

Practice 11

Performing Recovery Part I

Practice Target

In this practice you will perform specific recovery scenarios in `ORADB` database.

Starting from this practice lecture and on, recovery scenarios across all the practices will be sequentially numbered.

Practice Overview

In this practice, you will perform the full recovery procedure to the following scenarios:

- Complete recovery of the entire database in `NOARCHIVELOG` Mode
- Complete recovery of the entire database in `ARCHIVELOG` Mode
- Complete recovery of a user tablespace loss

You will also install a script called "CrashSimulator", and obtain the target database `DBID` and save it in an external file.

Assumptions

This practice assumes the `srv1` appliance is up and running and its database `ORADB` is running in `OPEN` state.

Installing the CrashSimulator

CrashSimulator is a free shell script developed by Francisco Munoz Alvarez ([his blog](#) – [follow him on twitter](#)) to perform specific crashes in Oracle database for the target of simulating recovery scenarios.

The script can be used to simulate the losses in the practice recovery scenarios. In the following steps, you will install the script and get familiar with using it.

Note: you do not need a third-party utility to simulate crashes. You can use the OS commands to simulated database crashes. You will learn about using the OS commands to simulate database crashes in this practice and in the future practices.

1. Download the `CrashSimulator.zip` from downloadable resources section.
2. Copy the file to the shared folder.
3. Open Putty and login to `srv1` as `oracle`.
4. Create a directory under `~/scripts` to save the script file in it

```
cd ~/scripts  
mkdir crashsimulator
```

5. Move the `CrashSimulator.zip` file to the new directory.

```
mv /media/sf_extdisk/CrashSimulator.zip ~/scripts/crashsimulator/
```

6. Extract the file.

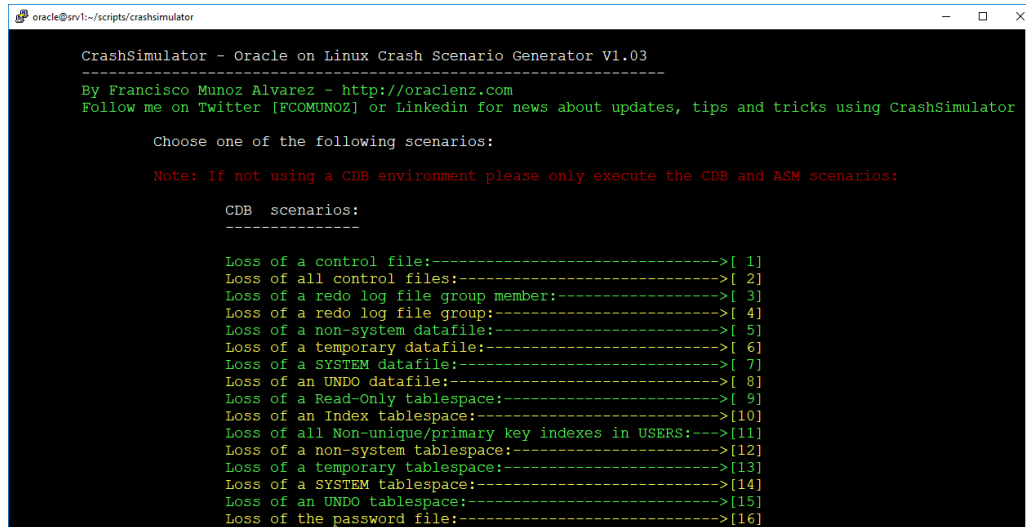
```
cd ~/scripts/crashsimulator/  
unzip CrashSimulator.zip
```

7. Execute the following script. The keyword 'low' stands for low resolution screen.

You will be prompted for accepting terms and conditions. Type 'Y'.

```
./CrashSimulator_Low.sh.x
```

You should see a screen like the following:



```

CrashSimulator - Oracle on Linux Crash Scenario Generator V1.03
-----
By Francisco Munoz Alvarez - http://oraclenz.com
Follow me on Twitter [FCOMUNOZ] or LinkedIn for news about updates, tips and tricks using CrashSimulator

Choose one of the following scenarios:

Note: If not using a CDB environment please only execute the CDB and ASM scenarios:

CDB scenarios:
-----
Loss of a control file:----->[ 1]
Loss of all control files:----->[ 2]
Loss of a redo log file group member:----->[ 3]
Loss of a redo log file group:----->[ 4]
Loss of a non-system datafile:----->[ 5]
Loss of a temporary datafile:----->[ 6]
Loss of a SYSTEM datafile:----->[ 7]
Loss of an UNDO datafile:----->[ 8]
Loss of a Read-Only tablespace:----->[ 9]
Loss of an Index tablespace:----->[10]
Loss of all Non-unique/primary key indexes in USERS:-->[11]
Loss of a non-system tablespace:----->[12]
Loss of a temporary tablespace:----->[13]
Loss of a SYSTEM tablespace:----->[14]
Loss of an UNDO tablespace:----->[15]
Loss of the password file:----->[16]
  
```

The script has three sections: CDB scenarios, PDB scenarios, and ASM scenarios.

