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SUMMARY

This hands-on guide covers the basics of Backup, Restore and Recovery of Oracle Databases using RMAN.

Rman is a most powerful Backup tool for Oracle Databases. When using it in complex production environments it is advisable to have hands on knowledge of the whole backup, restore and recovery cycle, including predefined step-by-step 'how to' procedures for each possible restore and recovery scenario.

The DBA and Backup Administrators must be properly trained to implement and validate the backup policy, and to manage any possible event that may requires to perform restore and recovery.

This hands on practice is organized into 4 chapters

CATALOG
ADMINISTRATION
BACKUP
RESTORE AND RECOVERY

Each chapter contains a group of scripts that permits to implement the practice executing them one by one.
RMAN Check List

This check list provides a quick overview of items that are important to consider when working with RMAN

- Define a backup retention policy
- Setup CONTROLFILE AUTOBACKUP ON
- Setup ARCHIVELOG DELETION POLICY to a number of ‘backed up’ times that satisfy your recovery needs
- Generate logs of backup jobs and monitor them for errors
- Execute periodically administrative scripts to clean up the backup repository from obsolete and expired backups
- Use a Flash Recovery Area to maintain an online staging area of your last backups. That will enable fast restore and recovery in case of need
- Use a change tracking file and incremental backups that satisfy your recovery needs.
- Prepare and test a complete set of recovery scenarios and train the DBA team on them, they should include at least the following scenarios:
  - System Tablespace loss
  - Online Redolog loss
  - Controlfile loss
  - Data Tablespace loss
  - Single/multiple datafile loss
  - Archived log sequences loss- Block corruptions recovery
  - Total loss (database)
  - Total loss (server = database/software/parameter files)
RMAN Hands On

The Hands-On Environment

- 11g RDBMS software
- 11g ASM storage configured with 2 disk groups:
  - DATADG, for the databases, and
  - FRADG, for the flash recovery area, for storing some of the backups and for archived log destination.
- 1 catalog database
- 1 test database
- 1 file system for storing other backups outside ASM

Two general setup scripts are used to set the environment, they are run from within most other scripts.

```bash
#!/usr/bin/tcsh
# set-environment
setenv ORACLE_HOME /oradisk/oracle/app/product/11.1.0/db_1
setenv PATH $ORACLE_HOME/bin:/usr/local/bin:/usr/bin:/bin
setenv rmanuser rman # the rman catalog owner
setenv rmanpwd cat # the rman catalog owner password
setenv dbauser sys # the dba user
setenv dbapwd oracle # the dba user password
setenv rmandb rmancat # the rman catalog database
setenv datadb redpanda # the test database
clear
echo
# eof script
```
-- sqlenv.sql
set echo off head off feed off
alter session set nls_date_format='dd/mm/yy hh24:mi:ss';
set pages 50000 lines 120 echo on head on veri on time on ti on
-- eof script
This chapter shows how to create the RMAN catalog, how to register a database with it and how to review some of the information contained in the catalog.

The Catalog chapter covers the following topics:

1. set-catalog
2. create-catalog
3. register-database
4. verify-registration
5. manual-backup-registration
6. create-scripts
7. export-catalog
8. query-catalog
9. get-catalog-version
10. upgrade-catalog
11. unregister-database
12. drop-catalog
This script creates the rman user that will be the owner of the rman catalog, on the catalog database. The catalog database is usually a small database that contains and maintains the metadata of all rman backups performed using the catalog.

```bash
#!/usr/bin/tcsh

source ./set-environment
sqlplus $dbauser/$dbapwd@$rmandb as sysdba<<eof
@sqlenv
set echo on
CREATE USER rman IDENTIFIED BY cat
    TEMPORARY TABLESPACE temp
    DEFAULT TABLESPACE users
    QUOTA UNLIMITED ON users;
GRANT RECOVERY_CATALOG_OWNER TO rman;
exit;
eof
exit
```
2-create-catalog

Using the rman user created on step 1, this script connects to the catalog database using the rman command line interface, and creates the rman catalog. The rman catalog is a set of database objects that will be used to store the rman backups metadata.

```
#!/usr/bin/tcsh

source ./set-environment
rman CATALOG $rmanuser/$rmanpwd@$rmandb <<eof
CREATE CATALOG;
eof
exit
```

**Script Output:**

```
Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 12:02:15 2008

Copyright (c) 1982, 2007, Oracle. All rights reserved.
connected to recovery catalog database
RMAN>
recovery catalog created
RMAN>
Recovery Manager complete.
```
3-register-database

Once the rman catalog is set, the databases to be backed up need to be registered with it. In this case we execute rman connecting to the database to be registered, the TARGET and to the CATALOG database.

#!/usr/bin/tcsh

source ./set-environment

echo executing command : REGISTER DATABASE

rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb <<eof
REGISTER DATABASE;
EOF

eof

exit

Script Output:

avargas-pc:~/scripts/CATALOG> ./3-register-database

executing command : REGISTER DATABASE

Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 12:25:00 2008
Copyright (c) 1982, 2007, Oracle. All rights reserved.

connected to target database: REDPANDA (DBID=3603176431)
connected to recovery catalog database
RMAN> database registered in recovery catalog
starting full resync of recovery catalog
full resync complete

RMAN>

Recovery Manager complete.
4-verify-registration

Once a databases is registered with rman, we can get information about it from the catalog. In this case we execute the report schema command to get information.

#!/usr/bin/tcsh

source ./set-environment

echo Executing Command : REPORT SCHEMA

rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb <<eof
REPORT SCHEMA;
.eof

exit

Script Output:

avargas-pc:~/scripts/CATALOG> ./4-verify-registration

Executing Command : REPORT SCHEMA
Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 13:45:24 2008
Copyright (c) 1982, 2007, Oracle. All rights reserved.
connected to target database: REDPANDA (DBID=3603176431)
connected to recovery catalog database
RMAN>
starting full resync of recovery catalog
full resync complete
Report of database schema for database with db_unique_name REDPANDA

List of Permanent Datafiles
===========================
<table>
<thead>
<tr>
<th>File Size(MB)</th>
<th>Tablespace</th>
<th>RB segs</th>
<th>Datafile Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SYSTEM</td>
<td>YES</td>
<td>+DATADG/redpanda/datafile/system.268.654614821</td>
</tr>
<tr>
<td>2</td>
<td>SYSAUX</td>
<td>NO</td>
<td>+DATADG/redpanda/datafile/sysaux.267.654614821</td>
</tr>
<tr>
<td>3</td>
<td>UNDOTBS1</td>
<td>YES</td>
<td>+DATADG/redpanda/datafile/undotbs1.269.654614823</td>
</tr>
<tr>
<td>4</td>
<td>USERS</td>
<td>NO</td>
<td>+DATADG/redpanda/datafile/users.270.654614823</td>
</tr>
<tr>
<td>5</td>
<td>DEV</td>
<td>NO</td>
<td>+DATADG/redpanda/datafile/dev.276.654704777</td>
</tr>
</tbody>
</table>

List of Temporary Files
=======================
<table>
<thead>
<tr>
<th>File Size(MB)</th>
<th>Tablespace</th>
<th>Maxsize(MB)</th>
<th>Tempfile Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TEMP</td>
<td>67108863</td>
<td>+DATADG/redpanda/tempfile/temp.273.654614997</td>
</tr>
</tbody>
</table>

RMAN>

Recovery Manager complete.
5-manual-backup-registration

Manual backups, made using Rman without a recovery catalog or user scripts, can be cataloged and made available to the rman catalog.
In this example a controlfile backup is made using rman in NOCATALOG mode, afterwards the backup is catalogued.

```bash
#!/usr/bin/tcsh
source ./set-environment
echo Executing command : backup current controlfile
echo
rman TARGET $dbaustr/$dbapwd@$datadb NOCATALOG<<eof
backup current controlfile;
list backup;
exit;
eof
echo
echo Type file name to catalog
set fname =$<
echo
echo Executing Command : CATALOG backuppiece '<filename>'
echo
rman TARGET $dbaustr/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb <<eof
CATALOG backuppiece '$fname';
eof
exit
```

**Script Output:**

```
avargas-pc:~/scripts/CATALOG> ./5-manual-backup-registration
```
Executing command: backup current controlfile

Copyright (c) 1982, 2007, Oracle. All rights reserved.

connected to target database: REDPANDA (DBID=3603176431)
using target database control file instead of recovery catalog

RMAN>
Starting backup at 31-MAY-08
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=118 device type=DISK
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 31-MAY-08
channel ORA_DISK_1: finished piece 1 at 31-MAY-08

piece handle=/FRADG/redpanda/backupset/2008_05_31/ncnnf0_tag20080531t135308_0.290.65617 1597 tag=TAG20080531T135308 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:01
Finished backup at 31-MAY-08
Starting Control File and SPFILE Autobackup at 31-MAY-08
piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080531-00 comment=NONE
Finished Control File and SPFILE Autobackup at 31-MAY-08

RMAN>
RMAN Hands On

RMAN>

Recovery Manager complete.

Type file name to catalog
/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080531-00

Executing Command : CATALOG backuppiece <filename>
Copyright (c) 1982, 2007, Oracle. All rights reserved.
connected to target database: REDPANDA (DBID=3603176431)
connected to recovery catalog database

RMAN>
cataloged backup piece
backup piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-
3603176431-20080531-00 RECID=60 STAMP=656171712
RMAN>
Recovery Manager complete.
6-create-scripts

Rman tasks can be run using scripts, that can be stored on the rman catalog. Global scripts will be available to all databases, non-global scripts will be available only to the target database. This example shows how to create a global script.

#!/usr/bin/tcsh

source ./set-environment
echo Executing Command : CREATE GLOBAL SCRIPT

rmantarget $dbauser/$dbapwd@$datadb catalog $rmanuser/$rmanpwd@$rmandb <<eof
CREATE GLOBAL SCRIPT global_full_backup COMMENT 'use only with ARCHIVELOG mode databases'
{ BACKUP DATABASE PLUS ARCHIVELOG;
DELETE NOPROMPT OBSOLETE;
}

LIST GLOBAL SCRIPT NAMES;
eof
exit

script output:

avargas-pc:~/scripts/catalog> ./6-create-scripts
Executing Command : CREATE GLOBAL SCRIPT
Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 14:00:53 2008
connected to target database: REDPANDA (DBID=3603176431)  
connected to recovery catalog database

RMAN> 2> 3> 4>
created global script global_full_backup
RMAN>
RMAN>

List of Stored Scripts in Recovery Catalog

<table>
<thead>
<tr>
<th>Global Scripts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Script Name</td>
</tr>
<tr>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td>global_full_backup</td>
</tr>
<tr>
<td>use only with ARCHIVELOG mode databases</td>
</tr>
</tbody>
</table>

RMAN>
Recovery Manager complete.
The database holding the rman catalog should be protected against information loss, the minimum level of protection can be implemented by executing a full export of the catalog schema. In case of catalog loss an import of the schema on a new or existing database will make the catalog available again.

#!/usr/bin/tcsh

source ./set-environment

echo Executing Command : exp $rmanuser/$rmanpwd@$rmandb file=rman-catalog-export.dmp

echo exp $rmanuser/$rmanpwd@$rmandb file=rman-catalog-export.dmp owner=rman feedback=100

exit

Script Output:

aargas-pc:/~scripts/CATALOG> ./7-export-catalog

Executing Command : exp rman/cat@rmancat file=rman-catalog-export.dmp

Export: Release 11.1.0.6.0 - Production on Sat May 31 14:03:51 2008

Copyright (c) 1982, 2007, Oracle. All rights reserved.
Connected to: Oracle Database 11g Enterprise Edition Release 11.1.0.6.0 -
Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options

Export done in US7ASCII character set and AL16UTF16 NCHAR character set
server uses WE8MSWIN1252 character set (possible charset conversion)
exporting pre-schema procedural objects and actions
exporting foreign function library names for user RMAN
exporting PUBLIC type synonyms
exporting private type synonyms
exporting object type definitions for user RMAN

About to export RMAN's objects ...
exporting database links
exporting sequence numbers
exporting cluster definitions
about to export RMAN's tables via Conventional Path ...

. . exporting table AL 28 rows exported
. . exporting table BCB 0 rows exported

. . exporting table XCF 0 rows exported
. . exporting table XDF 0 rows exported

... (more lines)
RMAN Hands On

- exporting refresh groups and children
- exporting dimensions
- exporting post-schema procedural objects and actions
- exporting statistics

Export terminated successfully with warnings.
8-query-catalog

In some specific situations it may be useful to query directly the recovery catalog. To do so we need to know the Database ID (dbid) and the DB Key of the database we want to query data for on the recovery catalog.

#!/usr/bin/tcsh

source ./set-environment
clear
echo
echo Querying Catalog Views for the Target DB_KEY or DBID Values
echo DB_KEY is used only in the recovery catalog.
echo You can determine the DBID by looking at the output displayed when RMAN connects to the database
echo or by querying a V\$DATABASE view as in the following:
echo
echo select dbid from v\$database
echo

set v_db=v\$database
sqlplus -s $dbauser/$dbapwd@$datadb as sysdba<<eof
@sqlenv
SELECT DBID FROM $v_db;
exit
eof
echo

You can then obtain the DB_KEY on the Catalog Database based on the DBID
echo Enter the DBID
set v_dbid = $<
RMAN Hands On

echo
echo select db_key from rc_database where dbid=$v_dbid;
sqlplus -s $rmanuser/$rmanpwd@$rmandb <<eof
@sqlenv
SELECT DB_KEY FROM RC_DATABASE WHERE DBID = $v_dbid;
eof

echo
echo Having the DB_KEY we can execute other queries on the catalog database
echo
echo Enter the DB_KEY
set v_dbkey = $<
echo
echo To obtain the backups per incarnation of a database you can execute the following script:

echo
echo SELECT DBINC_KEY,BS_KEY, BACKUP_TYPE, COMPLETION_TIME
echo FROM RC_DATABASE_INCARNATION i, RC_BACKUP_SET b
echo WHERE i.DB_KEY = $v_dbkey
echo AND i.DB_KEY = b.DB_KEY ;
sqlplus -s $rmanuser/$rmanpwd@$rmandb <<eof
@sqlenv
SELECT DBINC_KEY, BS_KEY, BACKUP_TYPE, COMPLETION_TIME
FROM RC_DATABASE_INCARNATION i, RC_BACKUP_SET b
WHERE i.DB_KEY = $v_dbkey
AND i.DB_KEY = b.DB_KEY ;
eof
echo
echo For querying RC_BACKUP_FILES you must call DBMS_RCVMAN.SETDATABASE, with the DBID of a database.
echo registered in the catalog, the fourth parameter must be DBID.
echo The other parameters must all be NULL.

echo "CALL DBMS_RCVMAN.SETDATABASE(null,null,null,$v_dbid,null);"

echo
sqlplus -s $rmanuser/$rmanpwd@$rmandb <<eof
CALL DBMS_RCVMAN.SETDATABASE(null,null,null,$v_dbid,null);
select BACKUP_TYPE,STATUS,TAG,BYTES,COMPLETION_TIME
from RC_BACKUP_FILES;
eof

Script Output:

avargas-pc:~/scripts/CATALOG> ./8-query-catalog

Querying Catalog Views for the Target DB_KEY or DBID Values
DB_KEY is used only in the recovery catalog.
You can determine the DBID by looking at the output displayed when RMAN connects to the database
or by querying a V$DATABASE view as in the following:

select dbid from v$database

    DBID
---
3603176431
You can then obtain the DB_KEY on the Catalog Database based on the DBID
Enter the DBID
3603176431

select db_key from rc_database where dbid=3603176431

<table>
<thead>
<tr>
<th>DB_KEY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

Having the DB_KEY we can execute other queries on the catalog database
Enter the DB_KEY
1

To obtain the backups per incarnation of a database you can execute the following script:

```sql
SELECT DBINC_KEY, BS_KEY, BACKUP_TYPE, COMPLETION_TIME
FROM RC_DATABASE_INCARNATION i, RC_BACKUP_SET b
WHERE i.DB_KEY = 1
AND i.DB_KEY = b.DB_KEY
```

<table>
<thead>
<tr>
<th>DBINC_KEY</th>
<th>BS_KEY</th>
<th>COMPLETION_TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>185</td>
<td>D 13/05/08 13:42:36</td>
</tr>
<tr>
<td>18</td>
<td>185</td>
<td>D 13/05/08 13:42:36</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td>... (more lines)</td>
</tr>
<tr>
<td>15</td>
<td>249</td>
<td>D 31/05/08 13:53:24</td>
</tr>
<tr>
<td>2</td>
<td>249</td>
<td>D 31/05/08 13:53:24</td>
</tr>
</tbody>
</table>
For querying RC_BACKUP_FILES you must call DBMS_RCVMAN.SETDATABASE, with the DBID of a database registered in the catalog, the fourth parameter must be DBID. The other parameters must all be NULL.

