.

```
[pollux.com] > rman target /

Recovery Manager: Release 10.2.0.3.0 - Production on Thu Jan 3 02:22:57 2008

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connected to target database: REDX (DBID=2305343033)


RMAN> backup as compressed backupset
tag acccmp
format '/backup/retain/%U'
(tablespace accounts);
```

```
Starting backup at 03/01/2008 02:24:49
using channel ORA_DISK_1
channel ORA_DISK_1: starting compressed full datafile backupset
channel ORA_DISK_1: specifying datafile(s) in backupset
input datafile fno=00006 name=+DB1DATADG/redx/datafile/accounts.287.642994845
channel ORA_DISK_1: starting piece 1 at 03/01/2008 02:24:51
channel ORA_DISK_1: finished piece 1 at 03/01/2008 02:24:55
piece handle=/backup/retain/ nnndf0_acccmp_0.344.642997493 tag=ACCCMP comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:04
Finished backup at 03/01/2008 02:24:55
```

## *7. Change the backup to be kept until sysdate + 2 years*

```
RMAN> change backup tag ACCCMP keep until time='sysdate + 730' nologs;

using channel ORA_DISK_1
keep attributes for the backup are changed
backup will be obsolete on date 02/01/2010 08:38:45
archived logs required to recover from this backup will not be kept
backup set key=8 recid=8 stamp=642999958
```

## *8. Confirm that you cannot access the table on the offline tablespace*

```
SQL> select count(*) from accounts;
select count(*) from accounts
*
ERROR at line 1:
ORA-00376: file 6 cannot be read at this time
ORA-01110: data file 6: '+DB1DATADG/redx/datafile/accounts.287.642994845'
```

## 8. *Remove the datafile from ASM*

On this step I do confirm that the file exist, then I do reomove it using asmcmd rm command, and confirm that the file was removed

```
[pollux.com] > asmcmd ls +DB1DATADG/redx/datafile/accounts.287.642994845

     accounts.287.642994845

[pollux.com] > asmcmd rm +DB1DATADG/redx/datafile/accounts.287.642994845

[pollux.com] > asmcmd ls +DB1DATADG/redx/datafile/accounts.287.642994845

     ASMCMD-08002: entry 'accounts.287.642994845 ' does not exist in directory
     '+DB1DATADG/redx/datafile/'
```

## 9. *Restore the tablespace from the Rman backup*

```
[pollux.com] > rman target /

Recovery Manager: Release 10.2.0.3.0 - Production on Thu Jan 3 02:34:09 2008

Copyright (c) 1982, 2005, Oracle.  All rights reserved.

connected to target database: REDX (DBID=2305343033)

RMAN> restore tablespace accounts from tag=acccmp;

Starting restore at 03/01/2008 02:34:31
using target database control file instead of recovery catalog
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=153 devtype=DISK
```

```
channel ORA_DISK_1: starting datafile backupset restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup set
restoring datafile 00006 to +DB1DATADG/redx/datafile/accounts.287.642994845
channel ORA_DISK_1: reading from backup piece
/backup/retain/nnndf0_acccmp_0.344.642997493
channel ORA_DISK_1: restored backup piece 1
piece handle=/backup/retain/nnndf0_acccmp_0.344.642997493
tag=ACCCMP
channel ORA_DISK_1: restore complete, elapsed time: 00:00:15
Finished restore at 03/01/2008 02:34:52
```

## *11. Check current online log sequences*

On the previous check our current log sequence was 27, now we got to sequence 29. This check is made to be sure that despite the database advanced its scn we will not require to do recover of the offline tablespace when seting it online again.

```
SQL> archive log list;
Database log mode              Archive Mode
Automatic archival             Enabled
Archive destination            USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence     27
Next log sequence to archive   29
Current log sequence           29
```

## *12. Set tablespace accounts online and check the control table*

```
SQL> alter tablespace accounts online;

Tablespace altered.
```

```
SQL> select count(*) from accounts;

  COUNT(*)
----------
        30
```

**End of the procedure**

Filename: Rman-Offline-TBS-back-and-restore.doc
Directory: G:\AV-Blog-Documents\Word
Template: C:\Documents and Settings\avargas\Application Data\Microsoft\Templates\Normal.dot
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