Practice

Performing RMAN Full Backups - Part I

Practice Target

In this practice you will learn the fundamentals of taking full backups in RMAN.

Practice Overview

In high level, in this practice, you will perform the following tasks:

- Take a cold/consistent backup of the entire database (in `NOARCHIVELOG` mode)
- Take a hot/inconsistent backup of the entire database
- Take backups of specific tablespaces
- Specify the backup destination of a `BACKUP` command

Assumptions

- This practice assumes that you have `srv1` up and running from the **non-CDB** snapshot.

A. Taking Whole Database Backup

In the following steps you will take a backup of the whole database using RMAN. You will learn meanwhile how RMAN takes its backups.

1. Open Putty and login to `srv1` as `oracle`.

2. Invoke RMAN and connect to the local database as target.

```
rman target /
```

3. Try to take backup of the database using the following command.

```
BACKUP DATABASE;
```

   - Why the command above fails?
   - How can you make it succeed?
   - What type of backup we are trying to take?

4. Shutdown the database and start it up in `MOUNT` mode.

   `STARTUP` and `SHUTDOWN` commands can be invoked from RMAN command prompt.

```
SHUTDOWN IMMEDIATE
STARTUP MOUNT
```

5. Try to take backup of the database

```
BACKUP DATABASE;
```

   After the backup is finished, examine the RMAN output and try answering the following questions:

   - How long did the backup take to finish?
   - How many channels RMAN allocated to take its backup?
   - Can you recognize the input files and the output files?
   - What are the database files that are **not** included in the backup?
   - How many output files produced by the command? and why?
   - Where the output files have been saved and why?
   - Does the RMAN output help to know the sizes of the produced backup files?

Following are the answers:

The backup operation took 16 seconds. This is understandable for a small database like ours, but in real life scenarios, taking a full backup of the entire database may take hours… depending on the database size and the bandwidth of the storage system.

The backup operation used one channel to the disk device to transfer the data. Some devices provide more bandwidth for the multiple channels. With such devices, configuring more than one channel could speed up the backup operation. We will learn about configuring multiple channels later in the course.

From the command output, we can recognize the input data files and the output backup pieces. In our case, all the datafiles are saved into a single backup piece. In large databases, we might need to control the number of files in each piece. RMAN allows to configure this control.

The temporary tablespace temp files are not included in the output backup file. This makes sense because when restore a database from RMAN backup files, we do not need any data from the temporary tablespace. The database simply creates the temp files from scratch.

The backup files are saved under the FRA location. RMAN created a directory called "backupset" and a sub-directory under it of the backup date. The backup files are saved in that sub-directory. This is a nice directory structure of saving the backup files because they are organized by dates.

Because the `CONTROLFILE AUTOBACKUP` is set to ON, RMAN automatically creates a backup of the control file after finishing from taking backup of the database. But the output file is not saved with the database backup files. It is saved under a separate sub-directory named as "autobackup".

The output doesn't display the produced file size. We need to issue other RMAN commands or using OS commands to display the file attributes including the file size.

6. Issue the following command in RMAN.

This command displays all the backupsets registered in RMAN repository. Observe that it displays the sizes of the generated backup pieces.

```
LIST BACKUPSET;
```

7. Issue the following query to obtain information about how much percentage is taken by the backup files from the fast recovery area.

Observe that you can issue SQL queries in RMAN prompt.

```
SELECT FILE_TYPE, PERCENT_SPACE_USED FROM V$RECOVERY_AREA_USAGE WHERE
PERCENT_SPACE_USED<>0 ORDER BY PERCENT_SPACE_USED DESC;
```

8. Exit from RMAN prompt.

```
exit
```

B. Enabling ARCHIVELOG mode in ORADB database

In the following steps you will enable the ARCHIVELOG mode in ORADB database. This step is a must to be able to take backups online.

9. Perform the steps below to enable the ARCHIVELOG mode in ORADB database.

```
# in sqlplus login to ORADB as sysdba
sqlplus / as sysdba

ALTER SYSTEM SET LOG_ARCHIVE_DEST_1='LOCATION=USE_DB_RECOVERY_FILE_DEST' SCOPE=SPFILE;
ALTER DATABASE ARCHIVELOG;
ALTER DATABASE OPEN;
-- verify that the archivelog is enabled
ARCHIVE LOG LIST
-- switch the log file
ALTER SYSTEM SWITCH LOGFILE;
-- checkout the generated archive log file
SELECT NAME FROM V$ARCHIVED_LOG;

Exit
```

C. Taking Database and Tablespace Backups Online

In the following steps you will use RMAN to take a hot backup of the target database and tablespaces. You will learn more concepts about backups taken by RMAN.