CALL DBMS_RCVMAN.SETDATABASE(null,null,null,3603176431,null);

<table>
<thead>
<tr>
<th>BACKUP_TYPE</th>
<th>STATUS</th>
<th>TAG</th>
<th>BYTES</th>
<th>COMPLETION_TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>COPY</td>
<td>AVAILABLE</td>
<td></td>
<td>1385472</td>
<td>13/05/08 13:58:43</td>
</tr>
<tr>
<td>COPY</td>
<td>AVAILABLE</td>
<td></td>
<td>48145920</td>
<td>14/05/08 11:22:27</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td>...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COPY</td>
<td>AVAILABLE</td>
<td>TAG20080531T135317</td>
<td>10174464</td>
<td>31/05/08 13:56:42</td>
</tr>
<tr>
<td>BACKUP SET</td>
<td>AVAILABLE</td>
<td>TAG20080531T135317</td>
<td>10174464</td>
<td>31/05/08 13:56:42</td>
</tr>
</tbody>
</table>
RMAN Hands On

9-get-catalog-version

This example shows how to get the catalog version on the rman catalog database

#!/usr/bin/tcsh
source ./set-environment
clear
echo
echo "SELECT * FROM rcver;"
echo

sqlplus -s $rmanuser/$rmanpwd@$rmandb <<eof
@sqlenv
SELECT * FROM rcver;
eof
echo
exit

Script Output:

avargas-pc:~/scripts/CATALOG> ./9-get-catalog-version
SELECT * FROM rcver;
VERSION
----------
11.01.00.06
10-upgrade-catalog

This example shows how to upgrade the catalog to the last version, the upgrade command needs to be entered twice to get it executed.

```bash
#!/usr/bin/tcsh
source ./set-environment
rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb <<eof
UPGRADE CATALOG;
UPGRADE CATALOG;
eof

Script Output:

avargas-pc:/scripts/CATALOG> ./10-upgrade-catalog
Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 14:28:40 2008
Copyright (c) 1982, 2007, Oracle. All rights reserved.

connected to target database: REDPANDA (DBID=3603176431)
connected to recovery catalog database

RMAN>

recovery catalog owner is RMAN
enter UPGRADE CATALOG command again to confirm catalog upgrade

RMAN>
recovery catalog upgraded to version 11.01.00.06
DBMS_RCVMAN package upgraded to version 11.01.00.06
DBMS_RCVCAT package upgraded to version 11.01.00.06

RMAN>
Recovery Manager complete.
If a database is not longer required on the rman catalog it can be unregistered. This command needs to be executed with the 'noprompt' option if run from within a script, otherwise it assumes NO as response to the confirmation request.

Note that rman metadata is always stored also on the controlfile, if a database is unregistered from the catalog, it can be afterwards registered again and all backups contained in the controlfile will be cataloged.

```
#!/usr/bin/tcsh
source ./set-environment
rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb <<eof
UNREGISTER DATABASE;
EOF
```

Script Output:
```
avargas-pc:/~/scripts/CATALOG> ./11-unregister-database
Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 14:33:08 2008
Copyright (c) 1982, 2007, Oracle. All rights reserved.

connected to target database: REDPANDA (DBID=3603176431)
connected to recovery catalog database

RMAN>

database name is "REDPANDA" and DBID is 3603176431

Do you really want to unregister the database (enter YES or NO)?
```
Error occurred getting response – assuming NO response

RMAN>

Recovery Manager complete.
12-drop-catalog

An rman catalog can be removed with the drop catalog command. If executed from a script the command needs to be entered twice to get it run.

#!/usr/bin/tcsh

source ./set-environment

echo Executing Command : DROP CATALOG

rman CATALOG $rmanuser/$rmanpwd@$rmandb <<eof
DROP CATALOG;
eof

Script Output:

avargas-pc:~/scripts/CATALOG> ./12-drop-catalog

Executing Command : DROP CATALOG

Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 14:41:53 2008

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connected to recovery catalog database
RMAN Hands On

RMAN>

recovery catalog owner is RMAN
enter DROP CATALOG command again to confirm catalog removal

RMAN>

Recovery Manager complete.

ADMINISTRATION

This chapter shows how to execute the most common administrative tasks within RMAN. They are important in order to maintain a catalog that reflects the real backups we have. Maintaining a clean, updated catalog will help to simplify restore operations.

The Administration chapter covers the following topics:

1. crosscheck
2. list
3. report
4. delete
1-crosscheck

Crosscheck check that cataloged backups exist on disk or tape; if they don't exist they are marked as expired; if they exist but are no longer required to satisfy the redundancy policy, it mark the backups as obsolete.

Obsolete and expired backups can be removed from disk and the catalog later with the delete obsolete/expired commands.

```bash
#!/usr/bin/tcsh
source ./set-environment
echo Executing Command : CROSSCHECK
echo
rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb <<eof
CROSSCHECK BACKUP;  # checks backup sets, proxy copies, and image copies
CROSSCHECK COPY OF DATABASE;
CROSSCHECK BACKUPSET;
CROSSCHECK ARCHIVELOG ALL;
eof
exit
```

**Script Output:**

```
avargas-pc:/scripts/ADMINISTRATION> ./1-crosscheck
Executing Command : CROSSCHECK
Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 14:54:00 2008
Copyright (c) 1982, 2007, Oracle.  All rights reserved.

connected to target database: REDPANDA (DBID=3603176431)
connected to recovery catalog database
RMAN>
allocated channel: ORA_DISK_1
eof
```
channel ORA_DISK_1: SID=152 device type=DISK

crosschecked backup piece: found to be 'AVAILABLE'
backup piece handle=/FRADG/redpanda/backupset/2008_05_13/nndn0_tag20080513t134024_0.273.654615629 RECID=48
STAMP=654615629

crosschecked backup piece: found to be 'AVAILABLE'
backup piece handle=/oradisk/backup/2gjg996m_1_1 RECID=49 STAMP=654615771

crosschecked backup piece: found to be 'EXPIRED'
backup piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080513-09 RECID=50
STAMP=654615779

crosschecked backup piece: found to be 'EXPIRED'
backup piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080513-0a RECID=51
STAMP=654616784

crosschecked backup piece: found to be 'EXPIRED'
backup piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080514-00 RECID=52
STAMP=654704791

crosschecked backup piece: found to be 'AVAILABLE'
backup piece handle=/FRADG/redpanda/backupset/2008_05_19/annnf0_tag20080519t090617_0.282.655117583 RECID=53
STAMP=655117583

crosschecked backup piece: found to be 'AVAILABLE'
backup piece handle=/FRADG/redpanda/backupset/2008_05_19/annnf0_tag20080519t090617_0.283.655117603 RECID=54
STAMP=655117603

crosschecked backup piece: found to be 'AVAILABLE'
backup piece handle=/FRADG/redpanda/backupset/2008_05_19/nndf0_tag20080519t090644_0.278.655117611 RECID=55
STAMP=655117610

crosschecked backup piece: found to be 'AVAILABLE'
backup piece handle=/FRADG/redpanda/backupset/2008_05_19/nndf0_tag20080519t090644_0.279.655117701 RECID=56
STAMP=655117701

crosschecked backup piece: found to be 'EXPIRED'
backup piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080519-00 RECID=57
STAMP=655117709

crosschecked backup piece: found to be 'AVAILABLE'
backup piece handle=/FRADG/redpanda/backupset/2008_05_31/ncnnf0_tag20080531t135308_0.290.656171597 RECID=58
STAMP=656171596

crosschecked backup piece: found to be 'AVAILABLE'
backup piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080531-00 RECID=60
STAMP=656171712

Crosschecked 12 objects
RMAN>

released channel: ORA_DISK_1
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=152 device type=DISK

RMAN>
using channel ORA_DISK_1
crosschecked backup piece: found to be 'AVAILABLE'
backup piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080513-09 RECID=50 STAMP=654615779
crosschecked backup piece: found to be 'AVAILABLE'
backup piece handle=+FRADG/redpanda/backupset/2008_05_13/nnndn0_tag20080513t134024_0.273.654615629 RECID=48 STAMP=654615629
crosschecked backup piece: found to be 'AVAILABLE'
backup piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080513-0a RECID=51 STAMP=654616784
crosschecked backup piece: found to be 'EXPIRED'
backup piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080514-00 RECID=52 STAMP=654704791
crosschecked backup piece: found to be 'AVAILABLE'
backup piece handle=+FRADG/redpanda/backupset/2008_05_19/nnndf0_tag20080519t090644_0.278.655117611 RECID=55 STAMP=655117610
crosschecked backup piece: found to be 'AVAILABLE'
backup piece handle=+FRADG/redpanda/backupset/2008_05_19/nnndf0_tag20080519t090817_0.269.655117701 RECID=56 STAMP=655117701
crosschecked backup piece: found to be 'EXPIRED'
backup piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080519-00 RECID=57 STAMP=655117709
crosschecked backup piece: found to be 'AVAILABLE'
backup piece handle=+FRADG/redpanda/backupset/2008_05_31/ncnnf0_tag20080531t135308_0.290.656171597 RECID=58 STAMP=656171596
crosschecked backup piece: found to be 'AVAILABLE'
backup piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080531-00 RECID=60 STAMP=656171712
Crosschecked 12 objects

RMAN>
released channel: ORA_DISK_1
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=152 device type=DISK
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_5_654614978.dbf RECID=79 STAMP=654616723
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_1_654616722.dbf RECID=81 STAMP=654693747
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_2_654616722.dbf RECID=83 STAMP=655014754
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_3_654616722.dbf RECID=85 STAMP=655027274
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_4_654616722.dbf RECID=87 STAMP=655117133
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_5_654616722.dbf RECID=89 STAMP=655117575
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_6_654616722.dbf RECID=91 STAMP=655117695
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_7_654616722.dbf RECID=93 STAMP=655994964
validation succeeded for archived log
archived log file name=+FRADG/redpanda/archivelog/2008_05_29/thread_1_seq_7.272.655994953 RECID=94 STAMP=655994964
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_8_654616722.dbf RECID=95 STAMP=655996769
validation succeeded for archived log
archived log file name=+/FRADG/redpanda/archivelog/2008_05_29/thread_1_seq_8.264.655996755 RECID=96
STAMP=655996769
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_9_654616722.dbf RECID=97
STAMP=656033212
validation succeeded for archived log
archived log file name=+/FRADG/redpanda/archivelog/2008_05_29/thread_1_seq_9.284.656033199 RECID=98
STAMP=656033212
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_10_654616722.dbf RECID=99
STAMP=656095932
validation succeeded for archived log
archived log file name=+/FRADG/redpanda/archivelog/2008_05_30/thread_1_seq_10.281.656095923 RECID=100
STAMP=656095932
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_11_654616722.dbf RECID=101
STAMP=656114531
validation succeeded for archived log
archived log file name=+/FRADG/redpanda/archivelog/2008_05_30/thread_1_seq_11.280.656114431 RECID=102
STAMP=656114531
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_12_654616722.dbf RECID=103
STAMP=656121638
validation succeeded for archived log
archived log file name=+/FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_12.286.656121621 RECID=104
STAMP=656121638
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_13_654616722.dbf RECID=105
STAMP=656135809
validation succeeded for archived log
archived log file name=+/FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_13.287.656135801 RECID=106
STAMP=656135809
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_14_654616722.dbf RECID=107
STAMP=656147212
validation succeeded for archived log
archived log file name=+/FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_14.288.656147205 RECID=108
STAMP=656147212
validation succeeded for archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_15_654616722.dbf RECID=109
STAMP=656161610
validation succeeded for archived log
archived log file name=+/FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_15.289.656161603 RECID=110
STAMP=656161610
Crosschecked 25 objects

RMAN>

Recovery Manager complete.
2-list

List produces a report of existing backups, different kind of oracle files can be listed separately with the list command.

```
#!/usr/bin/tcsh
source ./set-environment
echo Executing Command : LIST
rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb log=scrlog
<<eof
  LIST ARCHIVELOG ALL;
  LIST BACKUPSET;
  LIST EXPIRED BACKUPSET;
  LIST FAILURE;
  LIST RECOVERABLE BACKUPSET;
  eof
more scrlog
rm scrlog
exit
```

Script Output:

```
avargas-pc:~/scripts/ADMINISTRATION> ./2-list
Executing Command : LIST
RMAN> RMAN> RMAN> RMAN> RMAN> RMAN>
Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 14:57:40 2008
Copyright (c) 1982, 2007, Oracle. All rights reserved.
```
RMAN Hands On

connected to target database: REDPANDA (DBID=3603176431)
connected to recovery catalog database

RMAN>

List of Archived Log Copies for database with db_unique_name REDPANDA
=====================================================================  
Key     Thrd Seq     S Low Time
------- ---- ------- - ---------
435     1    5       A 13-MAY-08
Name: /oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_5_654614978.dbf
436     1    1       A 13-MAY-08
Name: /oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_1_654616722.dbf
437     1    2       A 14-MAY-08
Name: /oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_2_654616722.dbf
...
... (more lines)
458     1    15      A 31-MAY-08
Name: /oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_15_654616722.dbf
459     1    15      A 31-MAY-08
Name: +FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_15.289.656161603
RMAN>

List of Backup Sets
===================
BS Key  Type LV Size       Device Type Elapsed Time Completion Time
------- ---- -- ---------- ----------- ------------ ---------------
462     Incr 0  187.78M    DISK        00:02:12     13-MAY-08
BP Key: 474   Status: AVAILABLE  Compressed: YES  Tag: TAG20080513T134024
Piece Name:
+FRADG/redpanda/backupset/2008_05_13/nnndn0_tag20080513t134024_0.273.654615629
### List of Datafiles in backup set 462

<table>
<thead>
<tr>
<th>File LV</th>
<th>Type</th>
<th>Ckp SCN</th>
<th>Ckp Time</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>Incr 923651</td>
<td>13-MAY-08</td>
<td>+DATADG/redpanda/datafile/system.268.654614821</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>Incr 923651</td>
<td>13-MAY-08</td>
<td>+DATADG/redpanda/datafile/sysaux.267.654614821</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>Incr 923651</td>
<td>13-MAY-08</td>
<td>+DATADG/redpanda/datafile/undotbs1.269.654614823</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>Incr 923651</td>
<td>13-MAY-08</td>
<td>+DATADG/redpanda/datafile/users.270.654614823</td>
</tr>
</tbody>
</table>

### BS Key Size Device Type Elapsed Time Completion Time

<table>
<thead>
<tr>
<th>BS Key</th>
<th>Size</th>
<th>Device Type</th>
<th>Elapsed Time</th>
<th>Completion Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>463</td>
<td>1010.50K</td>
<td>DISK</td>
<td>00:00:05</td>
<td>13-MAY-08</td>
</tr>
</tbody>
</table>

BP Key: 475 Status: AVAILABLE Compressed: YES Tag: PROD_FLL_L0_FLS_ARC2DSK
Piece Name: /oradisk/backup/2gjg996m_1_1

### List of Archived Logs in backup set 463

<table>
<thead>
<tr>
<th>Thrd Seq</th>
<th>Low SCN</th>
<th>Low Time</th>
<th>Next SCN</th>
<th>Next Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>923617</td>
<td>13-MAY-08</td>
<td>923896</td>
<td>13-MAY-08</td>
</tr>
</tbody>
</table>

... (more lines)

### List of Backup Sets

<table>
<thead>
<tr>
<th>BS Key</th>
<th>Type</th>
<th>LV Size</th>
<th>Device Type</th>
<th>Elapsed Time</th>
<th>Completion Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>464</td>
<td>Full</td>
<td>9.70M</td>
<td>DISK</td>
<td>00:00:06</td>
<td>13-MAY-08</td>
</tr>
</tbody>
</table>

BP Key: 476 Status: EXPIRED Compressed: NO Tag: TAG20080513T134253
Piece Name: /oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-
3603176431-20080513-09
  SPFILE Included: Modification time: 13-MAY-08
  SPFILE db_unique_name: REDPANDA

  Control File Included: Ckp SCN: 923959      Ckp time: 13-MAY-08
  BS Key  Type LV Size       Device Type Elapsed Time Completion Time
  ------- ---- -- ---------- ----------- ------------ ---------------
    465   Full    9.70M      DISK        00:00:06     13-MAY-08
  BP Key: 477   Status: EXPIRED  Compressed: NO  Tag: TAG20080513T135938
Piece Name: /oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-
3603176431-20080513-0a
  SPFILE Included: Modification time: 13-MAY-08
  SPFILE db_unique_name: REDPANDA
  Control File Included: Ckp SCN: 945883      Ckp time: 13-MAY-08
...
... (more lines)
RMAN>
no failures found that match specification
RMAN>

List of Backup Sets
===================
BS Key  Type LV Size       Device Type Elapsed Time Completion Time
------- ---- -- ---------- ----------- ------------ ---------------
    462   Incr 0  187.78M    DISK        00:02:12     13-MAY-08
  BP Key: 474   Status: AVAILABLE  Compressed: YES  Tag: TAG20080513T134024
Piece Name:
+FRADG/redpandabackupset/2008_05_13/nndn0_tag20080513t134024_0.273.654615629
List of Datafiles in backup set 462
File LV Type Ckp SCN Ckp Time Name
---- -- ---- ---------- --------- ----

... (more lines)

RMAN>
Recovery Manager complete.
3-report

Report produces a concise list of existing backups, including the full path to the backup files.

#!/usr/bin/tcsh
source ./set-environment
echo Executing Command : REPORT
echo
rman TARGET $dbuser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb log=scrlog <<eof
REPORT SCHEMA;
REPORT OBSOLETE;
REPORT NEED BACKUP;
REPORT UNRECOVERABLE;
REPORT SCHEMA AT TIME 'SYSDATE-1';
eof
more scrlog
rm scrlog
exit

Script Output:
avargas-pc:~/scripts/ADMINISTRATION> ./3-report
Executing Command : REPORT
RMAN> RMAN> RMAN> RMAN> RMAN> RMAN>
Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 15:02:52 2008
RMAN Hands On

Copyright (c) 1982, 2007, Oracle. All rights reserved.

connected to target database: REDPANDA (DBID=3603176431)
connected to recovery catalog database

RMAN>

Report of database schema for database with db_unique_name REDPANDA

List of Permanent Datafiles

<table>
<thead>
<tr>
<th>File Size(MB)</th>
<th>Tablespace</th>
<th>RB segs</th>
<th>Datafile Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 700</td>
<td>SYSTEM</td>
<td>YES</td>
<td>+DATADG/redpanda/datafile/system.268.654614821</td>
</tr>
<tr>
<td>2 1010</td>
<td>SYSAUX</td>
<td>NO</td>
<td>+DATADG/redpanda/datafile/sysaux.267.654614821</td>
</tr>
<tr>
<td>3 570</td>
<td>UNDOTBS1</td>
<td>YES</td>
<td>+DATADG/redpanda/datafile/undotbs1.269.654614823</td>
</tr>
<tr>
<td>4 5</td>
<td>USERS</td>
<td>NO</td>
<td>+DATADG/redpanda/datafile/users.270.654614823</td>
</tr>
<tr>
<td>5 100</td>
<td>DEV</td>
<td>NO</td>
<td>+DATADG/redpanda/datafile/dev.276.654704777</td>
</tr>
</tbody>
</table>

List of Temporary Files

<table>
<thead>
<tr>
<th>File Size(MB)</th>
<th>Tablespace</th>
<th>Maxsize(MB)</th>
<th>Tempfile Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 20</td>
<td>TEMP</td>
<td>67108863</td>
<td>+DATADG/redpanda/tempfile/temp.273.654614997</td>
</tr>
</tbody>
</table>

RMAN>

RMAN retention policy will be applied to the command

RMAN retention policy is set to redundancy 1

Report of obsolete backups and copies

<table>
<thead>
<tr>
<th>Type</th>
<th>Key</th>
<th>Completion Time</th>
<th>Filename/Handle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archive Log</td>
<td>435</td>
<td>13-MAY-08</td>
<td>/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_5_654614978.dbf</td>
</tr>
<tr>
<td>Archive Log</td>
<td>436</td>
<td>14-MAY-08</td>
<td>/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_1_654616722.dbf</td>
</tr>
<tr>
<td>Archive Log</td>
<td>437</td>
<td>18-MAY-08</td>
<td>/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_2_654616722.dbf</td>
</tr>
<tr>
<td>Archive Log</td>
<td>438</td>
<td>18-MAY-08</td>
<td>/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_3_654616722.dbf</td>
</tr>
</tbody>
</table>

46
RMAN Hands On

File #bkps Name

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

RMAN>
Report of files that need backup due to unrecoverable operations
File Type of Backup Required Name
---- ----------------------- -----------------------------------

RMAN>
Report of database schema for database with db_unique_name REDPANDA

List of Permanent Datafiles
---------------------------
File Size(MB) Tablespace RB segs Datafile Name
--- -------- -------------------- ------- ------------------------
1  700 SYSTEM YES +DATADG/redpanda/datafile/system.268.654614821
2 1010 SYSAUX YES +DATADG/redpanda/datafile/sysaux.267.654614821
3  570 UNDOTBS1 YES +DATADG/redpanda/datafile/undotbs1.269.654614823
4  5 USERS YES +DATADG/redpanda/datafile/users.270.654614823
5 100 DEV YES +DATADG/redpanda/datafile/dev.276.654704777

List of Temporary Files
-----------------------
File Size(MB) Tablespace Maxsize(MB) Tempfile Name
--- -------- ----------------- ----------- -------------------
1  20 TEMP 67108863 +DATADG/redpanda/tempfile/temp.273.654614997

RMAN>
RMAN retention policy will be applied to the command

RMAN retention policy is set to redundancy 1
Report of obsolete backups and copies

Type Key Completion Time Filename/Handle
-------- ------- ------------------ ------------------------------
Archive Log 435 13-MAY-08/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_5_654614978.dbf
Archive Log 436 14-MAY-08/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_1_654616722.dbf
Archive Log 437 18-MAY-08/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_2_654616722.dbf
Archive Log 438 18-MAY-08/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_3_654616722.dbf
Archive Log 439 19-MAY-08/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_4_654616722.dbf
RMAN Hands On

RMAN retention policy will be applied to the command
RMAN retention policy is set to redundancy 1
Report of files with less than 1 redundant backups

File #bkps Name
---- ----- -----------------------------------------------------

RMAN>
Report of files that need backup due to unrecoverable operations
File Type of Backup Required Name
RMAN Hands On

---- ----------------------- -----------------------------------
RMAN>
Report of database schema for database with db_unique_name REDPANDA

List of Permanent Datafiles
-----------------------------------
File Size(MB) Tablespace   RB segs Datafile Name
---------------------------
1  700 SYSTEM   YES +DATADG/redpanda/datafile/system.268.654614821
2 1010 SYSAUX   YES +DATADG/redpanda/datafile/sysaux.267.654614821
3  570 UNDOTBS1  YES +DATADG/redpanda/datafile/undotbs1.269.654614823
4  5 USERS     YES +DATADG/redpanda/datafile/users.270.654614823
5  100 DEV      YES +DATADG/redpanda/datafile/dev.276.654704777

List of Temporary Files
-----------------------
File Size(MB) Tablespace Maxsize(MB) Tempfile Name
---------------------------
1  20 TEMP              67108863 +DATADG/redpanda/tempfile/temp.273.654614997

RMAN>
Recovery Manager complete.
4-delete

Delete remove obsolete backups from disk; obsolete backups are not required to satisfy the retention policy. It does
remove expired backups from the catalog also; expired backups exist on the catalog but were removed from disk.

#!/usr/bin/tcsh
source ./set-environment
echo Executing Command : DELETE
rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb log=scrlog
<<eof
DELETE NOPROMPT OBSOLETE;
DELETE NOPROMPT EXPIRED BACKUPSET;
eof
more scrlog
rm scrlog
exit

Script Output:

avargas-pc:~/scripts/ADMINISTRATION> ./4-delete
Executing Command : DELETE
RMAN>
Executing Command : DELETE
RMAN> RMAN> RMAN>
Copyright (c) 1982, 2007, Oracle. All rights reserved.
connected to target database: REDPANDA (DBID=3603176431)
connected to recovery catalog database
RMAN Hands On

RMAN>
RMAN retention policy will be applied to the command
RMAN retention policy is set to redundancy 1
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=170 device type=DISK
Deleting the following obsolete backups and copies:

<table>
<thead>
<tr>
<th>Type</th>
<th>Key</th>
<th>Completion Time</th>
<th>Filename/Handle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archive Log</td>
<td>435</td>
<td>13-MAY-08</td>
<td>/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_5_654614978.dbf</td>
</tr>
<tr>
<td>Archive Log</td>
<td>436</td>
<td>14-MAY-08</td>
<td>/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_1_654616722.dbf</td>
</tr>
<tr>
<td>Archive Log</td>
<td>437</td>
<td>18-MAY-08</td>
<td>/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_2_654616722.dbf</td>
</tr>
<tr>
<td>Archive Log</td>
<td>438</td>
<td>18-MAY-08</td>
<td>/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_3_654616722.dbf</td>
</tr>
<tr>
<td>Archive Log</td>
<td>439</td>
<td>19-MAY-08</td>
<td>/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_4_654616722.dbf</td>
</tr>
<tr>
<td>Archive Log</td>
<td>440</td>
<td>19-MAY-08</td>
<td>/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_5_654616722.dbf</td>
</tr>
<tr>
<td>Backup Set</td>
<td>462</td>
<td>13-MAY-08</td>
<td>Backup Piece</td>
</tr>
<tr>
<td>Backup Piece</td>
<td>474</td>
<td>13-MAY-08</td>
<td>+FRADG/redpanda/backupset/2008_05_13/nnndn0_tag20080513t134024_0.273.654615629</td>
</tr>
<tr>
<td>Backup Set</td>
<td>463</td>
<td>13-MAY-08</td>
<td>Backup Piece</td>
</tr>
<tr>
<td>Backup Piece</td>
<td>475</td>
<td>13-MAY-08</td>
<td>/oradisk/backup/2gjg996m_1_1</td>
</tr>
<tr>
<td>Backup Set</td>
<td>464</td>
<td>13-MAY-08</td>
<td>Backup Piece</td>
</tr>
<tr>
<td>Backup Piece</td>
<td>476</td>
<td>13-MAY-08</td>
<td>/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080513-09</td>
</tr>
<tr>
<td>Backup Set</td>
<td>465</td>
<td>13-MAY-08</td>
<td></td>
</tr>
</tbody>
</table>
Backup Piece       477    13-MAY-08
/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080513-0a
Backup Set       466    14-MAY-08
Backup Piece       478    14-MAY-08
/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080514-00
Backup Set       467    19-MAY-08
Backup Piece       479    19-MAY-08
+FRADG/redpanda/backupset/2008_05_19/annnf0_tag20080519t090617_0.282.655117583
Backup Set       468    19-MAY-08
Backup Piece       480    19-MAY-08
+FRADG/redpanda/backupset/2008_05_19/annnf0_tag20080519t090617_0.283.655117603
Backup Set       471    19-MAY-08
Backup Piece       483    19-MAY-08
/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080519-00
Backup Set       472    31-MAY-08
Backup Piece       484    31-MAY-08
+FRADG/redpanda/backupset/2008_05_31/nccnf0_tag20080531t135308_0.290.656171597
deleted archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_5_654614978.dbf
RECID=79 STAMP=654616723
deleted archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_1_654616722.dbf
RECID=81 STAMP=654693747
deleted archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_2_654616722.dbf
RECID=83 STAMP=655014754
deleted archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_3_654616722.dbf
RECID=85 STAMP=655027274
deleted archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_4_654616722.dbf
RECID=87 STAMP=655117133
deleted archived log
archived log file name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_5_654616722.dbf
RECID=89 STAMP=655117575
deleted backup piece
backup piece
handle=+FRADG/redpanda/backupset/2008_05_13/nnndn0_tag20080513t134024_0.273.654615629
RECID=48 STAMP=654615629
deleted backup piece
backup piece handle=/oradisk/backup/2gjg996m_1_1 RECID=49 STAMP=654615771
deleted backup piece
backup piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080513-09 RECID=50 STAMP=654615779
deleted backup piece
backup piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080513-0a RECID=51 STAMP=654616784
deleted backup piece
backup piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080514-00 RECID=52 STAMP=654704791
deleted backup piece
backup piece
handle=+FRADG/redpanda/backupset/2008_05_19/annnf0_tag20080519t090617_0.282.655117583
RECID=53 STAMP=655117583
deleted backup piece
backup piece
handle=+FRADG/redpanda/backupset/2008_05_19/annnf0_tag20080519t090617_0.283.655117603
RECID=54 STAMP=655117603
deleted backup piece
backup piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080519-00 RECID=57 STAMP=655117709
deleted backup piece
backup piece
handle=+FRADG/redpanda/backupset/2008_05_31/ncnnf0_tag20080531t135308_0.290.656171597
RECID=58 STAMP=656171596
Deleted 15 objects

RMAN>
using channel ORA_DISK_1
RMAN>

Recovery Manager complete.
BACKUP

Rman provides numerous and flexible ways to backup a database or parts of a database, in this chapter a few of the several options are shown.

The following scrips are part of this chapter:

0-make-io
1-change_tracking
2-backup-backupset-compressed
3-backup-as-copy
4-incremental-backup-and-tags
5-backup-plus-archived-logs
6-backup-controlfile
7-incremental-for-backup-recover
8-incremental-for-quick-recover
# This script generates insert/update statements on a cyclic way in order to advance the archive log sequences and produce some test data.

#!/usr/bin/tcsh
source ./set-environment
echo Executing Command : Massive Inserts into Test Table
sqlplus -s $dbauser/$dbapwd@$datadb as sysdba <<eof
-- create table tst as select * from dba_users;
delete from tst;
commit;
insert into tst select * from dba_users;
insert into tst select * from tst;
insert into tst select * from tst;
insert into tst select * from tst;
insert into tst select * from tst;
insert into tst select * from tst;
insert into tst select * from tst;
insert into tst select * from tst;
insert into tst select * from tst;
insert into tst select * from tst;
insert into tst select * from tst;
insert into tst select * from tst;
insert into tst select * from tst;
insert into tst select * from tst;
commit;
eof
exit

Script Output:

avargas-pc:~/scripts/BACKUP> ./0-make-io
Executing Command : Massive Inserts into Test Table
15360 rows deleted.
Commit complete.
30 rows created.
30 rows created.
60 rows created.
120 rows created.
240 rows created.
480 rows created.
960 rows created.
1920 rows created.
3840 rows created.
7680 rows created.

Commit complete.
This script creates a change tracking file on the Flash Recovery Area ASM diskgroup +FRADG. A Change Tracking File keeps track of changed blocks, RMAN instead of scanning all datafiles for changes, read the pointers on the change tracking file, that greatly speeds up incremental backups.