CDB scenarios actually work for both CDB and non-CDB databases. Those are the scenarios that you will mostly use in the course practices.

8. Type '88' then press **Enter**.

You should see the menu options of the other two sections [PDB scenarios], and [ASM scenarios].

9. Type '77' then press **Enter**.

You are now back to [CDB scenarios]. Throughout the course we will deal with scenarios from the options numbers 1 to 29.

10. Type '0' then press **Enter**. You exited from the script.

11. Take a snapshot of `srv1` appliance. Name it as "**Practice 11 Start**"

You should take a snapshot of `srv1` appliance because you will perform some destructive actions in this practice. Also, after every recovery scenario, you will delete the snapshot and revert the appliance to its initial state.

Caution!

Do not proceed with the practice until you take a snapshot of `srv1` appliance at this stage.

Recovery Scenario 1:

Complete recovery of the entire database in NOARCHIVELOG Mode

Scenario assumptions:

- The database is running in NOARCHIVELOG mode
- One or more datafiles are lost
- Recovery Catalog is not being used

Preparing for the scenario

To prepare for this recovery scenario, you will first switch the database to run in NOARCHIVELOG mode then you will take a full cold backup of the database.

- 12.** Invoke SQL*Plus and login to ORADB as sysdba

```
cd
sqlplus / as sysdba
```

- 13.** Switch ORADB to run in NOARCHIVELOG mode.

```
# mount the database
SHUTDOWN IMMEDIATE
STARTUP MOUNT

# disable the archivelog mode
ALTER DATABASE NOARCHIVELOG;

# restart the database
SHUTDOWN IMMEDIATE
STARTUP OPEN
```

- 14.** Invoke RMAN with connecting to ORADB as target, mount the database and take a full backup of the database.

```
rman target /

SHUTDOWN IMMEDIATE
STARTUP MOUNT

BACKUP DATABASE TAG 'FULL_DB';

SHUTDOWN IMMEDIATE
STARTUP
ALTER SYSTEM SWITCH LOGFILE;
```

Simulating the Crash

In the following steps, you will simulate losing one of the user datafiles.

15. Exit from RMAN and change the directory to the CrashSimulator directory. Invoke the CrashSimulator.

```
cd ~/scripts/crashsimulator/  
./CrashSimulator_Low.sh.x
```

16. Type '12' then press **Enter**. This is menu option of the crash action "**Loss of a non-system tablespace**".

The script, as a result, renames the `users` tablespace datafile and terminates the instance.

17. Confirm the lost datafile is not there. Obtain the full name of the datafile from the message returned by the simulator.

```
ls /u01/app/oracle/oradata/ORADB/datafile/**_**_users_**_.dbf
```

Recovery Actions

As a DBA, we assume that you have been reported about the issue. As a response from you, you logged on to the server and discovered the database instance is down. Therefore, as you normally do in such cases, you look at the alert.log file.

18. Open the alert log file and see why the instance crashed.

vi editor tip: when you open the file the first time, the current location will be the first line of the file. To go to the last line in the file, press on [G] (Upper case 'G' letter).

```
vi /u01/app/oracle/diag/rdbms/oradb/ORADB/trace/alert_ORADB.log
```

You will observe a message like the following:

```
terminating the instance due to error ***
```

You understand from the message that the instance crashed and it is not clear yet why.

19. Try starting up the database instance.

```
sqlplus / as sysdba  
STARTUP
```

You will receive an error like the following:

```
ORA-01157: cannot identify/lock data file * - see DBWR trace file  
ORA-01110: data file *:  
'/u01/app/oracle/oradata/ORADB/datafile/**_**_users_**_.dbf'
```

The message makes it obvious that the users tablespace datafile is not available.

20. Verify the users datafile is not available.

You reported the issue to the management and decided to restore the database. They understand that the data entered since last time the backup was taken will be lost.

```
ls /u01/app/oracle/oradata/ORADB/datafile/<users tablespace datafile>
```

- 21.** Invoke RMAN, login as target to `ORADB`, mount the database and then restore it.

Observe that RMAN rebuilds all the datafiles. Including that one that are already there.

We can restore the lost datafile only. You will restore a tablespace later. For this example, we want to experience restoring the entire database.

```
rman target /  
SHUTDOWN IMMEDIATE  
STARTUP MOUNT  
RESTORE DATABASE;  
RECOVER DATABASE;  
ALTER DATABASE OPEN RESETLOGS;
```

- 22.** (optional) Retrieve the incarnation history.

```
SELECT INCARNATION#, RESETLOGS_CHANGE#, PRIOR_RESETLOGS_CHANGE#, STATUS  
FROM V$DATABASE_INCARNATION  
ORDER BY 1;
```

Clean up

- 23.** Shutdown `srv1`.