10. Invoke RMAN and connect to the local database as target.

```
rman target /
```

11. Delete the backupsets taken earlier by RMAN.

Let's take this step as an opportunity to learn about how you can take advantage of the RMAN errors to help you to complete a command if you forget its syntax.

a. Issue the following command, then press the [ENTER] key on the keyboard three times.

```
DELETE
```

b. Examine the errors reported by RMAN. It displays the keywords that are expected to come after the command that you typed.

Our target is to delete the backupset. Hence, "`backupset`" is the correct keyword to use.

```
RMAN-01009: syntax error: found "end-of-file": expecting one of: "archivelog,
backuppiece, backupset, backup, controlfilecopy, copy, datafilecopy, expired, force,
foreign, global, noprompt, obsolete, proxy, preplugin, script"
```

c. Issue the following command, then press the ENTER key on the keyboard three times.

```
DELETE BACKUPSET
```

d. Again, the returned RMAN error displays the keywords that can come after the typed command.

After reviewing the retuned list, we can guess that the correct keyword is "of", because we are after deleting the backupset of the database.

```
RMAN-01009: syntax error: found "end-of-file": expecting one of: "backed, completed,
device, for, guid, like, of, tag, integer, ;"
```

e. Again, the returned RMAN error displays the keywords that can come after the typed command.

After reviewing the retuned list, we can guess that the correct keyword is "`DATABASE`", because we are after deleting the backupset of the database.

f. Issue the following command

Type "y" when you are prompted for confirmation. Typing "y" is equivalent to typing "yes".

Observe that the command deletes the backupset of the database but not the backupset generated from the `CONTROLFILE AUTOBACKUP` configuration.

```
DELETE BACKUPSET OF DATABASE;
```

12. Take backup of the database and the archived redo log files using the following command.

You can take backup of the entire database using a single command and backup of the archive logs using another command.

The command produces there backup sets: one for database backup, one for the archived redo log backup, and one for the control file auto-backup.

```
BACKUP DATABASE PLUS ARCHIVELOG;
```

13. Issue the following command. Recognize which archive log files have been included in the produced backup set.

```
SELECT NAME, SEQUENCE# FROM V$ARCHIVED_LOG ORDER BY 2;
```

14. Take a backupset of the database in the shared folder using `FORMAT` parameter of the `BACKUP` command.

Using the `FORMAT` parameter, we can direct the backup files to a location other than the default backup location.

```
BACKUP DATABASE FORMAT '/media/sf_staging/ORADB%U.bck';
```

15. Open the file explorer in the hosting PC and check out the generated file.

16. Take backup of the tablespace `USERS`.

```
BACKUP TABLESPACE users FORMAT '/media/sf_staging/users_%U.bck';
```

17. Check out the size of the produced backupset by either issuing the following command or by using the File Explorer.

```
LIST BACKUPSET OF TABLESPACE users;
```

18. Obtain the full name of the users datafile.

```
SELECT NAME FROM v$DATAFILE WHERE TS# = ( SELECT TS# FROM V$TABLESPACE WHERE
NAME='USERS');
```

19. Check out the size of the tablespace datafile.

Tip: `host` command allows us to execute an OS command from within RMAN command line.

```
host "ls -lh <full data file name>";
```

- Why do you think the datafile size is greater than the produced backup piece?

20. Delete all the backupsets

```
DELETE BACKUPSET;
```

21. Exit from RMAN.

```
exit
```

22. In Oracle VirtualBox, take a snapshot of `srv1` and name it as "**oradb non-CDB database**". Delete the old snapshot of the same name.

Summary

In this practice, you have used RMAN to perform the following tasks:

- Take a cold/consistent backup of the entire database (in `NOARCHIVELOG` mode)
- Take a hot/inconsistent backup of the entire database
- Take backups of specific tablespaces
- Specify manually the backup destination of a `BACKUP` command