```bash
#!/usr/bin/tcsh
source ./set-environment
echo Executing Command :

sqlplus -s $dbauser/$dbapwd@$datadb as sysdba <<eof
ALTER DATABASE ENABLE BLOCK CHANGE TRACKING USING FILE '+fradg';
eof

set v_bct=V\$BLOCK_CHANGE_TRACKING

sqlplus -s $dbauser/$dbapwd@$datadb as sysdba <<eof
col filename for a60
set lines 200
SELECT * FROM $v_bct;
eof
```
Script Output:

avargas-pc:~/scripts/BACKUP> ./1-change_tracking

Executing Command :
ALTER DATABASE ENABLE BLOCK CHANGE TRACKING USING FILE +fradg
block change tracking is enabled

Executing Command :
SELECT * FROM V$BLOCK_CHANGE_TRACKING
STATUS FILENAME
BYTES
--------- --------------------------------------------- ---------
ENABLED +FRADG/redpanda/changetracking/ctf.265.654310963 11599872
This script creates a compressed database backupset that includes also the archived logs. Once the backup complete successfully the original archived logs are removed from disk.

Rman compression saves around 80% of the space required to store a whole database backup.

```bash
#!/usr/bin/tcsh
source ./set-environment
echo Executing Command : BACKUP AS COMPRESSED BACKUPSET
echo rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb log=./scr.log <<eof
BACKUP AS COMPRESSED BACKUPSET DATABASE PLUS ARCHIVELOG DELETE INPUT;
eof
more ./scr.log
rm ./scr.log
exit
```

Script Output:

```
avargas-pc:~/scripts/BACKUP> ./2-backup-backupset-compressed
Executing Command : BACKUP AS COMPRESSED BACKUPSET
RMAN> RMAN>
Copyright (c) 1982, 2007, Oracle. All rights reserved.
connected to target database: REDPANDA (DBID=3603176431)
connected to recovery catalog database

RMAN>
```
Starting backup at 31-MAY-08
current log archived
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=104 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=6 RECID=126 STAMP=656179887
input archived log thread=1 sequence=7 RECID=122 STAMP=656179857
input archived log thread=1 sequence=8 RECID=117 STAMP=656179795
input archived log thread=1 sequence=9 RECID=124 STAMP=656179873
input archived log thread=1 sequence=10 RECID=123 STAMP=656179866
input archived log thread=1 sequence=11 RECID=118 STAMP=656179807
input archived log thread=1 sequence=12 RECID=119 STAMP=656179819
input archived log thread=1 sequence=13 RECID=116 STAMP=656179783
input archived log thread=1 sequence=14 RECID=120 STAMP=656179831
input archived log thread=1 sequence=15 RECID=115 STAMP=656179771
input archived log thread=1 sequence=16 RECID=121 STAMP=656179844
input archived log thread=1 sequence=17 RECID=125 STAMP=656179881
input archived log thread=1 sequence=18 RECID=129 STAMP=656180161
input archived log thread=1 sequence=19 RECID=131 STAMP=656180550
channel ORA_DISK_1: starting piece 1 at 31-MAY-08
channel ORA_DISK_1: finished piece 1 at 31-MAY-08
channel ORA_DISK_1: backup set complete, elapsed time: 00:01:15
channel ORA_DISK_1: deleting archived log(s)
archived log file name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_6.290.656179887 RECID=126 STAMP=656179887
archived log file name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_7.291.656179851 RECID=122 STAMP=656179857
archived log file name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_8.287.656179791 RECID=117 STAMP=656179795
archived log file name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_9.281.656179871 RECID=124
STAMP=656179873
archived log file name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_10.272.656179863 RECID=123
STAMP=656179866
archived log file name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_11.264.656179803 RECID=118
STAMP=656179807
archived log file name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_12.280.656179815 RECID=119
STAMP=656179819
archived log file name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_13.289.656179779 RECID=116
STAMP=656179783
archived log file name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_14.286.656179827 RECID=120
STAMP=656179831
archived log file name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_15.283.656179767 RECID=115
STAMP=656179771
archived log file name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_16.288.656179839 RECID=121
STAMP=656179844
archived log file name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_17.284.656179879 RECID=125
STAMP=656179881
archived log file name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_18.273.656180161 RECID=129
STAMP=656180161
archived log file name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_19.282.656180551 RECID=131
STAMP=656180550
Finished backup at 31-MAY-08
Starting backup at 31-MAY-08
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=000001 name=+DATADG/redpanda/datafile/sysaux.267.654614821
input datafile file number=000002 name=+DATADG/redpanda/datafile/system.268.654614821
input datafile file number=000003 name=+DATADG/redpanda/datafile/undotbs1.269.654614823
input datafile file number=000005 name=+DATADG/redpanda/datafile/dev.276.654704777
input datafile file number=000004 name=+DATADG/redpanda/datafile/users.270.654614823
channel ORA_DISK_1: starting piece 1 at 31-MAY-08
channel ORA_DISK_1: finished piece 1 at 31-MAY-08
piece handle=+FRADG/redpanda/backupset/2008_05_31/nnndf0_tag20080531t162355_0.282.656180641
tag=TAG20080531T162355 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:02:25
Finished backup at 31-MAY-08
Starting backup at 31-MAY-08
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=20 RECID=133 STAMP=656180786
channel ORA_DISK_1: starting piece 1 at 31-MAY-08
channel ORA_DISK_1: finished piece 1 at 31-MAY-08
piece handle=+FRADG/redpanda/backupset/2008_05_31/annnf0_tag20080531t162630_0.284.656180795
tag=TAG20080531T162630 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:02
channel ORA_DISK_1: deleting archived log(s)
archived log file name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_20.273.656180787 RECID=133
STAMP=656180786
Finished backup at 31-MAY-08
Starting Control File and SPFILE Autobackup at 31-MAY-08
piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080531-02 comment=NONE
Finished Control File and SPFILE Autobackup at 31-MAY-08
RMAN>

Recovery Manager complete.
3-backup-as-copy

This script creates a bit by bit copy of the database files and archived logs, the backup destination is a file system. This backup type create files that can be used to create a clone or restore the database without using rman. In addition this kind of backup can be updated applying to it the changes recorded on future incremental backups.

#!/usr/bin/tcsh
source ./set-environment
echo Executing Command : BACKUP AS COPY - to file system -
echo
rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb log=scr.log <<eof
BACKUP AS COPY DEVICE TYPE DISK DATABASE FORMAT '/oradisk/backup/%U' TAG='FULL2RECOVER'
PLUS ARCHIVELOG DELETE INPUT;
eof
more ./scr.log
rm ./scr.log
exit

Script Output:

avargas-pc:~/scripts/BACKUP> ./2-backup-backupset-compressed
Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 16:09:08 2008
Copyright (c) 1982, 2007, Oracle. All rights reserved.
connected to target database: REDPANDA (DBID=3603176431)
connected to recovery catalog database

RMAN> 2>
starting full resync of recovery catalog
full resync complete
Starting backup at 31-MAY-08
current log archived
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=113 device type=DISK
channel ORA_DISK_1: starting archived log copy
input archived log thread=1 sequence=15 RECID=110 STAMP=656161610
output file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_15.283.656179767
RECID=115 STAMP=656179771
channel ORA_DISK_1: archived log copy complete, elapsed time: 00:00:07
channel ORA_DISK_1: deleting archived log(s)
archived log file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_15.289.656161603
RECID=110 STAMP=656161610
channel ORA_DISK_1: starting archived log copy
input archived log thread=1 sequence=13 RECID=106 STAMP=656135809
output file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_13.289.656179779
RECID=116 STAMP=656179783
channel ORA_DISK_1: archived log copy complete, elapsed time: 00:00:07
channel ORA_DISK_1: deleting archived log(s)
archived log file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_13.287.656135801
RECID=106 STAMP=656135809
channel ORA_DISK_1: starting archived log copy
input archived log thread=1 sequence=8 RECID=96 STAMP=655996769
output file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_8.287.656179791 RECID=117
STAMP=656179795
channel ORA_DISK_1: archived log copy complete, elapsed time: 00:00:07
channel ORA_DISK_1: deleting archived log(s)
archived log file
name=+FRADG/redpanda/archivelog/2008_05_29/thread_1_seq_8.264.655996755 RECID=96
STAMP=655996769
channel ORA_DISK_1: starting archived log copy
input archived log thread=1 sequence=11 RECID=102 STAMP=656114531
output file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_11.264.656179803 RECID=118 STAMP=656179807
channel ORA_DISK_1: archived log copy complete, elapsed time: 00:00:07
channel ORA_DISK_1: deleting archived log(s)
archived log file
name=+FRADG/redpanda/archivelog/2008_05_30/thread_1_seq_11.280.656114431 RECID=102 STAMP=656114531
channel ORA_DISK_1: starting archived log copy
input archived log thread=1 sequence=12 RECID=104 STAMP=656121638
output file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_12.280.656179815 RECID=119 STAMP=656179819
channel ORA_DISK_1: archived log copy complete, elapsed time: 00:00:07
channel ORA_DISK_1: deleting archived log(s)
archived log file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_12.286.656121621 RECID=104 STAMP=656121638
channel ORA_DISK_1: starting archived log copy
input archived log thread=1 sequence=14 RECID=108 STAMP=656147212
output file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_14.286.656179827
RECID=120 STAMP=656179831
channel ORA_DISK_1: archived log copy complete, elapsed time: 00:00:07
channel ORA_DISK_1: deleting archived log(s)
archived log file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_14.288.656147205
RECID=108 STAMP=656147212
channel ORA_DISK_1: starting archived log copy
input archived log thread=1 sequence=16 RECID=112 STAMP=656176140
output file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_16.288.656179839
RECID=121 STAMP=656179844
channel ORA_DISK_1: archived log copy complete, elapsed time: 00:00:07
channel ORA_DISK_1: deleting archived log(s)
archived log file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_16.291.656176131
RECID=112 STAMP=656176140
channel ORA_DISK_1: starting archived log copy
input archived log thread=1 sequence=7 RECID=94 STAMP=655994964
output file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_7.291.656179851 RECID=122
channel ORA_DISK_1: archived log copy complete, elapsed time: 00:00:07
channel ORA_DISK_1: deleting archived log(s)
archived log file
name=+FRADG/redpanda/archivelog/2008_05_29/thread_1_seq_7.272.655994953 RECID=94
channel ORA_DISK_1: starting archived log copy
input archived log thread=1 sequence=10 RECID=100 STAMP=656095932
output file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_10.272.656179863
RECID=123 STAMP=656179866
channel ORA_DISK_1: archived log copy complete, elapsed time: 00:00:03
channel ORA_DISK_1: deleting archived log(s)
archived log file
name=+FRADG/redpanda/archivelog/2008_05_30/thread_1_seq_10.281.656095923
RECID=100 STAMP=656095932
channel ORA_DISK_1: starting archived log copy
input archived log thread=1 sequence=9 RECID=98 STAMP=656033212
output file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_9.281.656179871 RECID=124
STAMP=656179873
channel ORA_DISK_1: archived log copy complete, elapsed time: 00:00:03
channel ORA_DISK_1: deleting archived log(s)
archived log file
name=+FRADG/redpanda/archivelog/2008_05_29/thread_1_seq_9.284.656033199 RECID=98
STAMP=656033212
channel ORA_DISK_1: starting archived log copy
input archived log thread=1 sequence=17 RECID=114 STAMP=656179759
output file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_17.284.656179879
RECID=125 STAMP=656179881
channel ORA_DISK_1: archived log copy complete, elapsed time: 00:00:03
channel ORA_DISK_1: deleting archived log(s)
archived log file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_17.290.656179755
RECID=114 STAMP=656179759
channel ORA_DISK_1: starting archived log copy
input archived log thread=1 sequence=6 RECID=91 STAMP=655117695

69
output file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_6.290.656179887 RECID=126
STAMP=656179887
channel ORA_DISK_1: archived log copy complete, elapsed time: 00:00:01
channel ORA_DISK_1: deleting archived log(s)
archived log file
name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_6_654616722.dbf RECID=91
STAMP=655117695
Finished backup at 31-MAY-08
Starting backup at 31-MAY-08
using channel ORA_DISK_1
channel ORA_DISK_1: starting datafile copy
input datafile file number=00002
name=+DATADG/redpanda/datafile/sysaux.267.654614821
output file name=/oradisk/backup/data_D-REDPANDA_I-3603176431_TS-SYSAUX_FNO-
2_37jhp01h tag=FULL2RECOVER RECID=23 STAMP=656179989
channel ORA_DISK_1: datafile copy complete, elapsed time: 00:01:45
channel ORA_DISK_1: starting datafile copy
input datafile file number=00001
name=+DATADG/redpanda/datafile/system.268.654614821
output file name=/oradisk/backup/data_D-REDPANDA_I-3603176431_TS-SYSTEM_FNO-
1_38jhp0ou tag=FULL2RECOVER RECID=24 STAMP=656180068
channel ORA_DISK_1: datafile copy complete, elapsed time: 00:01:05
channel ORA_DISK_1: starting datafile copy
input datafile file number=00003
name=+DATADG/redpanda/datafile/undotbs1.269.654614823
output file name=/oradisk/backup/data_D-REDPANDA_I-3603176431_TS-UNDOTBS1_FNO-
3_39jhp0r4 tag=FULL2RECOVER RECID=25 STAMP=656180128
channel ORA_DISK_1: datafile copy complete, elapsed time: 00:00:55
channel ORA_DISK_1: starting datafile copy
input datafile file number=00005 name=+DATADG/redpanda/datafile/dev.276.654704777
output file name=/oradisk/backup/data_D-REDPANDA_I-3603176431_TS-DEV_FNO-5_3ajhp0t0 tag=FULL2RECOVER RECID=26 STAMP=656180142
channel ORA_DISK_1: datafile copy complete, elapsed time: 00:00:15
channel ORA_DISK_1: starting datafile copy
input datafile file number=00004
name=+DATADG/redpanda/datafile/users.270.654614823
output file name=/oradisk/backup/data_D-REDPANDA_I-3603176431_TS-USERS_FNO-4_3bjhp0tk tag=FULL2RECOVER RECID=27 STAMP=656180153
channel ORA_DISK_1: datafile copy complete, elapsed time: 00:00:01
Finished backup at 31-MAY-08
Starting backup at 31-MAY-08
current log archived
using channel ORA_DISK_1
channel ORA_DISK_1: starting archived log copy
input archived log thread=1 sequence=18 RECID=128 STAMP=656180155
output file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_18.273.656180161
RECID=129 STAMP=656180161
channel ORA_DISK_1: archived log copy complete, elapsed time: 00:00:01
channel ORA_DISK_1: deleting archived log(s)
archived log file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_18.282.656180155
RECID=128 STAMP=656180155
Finished backup at 31-MAY-08
Starting Control File and SPFILE Autobackup at 31-MAY-08
piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080531-01 comment=NONE
Finished Control File and SPFILE Autobackup at 31-MAY-08
RMAN>
RMAN Hands On

Recovery Manager complete.
4-incremental-backup-and-tags

This script creates a compressed incremental level 0 backupset and assigns to it a tag, that can be used to reference it on another rman command later.

The backup is created on the Flash Recovery Area because the parameter `db_recovery_file_dest` is set to ASM diskgroup FRADG.

```bash
#!/usr/bin/tcsh
source ./set-environment
echo Executing Command : BACKUP AS COMPRESSED BACKUPSET
echo
rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb log=scr.log <<eof
BACKUP AS COMPRESSED BACKUPSET INCREMENTAL LEVEL 0 DATABASE  TAG 'production_full_lv0';
eof
more ./scr.log
rm ./scr.log
exit
```

**Script Output:**

```
avargas-pc:~/scripts/BACKUP> ./4-incremental-backup-and-tags
RMAN> RMAN>

Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 17:09:40 2008
Copyright (c) 1982, 2007, Oracle.  All rights reserved.
connected to target database: REDPANDA (DBID=3603176431)
connected to recovery catalog database

RMAN>
```
Starting backup at 31-MAY-08
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=118 device type=DISK
cchannel ORA_DISK_1: starting compressed incremental level 0 datafile backup set
cchannel ORA_DISK_1: specifying datafile(s) in backup set

input datafile file number=00002
name=+DATADG/redpanda/datafile/sysaux.267.654614821

input datafile file number=00001
name=+DATADG/redpanda/datafile/system.268.654614821

input datafile file number=00003
name=+DATADG/redpanda/datafile/undotbs1.269.654614823

input datafile file number=00005 name=+DATADG/redpanda/datafile/dev.276.654704777

input datafile file number=00004
name=+DATADG/redpanda/datafile/users.270.654614823

channel ORA_DISK_1: starting piece 1 at 31-MAY-08

channel ORA_DISK_1: finished piece 1 at 31-MAY-08

piece
handle=+FRADG/redpanda/backupset/2008_05_31/nndon0_production_full_lv0_0.273.6561
83389 tag=PRODUCTION_FULL_LV0 comment=NONE

channel ORA_DISK_1: backup set complete, elapsed time: 00:02:36
Finished backup at 31-MAY-08

Starting Control File and SPFILE Autobackup at 31-MAY-08

`piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080531-03 comment=NONE`

Finished Control File and SPFILE Autobackup at 31-MAY-08

RMAN>

Recovery Manager complete.
5-backup-plus-archived-logs

This script like the previous creates a compressed incremental level 0 backupset and assigns to it a tag, that can be used to reference it on another rman command later. In this case the destination is set to a file system with the FORMAT clause.

```bash
#!/usr/bin/tcsh
source ./set-environment
echo Executing Command : BACKUP AS COMPRESSED BACKUPSET
echo
rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb log=scr.log <<eof
BACKUP AS COMPRESSED BACKUPSET INCREMENTAL LEVEL 0
DATABASE PLUS ARCHIVELOG
TAG 'prod_fll_l0_pls_arc2dsk'
FORMAT '/oradisk/backup/%U'
DELETE INPUT;
eof
more ./scr.log
rm ./scr.log
exit
```

Script Output:

```
avargas-pc:~/scripts/BACKUP> ./5-backup-plus-archived-logs
Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 17:35:21 2008
Copyright (c) 1982, 2007, Oracle.  All rights reserved.
connected to target database: REDPANDA (DBID=3603176431)
connected to recovery catalog database
RMAN> 2> 3> 4> 5>

Starting backup at 31-MAY-08
```
current log archived
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=120 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=7 RECID=93 STAMP=655994964
input archived log thread=1 sequence=8 RECID=95 STAMP=655996769
input archived log thread=1 sequence=9 RECID=97 STAMP=656033212
input archived log thread=1 sequence=10 RECID=99 STAMP=656095932
input archived log thread=1 sequence=11 RECID=101 STAMP=656114531
input archived log thread=1 sequence=12 RECID=103 STAMP=656121638
input archived log thread=1 sequence=13 RECID=105 STAMP=656135809
input archived log thread=1 sequence=14 RECID=107 STAMP=656147212
input archived log thread=1 sequence=15 RECID=109 STAMP=656161610
input archived log thread=1 sequence=16 RECID=111 STAMP=656176140
input archived log thread=1 sequence=17 RECID=113 STAMP=656179759
input archived log thread=1 sequence=18 RECID=127 STAMP=656180155
input archived log thread=1 sequence=19 RECID=130 STAMP=656180550
input archived log thread=1 sequence=20 RECID=132 STAMP=656180786
input archived log thread=1 sequence=21 RECID=135 STAMP=656184927
channel ORA_DISK_1: starting piece 1 at 31-MAY-08
channel ORA_DISK_1: finished piece 1 at 31-MAY-08
piece handle=/oradisk/backup/3ljhp5j1_1_1 tag=PROD_FLL_L0_PLS_ARC2DSK comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:55
channel ORA_DISK_1: deleting archived log(s)
archived log file
name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_7_654616722.dbf RECID=93
  STAMP=655994964
archived log file
name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_8_654616722.dbf RECID=95
  STAMP=655996769
archived log file
name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_9_654616722.dbf RECID=97
  STAMP=656033212
archived log file
name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_10_654616722.dbf RECID=99
STAMP=656095932

archived log file
name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_11_654616722.dbf RECID=101
STAMP=656114531

archived log file
name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_12_654616722.dbf RECID=103
STAMP=656121638

archived log file
name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_13_654616722.dbf RECID=105
STAMP=656135809

archived log file
name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_14_654616722.dbf RECID=107
STAMP=656147212

archived log file
name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_15_654616722.dbf RECID=109
STAMP=656161610

archived log file
name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_16_654616722.dbf RECID=111
STAMP=656176140
archived log file
name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_17_654616722.dbf RECID=113
STAMP=656179759

archived log file
name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_18_654616722.dbf RECID=127
STAMP=656180155

archived log file
name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_19_654616722.dbf RECID=130
STAMP=656180550

archived log file
name=/oradisk/oracle/app/product/11.1.0/db_1/dbs/arch1_20_654616722.dbf RECID=132
STAMP=656180786

archived log file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_21.288.656184925 RECID=135
STAMP=656184927

Finished backup at 31-MAY-08

Starting backup at 31-MAY-08

using channel ORA_DISK_1

channel ORA_DISK_1: starting compressed incremental level 0 datafile backup set

channel ORA_DISK_1: specifying datafile(s) in backup set
input datafile file number=00002 name=+DATADG/redpanda/datafile/sysaux.267.654614821
input datafile file number=00001 name=+DATADG/redpanda/datafile/system.268.654614821
input datafile file number=00003 name=+DATADG/redpanda/datafile/undotbs1.269.654614823
input datafile file number=00005 name=+DATADG/redpanda/datafile/dev.276.654704777
input datafile file number=00004 name=+DATADG/redpanda/datafile/users.270.654614823
channel ORA_DISK_1: starting piece 1 at 31-MAY-08
channel ORA_DISK_1: finished piece 1 at 31-MAY-08

piece
handle=+FRADG/redpanda/backupset/2008_05_31/nnndn0_tag20080531t173630_0.288.656184995
tag=TAG20080531T173630 comment=NONE

channel ORA_DISK_1: backup set complete, elapsed time: 00:02:26
Finished backup at 31-MAY-08
Starting backup at 31-MAY-08
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=22 RECID=137 STAMP=656185140
channel ORA_DISK_1: starting piece 1 at 31-MAY-08
channel ORA_DISK_1: finished piece 1 at 31-MAY-08
piece handle=/oradisk/backup/3njhp5pm_1_1 tag=PROD_FLL_L0_PLS_ARC2DSK comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:01
channel ORA_DISK_1: deleting archived log(s)
archived log file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_22.283.656185141 RECID=137
STAMP=656185140
Finished backup at 31-MAY-08
Starting Control File and SPFILE Autobackup at 31-MAY-08
piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080531-04 comment=NONE
Finished Control File and SPFILE Autobackup at 31-MAY-08

RMAN>
RMAN Hands On

Recovery Manager complete.
This script setup some of the basic configurable rman parameters. by setting AUTOBACKUP ON each time a backup is executed, or an structural change is made to the database, automatical a backup of the controlfile will be created.

```bash
#!/usr/bin/tcsh
source ./set-environment
echo Executing Command : Controlfile Autobackup Settings

rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb log=scr.log <<eof
CONFIGURE CONTROLFILE AUTOBACKUP ON;
CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO '%d_%F';
CONFIGURE ARCHIVELOG DELETION POLICY TO NONE; # delete obsolete and backed up 2 times
CONFIGURE SNAPSHOT CONTROLFILE NAME TO '/oradisk/oracle/app/product/11.1.0/db_1/dbs/snapcf_redpanda.f'; # default
eof
more scr.log
exit
```

Script Output:

```
avargas-pc:~/scripts/BACKUP> ./6-backup-controlfile
Executing Command : Controlfile Autobackup Settings
Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 17:44:43 2008
Copyright (c) 1982, 2007, Oracle. All rights reserved.
connected to target database: REDPANDA (DBID=3603176431)
connected to recovery catalog database
RMAN>
old RMAN configuration parameters:
```
RMAN Hands On

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>

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

RMAN>
old RMAN configuration parameters:
CONFIGURE ARCHIVELOG DELETION POLICY TO NONE;
new RMAN configuration parameters:
CONFIGURE ARCHIVELOG DELETION POLICY TO NONE;
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete

RMAN>
old RMAN configuration parameters:
CONFIGURE SNAPSHOT CONTROLFILE NAME TO
'/oradisk/oracle/app/product/11.1.0/db_1/dbs/snapcf_redpanda.f';
new RMAN configuration parameters:
CONFIGURE SNAPSHOT CONTROLFILE NAME TO
'/oradisk/oracle/app/product/11.1.0/db_1/dbs/snapcf_redpanda.f';
new RMAN configuration parameters are successfully stored

starting full resync of recovery catalog

full resync complete

RMAN>

Recovery Manager complete.
7-incremental-for-backup-recover

This script when executed the first time look for a backup with tag 'INCREMENTAL_DAILY_UPDATED' that does not exist yet, so it creates it. The second time it will create an incremental backup level 1 to be used to recover the original backup, on the next run. From the third time on, the script will make recover the backup tag 'INCREMENTAL_DAILY_UPDATED' with the previous incremental and it will create a new incremental backup.

#!/usr/bin/tcsh
source ./set-environment
echo Executing Command INCREMENTAL DAILY BACKUP TO FILE SYSTEM
echo
rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb log=scr.log <<eof
RUN
{
  ALLOCATE CHANNEL disk1 DEVICE TYPE DISK FORMAT '/oradisk/backup/%U';
  ALLOCATE CHANNEL disk2 DEVICE TYPE DISK FORMAT '/oradisk/backup/%U';
  RECOVER COPY OF DATABASE WITH TAG 'INCREMENTAL_DAILY_UPDATED';
  BACKUP INCREMENTAL LEVEL 1 FOR RECOVER OF COPY WITH TAG 'INCREMENTAL_DAILY_UPDATED'
  DATABASE FORMAT '/oradisk/backup/%U'
  PLUS ARCHIVELOG FORMAT '/oradisk/backup/%U';
}
eof
more ./scr.log
exit

Script Output:
avargas-pc:/scripts/BACKUP> ./7-incremental-for-backup-recover

Executing Command INCREMENTAL DAILY BACKUP TO FILE SYSTEM

Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 17:52:33 2008

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connected to target database: REDPANDA (DBID=3603176431)

connected to recovery catalog database

RMAN> 2> 3> 4> 5> 6> 7> 8> 9> 10> 11> 12>
allocated channel: disk1

channel disk1: SID=104 device type=DISK

allocated channel: disk2

channel disk2: SID=120 device type=DISK

Starting recover at 31-MAY-08

no copy of datafile 1 found to recover
no copy of datafile 2 found to recover
no copy of datafile 3 found to recover
no copy of datafile 4 found to recover
no copy of datafile 5 found to recover
Finished recover at 31-MAY-08
Starting backup at 31-MAY-08
current log archived
channel disk1: starting archived log backup set
channel disk1: specifying archived log(s) in backup set
input archived log thread=1 sequence=21 RECID=134 STAMP=656184927
channel disk1: starting piece 1 at 31-MAY-08
channel disk2: starting archived log backup set
channel disk2: specifying archived log(s) in backup set
input archived log thread=1 sequence=22 RECID=136 STAMP=656185140
input archived log thread=1 sequence=23 RECID=139 STAMP=656185958
channel disk2: starting piece 1 at 31-MAY-08
channel disk1: finished piece 1 at 31-MAY-08
piece handle=/oradisk/backup/3pjhp6j8_1_1 tag=TAG20080531T175239 comment=NONE
channel disk1: backup set complete, elapsed time: 00:00:04
channel disk2: finished piece 1 at 31-MAY-08
piece handle=/oradisk/backup/3qjhp6jc_1_1 tag=TAG20080531T175239 comment=NONE
channel disk2: backup set complete, elapsed time: 00:00:01
Finished backup at 31-MAY-08

Starting backup at 31-MAY-08
no parent backup or copy of datafile 2 found
no parent backup or copy of datafile 1 found
no parent backup or copy of datafile 3 found
no parent backup or copy of datafile 5 found
no parent backup or copy of datafile 4 found
channel disk1: starting datafile copy
input datafile file number=00002
name=+DATADG/redpanda/datafile/sysaux.267.654614821

channel disk2: starting datafile copy
input datafile file number=00001
name=+DATADG/redpanda/datafile/system.268.654614821
output file name=/oradisk/backup/data_D-REDPANDA_I-3603176431_TS-SYSTEM_FNO-1_3sjhp6jm tag=INCREMENTAL_DAILY_UPDATED RECID=28 STAMP=656186125
channel disk2: datafile copy complete, elapsed time: 00:02:36

channel disk2: starting datafile copy
input datafile file number=00003
name=+DATADG/redpanda/datafile/undotbs1.269.654614823
output file name=/oradisk/backup/data_D-REDPANDA_I-3603176431_TS-SYSAUX_FNO-2_3rjhp6ji tag=INCREMENTAL_DAILY_UPDATED RECID=29 STAMP=656186152
channel disk1: datafile copy complete, elapsed time: 00:03:01

channel disk1: starting datafile copy
input datafile file number=00005 name=+DATADG/redpanda/datafile/dev.276.654704777
output file name=/oradisk/backup/data_D-REDPANDA_I-3603176431_TS-DEV_FNO-5_3ujhp6pc tag=INCREMENTAL_DAILY_UPDATED RECID=30 STAMP=656186186

channel disk1: datafile copy complete, elapsed time: 00:00:36

channel disk1: starting datafile copy

input datafile file number=00004
name=/DATADG/redpanda/datafile/users.270.654614823

output file name=/oradisk/backup/data_D-REDPANDA_I-3603176431_TS-DEV_FNO-5_3ujhp6pc tag=INCREMENTAL_DAILY_UPDATED RECID=30 STAMP=656186186

channel disk1: datafile copy complete, elapsed time: 00:00:36

output file name=/oradisk/backup/data_D-REDPANDA_I-3603176431_TS-USERS_FNO-4_3vjhp6ql tag=INCREMENTAL_DAILY_UPDATED RECID=31 STAMP=656186209

channel disk1: datafile copy complete, elapsed time: 00:00:15

output file name=/oradisk/backup/data_D-REDPANDA_I-3603176431_TS-UNDOTBS1_FNO-3_tjhp6oo tag=INCREMENTAL_DAILY_UPDATED RECID=32 STAMP=656186224

channel disk2: datafile copy complete, elapsed time: 00:01:27

Finished backup at 31-MAY-08

Starting backup at 31-MAY-08

current log archived

channel disk1: starting archived log backup set
channel disk1: specifying archived log(s) in backup set

input archived log thread=1 sequence=24 RECID=141 STAMP=656186228

channel disk1: starting piece 1 at 31-MAY-08

channel disk1: finished piece 1 at 31-MAY-08

piece handle=/oradisk/backup/40jhp6rm_1_1 tag=TAG20080531T175709 comment=NONE

channel disk1: backup set complete, elapsed time: 00:00:01

Finished backup at 31-MAY-08

Starting Control File and SPFILE Autobackup at 31-MAY-08

piece handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080531-05 comment=NONE

Finished Control File and SPFILE Autobackup at 31-MAY-08

released channel: disk1

released channel: disk2

RMAN>
Recovery Manager complete.
This script is similar to the previous one, the difference is that instead of applying each day the previous day incremental backup, it will wait for a week before starting to apply the incremental pieces.

When executed the first time it will look for a backup with tag 'INCREMENTAL_FAST_RECOVER' that does not exist yet, so it creates it.
From the second and until the seventh time it will create an incremental backup level 1 to be used to recover the backup with tag 'INCREMENTAL_FAST_RECOVER'.
From the eighth time on, the script will recover the backup tagged 'INCREMENTAL_FAST_RECOVER' using the incremental produced a week ago.

#!/usr/bin/tcsh
source ./set-environment
echo Executing Command : INCREMENTAL SEVEN DAY BACKUP
echo
rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb log=scr.log <<eof
RUN
{
    RECOVER COPY OF DATABASE
    WITH TAG 'INCREMENTAL_FAST_RECOVER'
    UNTIL TIME 'SYSDATE - 7';
    BACKUP
    INCREMENTAL LEVEL 1
    FOR RECOVER OF COPY WITH TAG 'INCREMENTAL_FAST_RECOVER'
    DATABASE;
}
eof
Script Output:

avargas-pc:~/scripts/BACKUP> ./8-incremental-for-quick-recover

Executing Command : INCREMENTAL SEVEN DAY BACKUP

Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 18:01:41 2008

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connected to target database: REDPANDA (DBID=3603176431)

connected to recovery catalog database

RMAN> 2> 3> 4> 5> 6> 7> 8> 9> 10>

Starting recover at 31-MAY-08

allocated channel: ORA_DISK_1

channel ORA_DISK_1: SID=104 device type=DISK

no copy of datafile 1 found to recover

no copy of datafile 2 found to recover
no copy of datafile 3 found to recover
no copy of datafile 4 found to recover
no copy of datafile 5 found to recover
Finished recover at 31-MAY-08

Starting backup at 31-MAY-08
using channel ORA_DISK_1
no parent backup or copy of datafile 2 found
no parent backup or copy of datafile 1 found
no parent backup or copy of datafile 3 found
no parent backup or copy of datafile 5 found
no parent backup or copy of datafile 4 found
channel ORA_DISK_1: starting datafile copy
input datafile file number=00002
name=+DATADG/redpanda/datafile/sysaux.267.654614821
RMAN Hands On

output file name=+/FRADG/redpanda/datafile/sysaux.289.656186511
tag=INCREMENTAL_FAST_RECOVER RECID=33 STAMP=656186675

channel ORA_DISK_1: datafile copy complete, elapsed time: 00:02:56

channel ORA_DISK_1: starting datafile copy

input datafile file number=00001
name=+/DATADG/redpanda/datafile/system.268.654614821

output file name=+/FRADG/redpanda/datafile/system.280.656186693
tag=INCREMENTAL_FAST_RECOVER RECID=34 STAMP=656186852

channel ORA_DISK_1: datafile copy complete, elapsed time: 00:02:46

channel ORA_DISK_1: starting datafile copy

input datafile file number=00003
name=+/DATADG/redpanda/datafile/undotbs1.269.654614823

output file name=+/FRADG/redpanda/datafile/undotbs1.264.656186867
tag=INCREMENTAL_FAST_RECOVER RECID=35 STAMP=656186981

channel ORA_DISK_1: datafile copy complete, elapsed time: 00:02:07

channel ORA_DISK_1: starting datafile copy

input datafile file number=00005 name=+/DATADG/redpanda/datafile/dev.276.654704777
output file name=+FRADG/redpanda/datafile/dev.272.656186997
tag=INCREMENTAL_FAST_RECOVER RECID=36 STAMP=656187020

channel ORA_DISK_1: datafile copy complete, elapsed time: 00:00:35

channel ORA_DISK_1: starting datafile copy

input datafile file number=00004
name=+DATADG/redpanda/datafile/users.270.654614823

output file name=+FRADG/redpanda/datafile/users.281.656187035
tag=INCREMENTAL_FAST_RECOVER RECID=37 STAMP=656187036

channel ORA_DISK_1: datafile copy complete, elapsed time: 00:00:04

Finished backup at 31-MAY-08

Starting Control File and SPFILE Autobackup at 31-MAY-08

table handle=/oradisk/oracle/app/product/11.1.0/db_1/dbs/REDPANDA_c-3603176431-20080531-06 comment=NONE

Finished Control File and SPFILE Autobackup at 31-MAY-08

RMAN>
RECOVERY

Restore and recovery are the critical ends of the Backup and Recovery policies, in this chapter we simulate critical failures and we execute the restore and recovery using the backups implemented on the previous chapter.

The following scenarios are implemented:

1-system-tablespace-loss 1b-recover-system-tablespace
2-user-datafile-loss 2b-recover-users-tablespace
3-online-redo-loss 3b-recover-from-redo-loss
4-controlfile-loss 4b-recover-from-controlfile-loss
5-database-loss 5b-recover-from-total-loss
This script generates a crash that removes the system tablespace datafile, in order to be able to remove the datafile a crash of the ASM instance is produced. Once the system tablespace datafile is removed the database is brought up and the error messages

ORA-01157: cannot identify/lock data file 1 - see DBWR trace file
and
ORA-01110: data file 1: '+DATADG/redpanda/datafile/system.268.654614821'

are returned by Oracle.

#!/usr/bin/tcsh
source ./set-environment
echo Generating database crash ...
 echoedef
set v_rmf=`echo 'select file_name from dba_data_files where file_id=1;' | sqlplus -s / as sysdba | grep system`
setenv ORACLE_SID +ASM
sqlplus -s $dbauser/$dbapwd@+ASM as sysdba <<eof
shutdown abort;
eof
sqlplus -s $dbauser/$dbapwd@+ASM as sysdba <<eof
startup
eof
echo
echo Generating system tablespace loss ...
echo
asmcmd lsdg
RMAN Hands On

echo
asmcmd ls +datadg/redpanda/datafile
echo
asmcmd rm -rf $v_rmf
echo
asmcmd lsdg
echo
asmcmd ls +datadg/redpanda/datafile
echo
echo Trying to restart the database after the crash ...
echo
sqlplus -s $dbauser/$dbapwd@$datadb as sysdba <<eof
startup
eof
exit

Script Output:

   avargas-pc:/scripts/RECOVERY> ./1-system-tablespace-loss
Generating database crash ...
ASM instance shutdown
ASM instance started
Total System Global Area  284565504 bytes
Fixed Size  1299428 bytes
Variable Size             258100252 bytes
ASM Cache                  25165824 bytes

ASM diskgroups mounted

Generating system tablespace loss ...

<table>
<thead>
<tr>
<th>State</th>
<th>Type</th>
<th>Rebal</th>
<th>Sector</th>
<th>Block</th>
<th>AU</th>
<th>Total_MB</th>
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<th>Req_mir_free_MB</th>
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</table>

DEV.276.654704777
SYSAUX.267.654614821
SYSTEM.268.654614821
UNDOTBS1.269.654614823
USERS.270.654614823
## RMAN Hands On

```
<table>
<thead>
<tr>
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<td></td>
<td>22904</td>
<td>21518</td>
<td>7896</td>
</tr>
</tbody>
</table>

DEV.276.654704777
SYSAUX.267.654614821
UNDOTBS1.269.654614823
USERS.270.654614823

Trying to restart the database after the crash ...
ORACLE instance started.

Total System Global Area 318046208 bytes

Fixed Size 1299652 bytes

Variable Size 285215548 bytes

Database Buffers 25165824 bytes

Redo Buffers 6365184 bytes
```
Database mounted.

ORA-01157: cannot identify/lock data file 1 - see DBWR trace file

ORA-01110: data file 1: '+DATADG/redpanda/datafile/system.268.654614821'
This script starts the catalog database, that was down as result of the crash on the previous scenario, then mounts the production database, restores and recover datafile 1 and opens the database.

```bash
#!/usr/bin/tcsh
source ./set-environment
echo Restarting RMAN Catalog Database
echo
setenv ORACLE_SID rmancat
sqlplus -s $dbauser/$dbapwd@$rmandb as sysdba<<eof
startup
exit
.eof

echo
echo Executing Command : RESTORE and RECOVER SYSTEM DATAFILE
echo

cat.tar rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb <<eof
startup mount;
restore datafile 1;
recover datafile 1;
alter database open;
eof
sqlplus $dbauser/$dbapwd@$datadb as sysdba <<eof
select file_name from dba_data_files;
exit
.eof
exit
```
**Script Output:**

avargas-pc:~/scripts/RECOVERY> ./1b-recover-system-tablespace

Restarting RMAN Catalog Database

ORACLE instance started.

Total System Global Area  313860096 bytes
Fixed Size                  1299624 bytes
Variable Size             226495320 bytes
Database Buffers           79691776 bytes
Redo Buffers                6373376 bytes
Database mounted.

Database opened.

Executing Command : RESTORE and RECOVER SYSTEM DATAFILE

Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 18:35:18 2008
Copyright (c) 1982, 2007, Oracle.  All rights reserved.

connected to target database: REDPANDA (DBID=3603176431, not open)

connected to recovery catalog database

RMAN>

starting full resync of recovery catalog
RMAN Hands On

full resync complete
database is already started

RMAN>
Starting restore at 31-MAY-08
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=170 device type=DISK

channel ORA_DISK_1: restoring datafile 00001
input datafile copy RECID=34 STAMP=656186852 file
ame=+FRADG/redpanda/datafile/system.280.656186693
destination for restore of datafile 00001:
+DATADG/redpanda/datafile/system.268.654614821
channel ORA_DISK_1: copied datafile copy of datafile 00001
output file name=+DATADG/redpanda/datafile/system.268.656188537 RECID=0 STAMP=0
Finished restore at 31-MAY-08
starting full resync of recovery catalog
full resync complete

RMAN>
Starting recover at 31-MAY-08
using channel ORA_DISK_1

starting media recovery
media recovery complete, elapsed time: 00:00:16

Finished recover at 31-MAY-08

RMAN>
database opened
RMAN Hands On

RMAN>

Recovery Manager complete.

SQL>Plus: Release 11.1.0.6.0 - Production on Sat May 31 18:37:55 2008

Copyright (c) 1982, 2007, Oracle. All rights reserved.

Connected to:
Oracle Database 11g Enterprise Edition Release 11.1.0.6.0 - Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options

SQL>
FILE_NAME
---------------------------------------------
+DATADG/redpanda/datafile/system.268.656188537
+DATADG/redpanda/datafile/sysaux.267.654614821
+DATADG/redpanda/datafile/undotbs1.269.654614823
+DATADG/redpanda/datafile/users.270.654614823
+DATADG/redpanda/datafile/dev.276.654704777

SQL> Disconnected from Oracle Database 11g Enterprise Edition Release 11.1.0.6.0
- Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options
2-user-datafile-loss

This script creates a `apps.customers` table on tablespace `users`, then the datafile is removed and the reference table is accessed. The following errors are then returned:

```sql
select username from apps.customers
  *
ERROR at line 1:
ORA-00376: file 4 cannot be read at this time
ORA-01110: data file 4: '+DATADG/redpanda/datafile/users.270.654614823'
```

```bash
#!/usr/bin/tcsh
source ./set-environment
setenv ORACLE_SID redpanda
clear
echo
echo Preparing User Application ...
echo
echo sqlplus -s $dbuser/$dbapwd@$datadb as sysdba <<eof
drop user apps cascade;
create user apps identified by apps default tablespace users temporary tablespace temp;
grant dba to apps;
connect apps/apps@$datadb
create table customers as select * from dba_users;
update customers set username='CUSTOMER_'||USERNAME;
commit;
exit
eof
eof
```
echo
echo Generating user datafile remove ...

set v_rmf=`echo "select file_name from dba_data_files where tablespace_name='USERS';" | sqlplus -s / as sysdba | grep users`

echo
echo Setting tablespace users offline ...

sqlplus -s $dbauser/$dbapwd@$datadb as sysdba <<eof
alter tablespace users offline;


EOF

echo
echo Removing tablespace users datafile ...

setenv ORACLE_SID +ASM
asmcmd lsdg

asmcmd ls +datadg/redpanda/datafile

asmcmd rm -rf $v_rmf

asmcmd ls +datadg/redpanda/datafile

asmcmd lsdg

echo

echo Checking application ...

echo
RMAN Hands On

sqlplus -s $dbuser/$dbapwd@$datadb as sysdba <<eof
select username from apps.customers;
exiteof

Script Output:

avargas-pc:~/scripts/RECOVERY> ./2-user-datafile-loss
Preparing User Application ...
drop user apps cascade
  *
ERROR at line 1:
ORA-01918: user 'APPS' does not exist
User created.
Grant succeeded.
Table created.
31 rows updated.
Commit complete.
USERNAME
----------------------------------
CUSTOMER_APPS
CUSTOMER_SYSMAN
... (more data)
CUSTOMER_OWBSYS
CUSTOMER_WKSYS

31 rows selected.

Generating user datafile remove ...

Setting tablespace users offline ...

Tablespace altered.

Removing tablespace users datafile ...

<table>
<thead>
<tr>
<th>State</th>
<th>Type</th>
<th>Rebal</th>
<th>Sector</th>
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<tr>
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</tr>
</tbody>
</table>

DEV.276.654704777
SYSAUX.267.654614821
SYSTEM.268.656188537
UNDOTBS1.269.654614823

**<<<< to be removed**

DEV.276.654704777
SYSAUX.267.654614821
SYSTEM.268.656188537
UNDOTBS1.269.654614823

<table>
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<tr>
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<th>AU</th>
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<td>NRDATADG/</td>
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<tr>
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<td>7896</td>
<td>0</td>
<td>0</td>
<td>NRFRADDG/</td>
</tr>
</tbody>
</table>

Checking application ...
select username from apps.customers

*  

ERROR at line 1:
ORA-00376: file 4 cannot be read at this time
ORA-01110: data file 4: '+DATADG/redpanda/datafile/users.270.654614823'
This script restores the missing datafile of the tablespace users. In this case, the database did not crash when the datafile was removed, so the restore and recover can be done online.

```bash
#!/usr/bin/tcsh
source ./set-environment
echo Restoring and Recovering Tablespace Users ...
echo
rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb <<eof
restore datafile 4;
recover datafile 4;
sql 'alter tablespace users online' ;
eof
echo
echo Checking application ...
echo
sqlplus -s $dbauser/$dbapwd@$datadb as sysdba <<eof
select username from apps.customers;
exit
eof
eof
exit
```

**Script Output:**

```
avargas-pc:~/scripts/RECOVERY> ./2b-recover-users-tablespace
Restoring and Recovering Tablespace Users ...
```
RMAN Hands On

Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 18:51:54 2008
Copyright (c) 1982, 2007, Oracle. All rights reserved.

connected to target database: REDPANDA (DBID=3603176431)
connected to recovery catalog database

RMAN>

Starting restore at 31-MAY-08
starting full resync of recovery catalog
full resync complete
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=114 device type=DISK
channel ORA_DISK_1: restoring datafile 00004
input datafile copy RECID=37 STAMP=656187036 file name=+FRADG/redpanda/datafile/users.281.656187035
destination for restore of datafile 00004:
+DATADG/redpanda/datafile/users.270.654614823
channel ORA_DISK_1: copied datafile copy of datafile 00004
output file name=+DATADG/redpanda/datafile/users.270.656189521 RECID=0 STAMP=0

Finished restore at 31-MAY-08

starting full resync of recovery catalog

full resync complete

RMAN>

Starting recover at 31-MAY-08

using channel ORA_DISK_1

starting media recovery

media recovery complete, elapsed time: 00:00:09

Finished recover at 31-MAY-08

RMAN>
sql statement: alter tablespace users online
starting full resync of recovery catalog
full resync complete

RMAN>

Recovery Manager complete.

Checking application ...

USERNAME
------------------------
CUSTOMER_APPS
CUSTOMER_SYSMAN
CUSTOMER_DBSNMP
CUSTOMER_SYSTEM
CUSTOMER_SYS
CUSTOMER_MGMT_VIEW
CUSTOMER_SPATIAL_WFS_ADMIN_USR
CUSTOMER_SPATIAL_CSW_ADMIN_USR
CUSTOMER_APEX_PUBLIC_USER
CUSTOMER_DIP
CUSTOMER_MDDATA
CUSTOMER_XS$NULL
CUSTOMER_TSMSYS
CUSTOMER_ORACLE_OCM
CUSTOMER_OLAPSYS
CUSTOMER_SI_INFOMTN_SCHEMA
CUSTOMER_OWBSYS
CUSTOMER_FLOWS_030000
CUSTOMER_ORDPLUGINS
CUSTOMER_WKPROXY
CUSTOMER_XDB
CUSTOMER_ANONYMOUS
CUSTOMER_CTXSYS
CUSTOMER_WK_TEST
CUSTOMER_WMSYS
CUSTOMER_EXFSYS
CUSTOMER_ORDSYS
CUSTOMER_MDSYS
CUSTOMER_FLOWS_FILES
CUSTOMER_OUTLN
CUSTOMER_WKSYS

31 rows selected.
This script simulates a database crash that lead to a missing online redo log, when the database is restarted the following errors are displayed:

ORA-00313: open failed for members of log group 1 of thread 1
ORA-00312: online log 1 thread 1:
'+DATADG/redpanda/onlinelog/group_1.271.654616725'
ORA-00312: online log 1 thread 1:
'+FRADG/redpanda/onlinelog/group_1.285.654616725'

```bash
#!/usr/bin/tcsh
source ./set-environment
echo Generating database crash ...
echo

set v_logf=v\$logfile
set v_logs=v\$log
set v_logh=v\$log_history

sqlplus -s $dbauser/$dbapwd@$datadb as sysdba <<eof
set pages 50000 lines 120 echo off head off veri off flush off ti off
spool rmonlnlog.sh
select 'asmcmd rm ''|member||'' from $v_logf where group#=1;
spool off
set echo on head on veri on
set pages 50000 lines 120
eof
```
spool redolog_miss_status-before_crash.log
archive log list;
select SEQUENCE# from $v_logh where FIRST_TIME=(select max(FIRST_TIME) from $v_logh);
select * from $v_logs;
spool off
SHUTDOWN ABORT;
eof

sqlplus -s $dbauser/$dbapwd@$rmandb as sysdba <<eof
SHUTDOWN ABORT;
eof

echo
echo Removing online redo log group ...
echo
setenv ORACLE_SID +ASM

sqlplus -s sys/oracle as sysdba <<eof
SHUTDOWN ABORT;
STARTUP;
eof

chmod 700 ./rmonlnlog.sh
./rmonlnlog.sh
rm ./rmonlnlog.sh

echo
echo Starting databases after the crash ...
echo
Script Output:

```
avargas-pc:/scripts/RECOVERY> ./3-online-redo-loss
Generating database crash ...
asmcmd rm +DATADG/redpanda/onlinelog/group_1.271.654616725
asmcmd rm +FRADG/redpanda/onlinelog/group_1.285.654616725
```

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

SEQUENCE#  
----------
    26
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<th>THREAD#</th>
<th>SEQUENCE#</th>
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<th>MEMBERS</th>
<th>ARC</th>
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<td>YES</td>
<td>INACTIVE</td>
</tr>
<tr>
<td>1342671</td>
<td>31-MAY-08</td>
<td>1351977</td>
<td>31-MAY-08</td>
<td>2</td>
<td>YES</td>
<td>INACTIVE</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>26</td>
<td>52428800</td>
<td>2</td>
<td>YES</td>
<td>INACTIVE</td>
</tr>
<tr>
<td>1373684</td>
<td>31-MAY-08</td>
<td>1373684</td>
<td>31-MAY-08</td>
<td>2</td>
<td>NO</td>
<td>CURRENT</td>
</tr>
</tbody>
</table>

ORACLE instance shut down.
ORACLE instance shut down.

Removing online redo log group ...

ASM instance shutdown
ASM instance started

Total System Global Area  284565504 bytes
Fixed Size 1299428 bytes
Variable Size 258100252 bytes
ASM Cache 25165824 bytes
ASM diskgroups mounted

Starting databases after the crash ...
ORACLE instance started.

Total System Global Area  313860096 bytes
Fixed Size                  1299624 bytes
Variable Size             243272536 bytes
Database Buffers           62914560 bytes
Redo Buffers                6373376 bytes
Database mounted.

Database opened.
ORACLE instance started.

Total System Global Area  318046208 bytes
Fixed Size                  1299652 bytes
Variable Size             281021244 bytes
Database Buffers           29360128 bytes
Redo Buffers                6365184 bytes
Database mounted.

ORA-00313: open failed for members of log group 1 of thread 1
ORA-00312: online log 1 thread 1:
  '+DATADG/redpanda/onlinelog/group_1.271.654616725'
ORA-00312: online log 1 thread 1:
  '+FRADG/redpanda/onlinelog/group_1.285.654616725'
This script performs the recovery of the database on the online redolog miss scenario. When a redolog is missing a full database restore must be done.

The script request the sequence # to recover using the until sequence clause. This sequence can be obtained from the database alert.log

```
#!/usr/bin/tcsh
source ./set-environment
set v_logf=v\$logfile
set v_log=v\$log
echo Executing Full Database Restore ...
echo
echo Please check the last archived sequence of the database.
echo please enter sequence number to restore to ...
set v_seq = $<
echo

rman TARGET $dbuser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb <<eof
STARTUP MOUNT;
RESTORE DATABASE;
RECOVER DATABASE UNTIL SEQUENCE $v_seq THREAD 1;
ALTER DATABASE OPEN RESETLOGS;
eof

echo Checking Database after online redolog loss and database restore and recover
echo```
sqlplus $dbuser/$dbapwd@$datadb <<eof

set pages 50000 lines 200
col member for a55

select * from $v_log;
select member from $v_logf;
exit
eof

Script Output:

avargas-pc:/scripts/RECOVERY> ./3b-recover-from-redo-loss

Executing Full Database Restore ...

Please check the last archived sequence of the database.
please enter sequence number to restore to ...
26

Recovery Manager: Release 11.1.0.6.0 - Production on Sat May 31 19:16:40 2008
Copyright (c) 1982, 2007, Oracle. All rights reserved.
connected to target database: REDPANDA (DBID=3603176431, not open)
connected to recovery catalog database

RMAN>
database is already started
RMAN Hands On

RMAN>
Starting restore at 31-MAY-08
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=145 device type=DISK
channel ORA_DISK_1: restoring datafile 00001

input datafile copy RECID=34 STAMP=656186852 file
name=+FRADG/redpanda/datafile/system.280.656186693
destination for restore of datafile 00001:
+DATADG/redpanda/datafile/system.268.656188537

channel ORA_DISK_1: copied datafile copy of datafile 00001

output file name=+DATADG/redpanda/datafile/system.268.656188537 RECID=0 STAMP=0
channel ORA_DISK_1: restoring datafile 00002

input datafile copy RECID=33 STAMP=656186675 file
name=+FRADG/redpanda/datafile/sysaux.289.656186511
destination for restore of datafile 00002:
+DATADG/redpanda/datafile/sysaux.267.654614821

channel ORA_DISK_1: copied datafile copy of datafile 00002

output file name=+DATADG/redpanda/datafile/sysaux.267.654614821 RECID=0 STAMP=0
channel ORA_DISK_1: restoring datafile 00003
input datafile copy RECID=35 STAMP=656186981 file
name=+FRADG/redpanda/datafile/undotbs1.264.656186867
destination for restore of datafile 00003:
+DATADG/redpanda/datafile/undotbs1.269.654614823
cchannel ORA_DISK_1: copied datafile copy of datafile 00003
output file name=+DATADG/redpanda/datafile/undotbs1.269.654614823 RECID=0 STAMP=0
cchannel ORA_DISK_1: restoring datafile 00004
input datafile copy RECID=37 STAMP=656187036 file
name=+FRADG/redpanda/datafile/users.281.656187035
destination for restore of datafile 00004:
+DATADG/redpanda/datafile/users.270.656189521
cchannel ORA_DISK_1: copied datafile copy of datafile 00004
output file name=+DATADG/redpanda/datafile/users.270.656189521 RECID=0 STAMP=0
cchannel ORA_DISK_1: restoring datafile 00005
input datafile copy RECID=36 STAMP=656187020 file
name=+FRADG/redpanda/datafile/dev.272.656186997
destination for restore of datafile 00005:
+DATADG/redpanda/datafile/dev.276.654704777
channel ORA_DISK_1: copied datafile copy of datafile 00005
output file name=+DATADG/redpanda/datafile/dev.276.654704777 RECID=0 STAMP=0
Finished restore at 31-MAY-08

RMAN>
Starting recover at 31-MAY-08
using channel ORA_DISK_1

starting media recovery

archived log for thread 1 with sequence 25 is already on disk as file
+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_25.287.656187249

archived log file
name=+FRADG/redpanda/archivelog/2008_05_31/thread_1_seq_25.287.656187249 thread=1
sequence=25

media recovery complete, elapsed time: 00:00:18
Finished recover at 31-MAY-08
RMAN Hands On

RMAN>
database opened
new incarnation of database registered in recovery catalog
RPC call appears to have failed to start on channel default
RPC call OK on channel default
starting full resync of recovery catalog
full resync complete

RMAN>

Recovery Manager complete.

Checking Database after online redolog loss and database restore and recover

<table>
<thead>
<tr>
<th>GROUP#</th>
<th>THREAD#</th>
<th>SEQUENCE#</th>
<th>BYTES</th>
<th>MEMBERS</th>
<th>ARC STATUS</th>
<th>FIRST_CHANGE#</th>
<th>FIRST_TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GROUP#</td>
<td>STATUS</td>
<td>TYPE</td>
<td>MEMBER</td>
<td>IS_</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ONLINE</td>
<td>+DATADG/redpanda/onlinelog/group_1.271.656191261</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ONLINE</td>
<td>+FRADG/redpanda/onlinelog/group_1.290.656191263</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>ONLINE</td>
<td>+DATADG/redpanda/onlinelog/group_2.272.656191267</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>ONLINE</td>
<td>+FRADG/redpanda/onlinelog/group_2.262.656191269</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ONLINE</td>
<td>+DATADG/redpanda/onlinelog/group_3.274.656191271</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ONLINE</td>
<td>+FRADG/redpanda/onlinelog/group_3.263.656191273</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4-controlfile-loss

This script simulates a database crash that lead to a missing controlfile, when the database is restarted the following error is displayed:

ORA-00205: error in identifying control file, check alert log for more info

#!/usr/bin/tcsh
source ./set-environment
echo Generating database crash ...
set v_ctf=v\$controlfile
sqlplus -s $dbauser/$dbapwd@$datadb as sysdba <<eof
set pages 50000 lines 120 echo off head off veri off flush off ti off
spool rmctlfl.sh
select 'asmcmd rm '||name||'' from $v_ctf
spool off
SHUTDOWN ABORT
eof

sqlplus -s $dbauser/$dbapwd@$rmandb as sysdba <<eof
SHUTDOWN ABORT
eof

echo Checking databases up ...
ps -efa | grep smon | grep -v grep
echo
echo Removing controlfiles ...
echo
setenv ORACLE_SID +ASM
RMAN Hands On

```sql
sqlplus -s / as sysdba <<eof
SHUTDOWN ABORT
STARTUP
eof

chmod 700 ./rmctlfl.sh
./rmctlfl.sh
rm rmctlfl.sh

echo
echo Starting databases after the crash ...
echo
sqlplus -s $dbauser/$dbapwd@$rmandb as sysdba <<eof
STARTUP
eof

sqlplus -s $dbauser/$dbapwd@$datadb as sysdba <<eof
STARTUP
eof
```

**Script Output:**

```
avargas-pc:~/scripts/RECOVERY> ./4-controlfile-loss
Generating database crash ...
asmcmd rm +DATADG/redpanda/controlfile/current.266.654614799
asmcmd rm +FRADG/redpanda/controlfile/current.260.654392655

ORACLE instance shut down.
ORACLE instance shut down.
Checking databases up ...
oracle 483 1 0 18:58 ? 00:00:00 asm_smon_+ASM
Removing controlfiles ...
```
ASM instance shutdown
ASM instance started

Total System Global Area  284565504 bytes
Fixed Size                  1299428 bytes
Variable Size             258100252 bytes
ASM Cache                  25165824 bytes
ASM diskgroups mounted

Starting databases after the crash ...

ORACLE instance started.
Total System Global Area  313860096 bytes
Fixed Size                  1299624 bytes
Variable Size             243272536 bytes
Database Buffers           62914560 bytes
Redo Buffers                6373376 bytes
Database mounted.
Database opened.
ORACLE instance started.

Total System Global Area  318046208 bytes
Fixed Size                  1299652 bytes
Variable Size             289409852 bytes
Database Buffers           20971520 bytes
Redo Buffers                6365184 bytes

ORA-00205: error in identifying control file, check alert log for more info
This script restores the missing controlfile from an autobackup, then mounts and recovers the database. After a controlfile restore, the database must be opened using the resetlogs option.

```
#!/usr/bin/tcsh
source ./set-environment
echo Executing Controlfile Restore
echo
echo Please check the DBID from any backup file, i.e.:
echo
in this controlfile backup dbid=3603176431
echo
echo cf_D-REDPANDA_id-3603176431_b0jg00fq
echo ------------------^^^^^^^^^^^^^^^^
echo
echo please enter DBID number of the database to restore the controlfile
set v_dbid = $<
echo

rman TARGET $dbuser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb <<eof
SET DBID $v_dbid;
STARTUP NOMOUNT;
RESTORE CONTROLFILE FROM AUTOBACKUP;
ALTER DATABASE MOUNT;
RECOVER DATABASE;
ALTER DATABASE OPEN RESETLOGS;
eof

set v_ctlf=v\$controlfile
echo Checking Database after controlfile loss and restore
```
RMAN Hands On

echo

sqlplus $dbuser/$dbapwd@$datadb as sysdba<<eof
set pages 50000 lines 120
select name from $v_ctlf
;
exit
eof

**Script Output:**

  avargas-pc:~/scripts/RECOVERY> ./4b-recover-from-controlfile-loss

  Executing Controlfile Restore

  Please check the DBID from any backup file, i.e.:

  in this controlfile backup dbid=3603176431

  cf_D-REDPANDA_id-3603176431_0bjg00fq
  ------------------------

  please enter DBID number of the database to restore the controlfile

  3603176431


  Copyright (c) 1982, 2007, Oracle. All rights reserved.

  connected to target database: REDPANDA (not mounted)

  connected to recovery catalog database
RMAN Hands On

RMAN>
executing command: SET DBID
database name is "REDPANDA" and DBID is 3603176431

RMAN>
database is already started

RMAN>
Starting restore at 31-MAY-08
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=157 device type=DISK

recovery area destination: +FRADG
database name (or database unique name) used for search: REDPANDA
channel ORA_DISK_1: no AUTOBACKUPS found in the recovery area
channel ORA_DISK_1: looking for AUTOBACKUP on day: 20080531
channel ORA_DISK_1: AUTOBACKUP found: REDPANDA_c-3603176431-20080531-09
channel ORA_DISK_1: restoring control file from AUTOBACKUP REDPANDA_c-3603176431-20080531-09
channel ORA_DISK_1: control file restore from AUTOBACKUP complete
output file name=+DATADG/redpanda/controlfile/current.266.656198431
output file name=+FRADG/redpanda/controlfile/current.260.656198431
Finished restore at 31-MAY-08

RMAN>
database mounted
released channel: ORA_DISK_1

RMAN>
Starting recover at 31-MAY-08
Starting implicit crosscheck backup at 31-MAY-08
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=157 device type=DISK
Crosschecked 40 objects
Finished implicit crosscheck backup at 31-MAY-08

Starting implicit crosscheck copy at 31-MAY-08
using channel ORA_DISK_1
Crosschecked 29 objects
Finished implicit crosscheck copy at 31-MAY-08

searching for all files in the recovery area
cataloging files...
no files cataloged

using channel ORA_DISK_1

starting media recovery
archived log for thread 1 with sequence 1 is already on disk as file +DATADG/redpanda/onlinelog/group_1.271.656191261

archived log file name=+DATADG/redpanda/onlinelog/group_1.271.656191261 thread=1 sequence=1

media recovery complete, elapsed time: 00:00:16

Finished recover at 31-MAY-08

RMAN>
database opened

new incarnation of database registered in recovery catalog

RPC call appears to have failed to start on channel default

RPC call OK on channel default

starting full resync of recovery catalog

full resync complete

RMAN>

Recovery Manager complete.
Checking Database after controlfile loss and restore

SQL*Plus: Release 11.1.0.6.0 - Production on Sat May 31 21:24:01 2008

Copyright (c) 1982, 2007, Oracle. All rights reserved.

Checking Database after controlfile loss and restore

SQL*Plus: Release 11.1.0.6.0 - Production on Sat May 31 21:26:24 2008
Copyright (c) 1982, 2007, Oracle. All rights reserved.

Connected to:
Oracle Database 11g Enterprise Edition Release 11.1.0.6.0 - Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options

SQL> SQL>
NAME
+DATADG/redpanda/controlfile/current.266.656198431
+FRADG/redpanda/controlfile/current.260.656198431
This script simulates a crash that lead to the complete loss of the database, the whole database directory is wiped off the ASM diskgroup DATADG, all online logs, controlfiles, spfile and datafiles are lost.

When trying to open the database the following errors are returned:

ORA-01078: failure in processing system parameters
ORA-01565: error in identifying file '+DATADG/redpanda/spfileredpanda.ora'
ORA-17503: ksdopn:2 Failed to open file +DATADG/redpanda/spfileredpanda.ora
ORA-15056: additional error message
ORA-17503: ksdopn:DGOpenFile05 Failed to open file +DATADG/redpanda/spfileredpanda.ora
ORA-17503: ksdopn:2 Failed to open file +DATADG/redpanda/spfileredpanda.ora
ORA-15173: entry 'redpanda' does not exist in directory '/'
ORA-06512: at line 4

#!/usr/bin/tcsh
source ./set-environment
echo Generating database crash ...
echo
set v_par=v\$parameter
set v_dba=v\$database
set v_logs=v\$log
set v_logh=v\$log_history
sqlplus -s $dbuser/$dbapwd@$datadb as sysdba <<eof
set echo on head on version pages 50000 lines 120
spool redolog_miss_status-before_crash.log
archive log list;
select SEQUENCE# from $v_logh where FIRST_TIME=(select max(FIRST_TIME) from $v_logh);
select * from $v_logs;

}
spool off
set pages 50000 lines 120 echo off head off veri off flush off ti off
spool rmdbs.sh
select 'asmcmd rm -rf '||a.value||'/'||b.name
from $v_par a, $v_dba b
where a.name='db_create_file_dest';
spool off
SHUTDOWN ABORT
eof

sqlplus -s $dbauser/$dbapwd@$rmandb as sysdba <<eof
SHUTDOWN ABORT
eof
echo
echo Preparing to crash and burn database ... 
echo
setenv ORACLE_SID +ASM
sqlplus -s / as sysdba <<eof
SHUTDOWN ABORT
STARTUP
eof
chmod 700 ./rmdbs.sh
./rmdbs.sh
rm rmdbs.sh
echo
echo Starting databases after the crash ... 
echo
sqlplus -s $dbauser/$dbapwd@$rmandb as sysdba <<eof
STARTUP
eof
sqlplus -s $dbauser/$dbapwd@$datadb as sysdba <<eof
STARTUP
eof

echo
echo Evaluating damage ...
echo
echo Listing directories on ASM Data diskgroup
echo
asmcmd ls +datadg
echo
echo Listing directories on ASM Flash Recovery Area diskgroup
echo
asmcmd ls +fradg
echo

**Script Output:**

```
avargas-pc:~/scripts/RECOVERY> ./5-database-loss
Generating database crash ...
Database log mode              Archive Mode
  Automatic archival             Enabled
  Archive destination            USE_DB_RECOVERY_FILE_DEST
  Oldest online log sequence     1
  Next log sequence to archive   3
  Current log sequence           3
```
RMAN Hands On

<table>
<thead>
<tr>
<th>GROUP#</th>
<th>THREAD#</th>
<th>SEQUENCE#</th>
<th>BYTES</th>
<th>MEMBERS</th>
<th>ARC STATUS</th>
<th>FIRST_CHANGE#</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>52428800</td>
<td>2</td>
<td>YES INACTIVE</td>
<td>1409399 31-MAY-08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>52428800</td>
<td>2</td>
<td>YES ACTIVE</td>
<td>1410694 31-MAY-08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>52428800</td>
<td>2</td>
<td>NO CURRENT</td>
<td>1410918 31-MAY-08</td>
</tr>
</tbody>
</table>

asmcmd rm -rf +DATADG/REDPANDA

ORACLE instance shut down.
ORACLE instance shut down.

Preparing to crash and burn database ...
ASM instance shutdown
ASM instance started

Total System Global Area  284565504 bytes
Fixed Size                 1299428 bytes
Variable Size              258100252 bytes
ASM Cache                  25165824 bytes
ASM diskgroups mounted
Starting databases after the crash ...

ORACLE instance started.

Total System Global Area  313860096 bytes
Fixed Size                  1299624 bytes
Variable Size             243272536 bytes
Database Buffers           62914560 bytes
Redo Buffers                6373376 bytes
Database mounted.
Database opened.

ORA-01078: failure in processing system parameters
ORA-01565: error in identifying file '+DATADG/redpanda/spfileredpanda.ora'
ORA-17503: ksfdopn:2 Failed to open file +DATADG/redpanda/spfileredpanda.ora
ORA-15056: additional error message
ORA-17503: ksfdopn:DGOpenFile05 Failed to open file +DATADG/redpanda/spfileredpanda.ora
ORA-17503: ksfdopn:2 Failed to open file +DATADG/redpanda/spfileredpanda.ora
ORA-15173: entry 'redpanda' does not exist in directory '/'
ORA-06512: at line 4

Evaluating damage ...

Listing directories on ASM Data diskgroup
RMANCAT/

Listing directories on ASM Flash Recovery Area diskgroup
NRDB/
REDPANDA/
RMANCAT/
This script executes the restore after a total database loss.

In first term it creates the missing database directory on the ASM diskgroup DATADG, this is necessary to be able to restore the spfile and controlfile on the first stages of the restore procedure.

The instance is initially started by rman with dummy parameters, once the spfile is restored the instance is restarted nomount using the spfile.

Once the controlfile is successfully restored from autobackup the database can be restored, recovered and open with the restlogs option.

```
#!/usr/bin/tcsh
source ./set-environment
echo Executing Controlfile Restore
echo Please check the DBID from any backup file, i.e.:
echo
```

```
echo in this controlfile backup dbid=3603176431
echo cf_D-REDPANDA_id-3603176431_0bjg00fq
echo -----------------^^^^^^^^^^---------
```

```
echo Please enter DBID number of the database to restore the controlfile
set v_dbid = $<
```

```
echo Please check the last archived sequence of the database.
echo please enter sequence number to restore to ...
```
set v_seq = $<
echo
echo Rebuilding Database Directory on Data Diskgroup
echo
setenv ORACLE_SID +ASM
asmcmd mkdir +DATADG/REDPANDA
asmcmd ls +DATADG
echo
echo Executing Rman Restore and Recovery Steps
echo

rman TARGET $dbauser/$dbapwd@$datadb CATALOG $rmanuser/$rmanpwd@$rmandb <<eof
SET DBID $v_dbid;
STARTUP NOMOUNT;
RESTORE SPFILE FROM AUTOBACKUP;
STARTUP FORCE NOMOUNT;
RESTORE CONTROLFILE FROM AUTOBACKUP;
ALTER DATABASE MOUNT;
run {
  set until sequence $v_seq thread 1;
  restore database;
  recover database;
}
ALTER DATABASE OPEN RESETLOGS;
eof
set v_log=v\$log
set v_logf=v\$logfile
set v_dbs=v\$database
echo Checking Database after total database loss, restore and recover
echo
sqlplus $dbauser/$dbapwd@$datadb as sysdba <<eof
set pages 50000 lines 120
select * from $v_log;
select member from $v_logf;
select name from $v_dbs;
exit
eof

**Script Output:**

avargas-pc:/~/scripts/RECOVERY> ./5b-recover-from-total-loss

Executing Controlfile Restore
Please check the DBID from any backup file, i.e.:
in this controlfile backup dbid=3603176431

cf_D-REDPANDA_id-3603176431_0bjg00fq
-----------------^^^^^^^^^^---------

please enter DBID number of the database to restore the controlfile
3603176431

Please check the last archived sequence of the database.

please enter sequence number to restore to ...
3

Rebuilding Database Directory on Data Diskgroup

REDPANDA/
RMANCAT/

Executing Rman Restore and Recovery Steps

connected to target database (not started)
connected to recovery catalog database

RMAN>
executing command: SET DBID
database name is "REDPANDA" and DBID is 3603176431

RMAN>
startup failed: ORA-01078: failure in processing system parameters
ORA-01565: error in identifying file '+DATADG/redpanda/spfileredpanda.ora'
ORA-17503: ksfdopn:2 Failed to open file +DATADG/redpanda/spfileredpanda.ora
ORA-15056: additional error message
ORA-17503: ksfdopn:DGOpenFile05 Failed to open file +DATADG/redpanda/spfileredpanda.ora
ORA-17503: ksfdopn:2 Failed to open file +DATADG/redpanda/spfileredpanda.ora
ORA-15173: entry 'spfileredpanda.ora' does not exist in directory 'redpanda'
ORA-06512: at line 4

starting Oracle instance without parameter file for retrieval of spfile
Oracle instance started

Total System Global Area 159019008 bytes
Fixed Size                     1298584 bytes
Variable Size                 67112808 bytes
Database Buffers              83886080 bytes
Redo Buffers                   6721536 bytes

RMAN>
Starting restore at 31-MAY-08
allocated channel: ORA_DISK_1

channel ORA_DISK_1: SID=99 device type=DISK

channel ORA_DISK_1: looking for AUTOBACKUP on day: 20080531
channel ORA_DISK_1: AUTOBACKUP found: REDPANDA_c-3603176431-20080531-0b
channel ORA_DISK_1: restoring spfile from AUTOBACKUP REDPANDA_c-3603176431-20080531-0b
channel ORA_DISK_1: SPFILE restore from AUTOBACKUP complete
Finished restore at 31-MAY-08

RMAN>
Oracle instance started
RMAN Hands On

```
Total System Global Area     318046208 bytes
Fixed Size                  1299652 bytes
Variable Size               285215548 bytes
Database Buffers            25165824 bytes
Redo Buffers                6365184 bytes

RMAN>
Starting restore at 31-MAY-08
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=152 device type=DISK
recovery area destination: +FRADG
database name (or database unique name) used for search: REDPANDA
channel ORA_DISK_1: no AUTOBACKUPS found in the recovery area
channel ORA_DISK_1: looking for AUTOBACKUP on day: 20080531
channel ORA_DISK_1: AUTOBACKUP found: REDPANDA_c-3603176431-20080531-0b
channel ORA_DISK_1: restoring control file from AUTOBACKUP REDPANDA_c-3603176431-
20080531-0b
channel ORA_DISK_1: control file restore from AUTOBACKUP complete
output file name=+DATADG/redpanda/controlfile/current.273.656200773
output file name=+FRADG/redpanda/controlfile/current.260.656198431
```
Finished restore at 31-MAY-08

RMAN>
database mounted
released channel: ORA_DISK_1

RMAN> 2> 3> 4> 5>
executing command: SET until clause

Starting restore at 31-MAY-08
Starting implicit crosscheck backup at 31-MAY-08
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=152 device type=DISK
Crosschecked 46 objects
Finished implicit crosscheck backup at 31-MAY-08
Starting implicit crosscheck copy at 31-MAY-08
using channel ORA_DISK_1
Crosschecked 29 objects
Finished implicit crosscheck copy at 31-MAY-08

searching for all files in the recovery area
cataloging files...
no files cataloged

using channel ORA_DISK_1

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
+DATADG/redpanda/datafile/system.268.656188537
channel ORA_DISK_1: restoring datafile 00002 to
+DATADG/redpanda/datafile/sysaux.267.654614821
channel ORA_DISK_1: restoring datafile 00003 to
+DATADG/redpanda/datafile/undotbs1.269.654614823

channel ORA_DISK_1: restoring datafile 00004 to
+DATADG/redpanda/datafile/users.270.656189521

channel ORA_DISK_1: restoring datafile 00005 to
+DATADG/redpanda/datafile/dev.276.654704777

channel ORA_DISK_1: reading from backup piece
+FRADG/redpanda/backupset/2008_05_31/nndf0_tag20080531t213007_0.294.656199013

channel ORA_DISK_1: piece
handle=+FRADG/redpanda/backupset/2008_05_31/nndf0_tag20080531t213007_0.294.656199013
tag=TAG20080531T213007

channel ORA_DISK_1: restored backup piece 1

channel ORA_DISK_1: restore complete, elapsed time: 00:02:55

Finished restore at 31-MAY-08

Starting recover at 31-MAY-08

using channel ORA_DISK_1

starting media recovery
archived log for thread 1 with sequence 2 is already on disk as file 
+FRADG/redpanda/onlinelog/group_2.262.656191269
archived log file name=+FRADG/redpanda/onlinelog/group_2.262.656191269 thread=1 sequence=2
media recovery complete, elapsed time: 00:00:02
Finished recover at 31-MAY-08

RMAN>
database opened
new incarnation of database registered in recovery catalog
RPC call appears to have failed to start on channel default
RPC call OK on channel default
starting full resync of recovery catalog
full resync complete
RMAN>
Recovery Manager complete.
Checking Database after total database loss, restore and recover
SQL*Plus: Release 11.1.0.6.0 - Production on Sat May 31 22:05:52 2008

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Connected to:
Oracle Database 11g Enterprise Edition Release 11.1.0.6.0 - Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options

<table>
<thead>
<tr>
<th>GROUP#</th>
<th>THREAD#</th>
<th>SEQUENCE#</th>
<th>BYTES</th>
<th>MEMBERS</th>
<th>ARC</th>
<th>STATUS</th>
<th>FIRST_CHANGE#</th>
<th>FIRST_TIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>52428800</td>
<td>2</td>
<td>NO</td>
<td>CURRENT</td>
<td>1410919</td>
<td>31-MAY-08</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>0</td>
<td>52428800</td>
<td>2</td>
<td>YES</td>
<td>UNUSED</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>52428800</td>
<td>2</td>
<td>YES</td>
<td>UNUSED</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

6 rows selected.

NAME
-------
REDPANDA
SQL> Disconnected from Oracle Database 11g Enterprise Edition Release 11.1.0.6.0 - Production

With the Partitioning, OLAP, Data Mining and Real Application Testing options

End of Document