- 24.** Restore `srv1` to the snapshot "**Practice 11 Start**". Do not delete the snapshot.

When you restore the appliance, make sure that the checkbox that reads as follows is **unmarked**: "Create a snapshot of the current machine state".

- 25.** Start `srv1`.

Recovery Scenario 2:

Complete recovery of the entire database in ARCHIVELOG Mode

Scenario assumptions:

- The database is running in ARCHIVELOG mode
- All or most datafiles are lost
- Recovery Catalog is not being used

Preparing for the scenario

To prepare for this recovery scenario, take a full online backup of the database.

- 26.** Invoke RMAN and connect to ORADB as target then take full backup of the database.

```
rman target /  
BACKUP DATABASE TAG 'FULL_DB';  
ALTER SYSTEM SWITCH LOGFILE;
```

Simulating the Crash

- 27.** Exit from RMAN and change the directory to the CrashSimulator directory. Invoke the CrashSimulator.

```
cd ~/scripts/crashsimulator/  
./CrashSimulator_Low.sh.x
```

- 28.** Type '17' then press **Enter**. This is menu option of the crash action "Loss of all datafiles".
The script will rename all the datafiles and terminate the instance.

Recovery Actions

- 29.** Try starting up the database instance.

You will receive the same error that you received in the previous scenario.

```
sqlplus / as sysdba  
STARTUP
```

- 30.** Mount the database

```
SHUTDOWN IMMEDIATE  
STARTUP MOUNT
```

- 31.** Invoke RMAN, login as target to ORADB.

```
rman target /
```

- 32.** Before restoring the database, you want to make sure that the backup files are valid.
Bear in mind that this command may take long time, if it is run against large database.

```
RESTORE DATABASE VALIDATE;
```

- 33.** Restore the database, recover it, then open it in read/write mode.

Observe that you do not open the database in `RESETLOGS` option in this scenario.

```
RESTORE DATABASE;  
RECOVER DATABASE;  
ALTER DATABASE OPEN;
```

- 34.** (optional) Retrieve the incarnation history.

```
SELECT INCARNATION#, RESETLOGS_CHANGE#, PRIOR_RESETLOGS_CHANGE#, STATUS  
FROM V$DATABASE_INCARNATION  
ORDER BY 1;
```

Clean up

- 35.** Shutdown `srv1`.
- 36.** Restore `srv1` to the snapshot "**Practice 11 Start**". Do not delete the snapshot.
- 37.** Start `srv1`.

Recovery Scenario 3:

Complete recovery of a user tablespace loss

Scenario assumptions:

- The database is running in `ARCHIVELOG` mode
- One or some datafiles of a user tablespace are lost
- Recovery Catalog is not being used

Preparing for the scenario

To prepare for this recovery scenario, take a full online backup of the tablespace.

- 38.** Invoke RMAN and connect to `ORADB` as target then take full backup of the users tablespace.

```
rman target /  
BACKUP TABLESPACE users TAG 'FULL_USERS';  
ALTER SYSTEM SWITCH LOGFILE;
```

Simulating the Crash

You will not use the CrashSimulator in this scenario because it automatically terminates the instance. You will use a manual method to simulate the tablespace loss.

- 39.** Invoke SQL*Plus and login as sysdba.

```
sqlplus / as sysdba
```

- 40.** Retrieve the datafiles included in the `users` tablespace.

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

- 41.** Delete the users tablespace datafile.

```
! rm /u01/app/oracle/oradata/ORADB/datafile/<users tablespace datafile>
```

- 42.** Verify that the database instance is up and running.

```
! ps -ef | grep pmon  
SELECT * FROM V$VERSION;
```

Recovery Actions

- 43.** To figure out which datafile is lost, invoke RMAN, connect as target to `ORADB` and issue the following command.

You should receive an error like the following:

```
RMAN-06169: could not read file header for datafile n error reason 5
```

```
rman target /  
VALIDATE DATABASE;
```

- 44.** Retrieve the tablespace name to which the lost datafile belongs to.

```
SELECT NAME FROM V$TABLESPACE WHERE TS# = (SELECT D.TS# FROM V$DATAFILE D WHERE  
FILE#=<n>);
```

- 45.** Issue the following commands on the tablespace to recover it.

Observe that you could recover the tablespace while the database is still up and running.

```
ALTER TABLESPACE users OFFLINE IMMEDIATE;  
RESTORE TABLESPACE users;  
RECOVER TABLESPACE users;  
ALTER TABLESPACE users ONLINE;
```

Clean up

- 46.** Delete the backup files.

```
DELETE BACKUPSET TAG 'FULL_USERS';
```

- 47.** Delete the snapshot "**Practice 11 Start**"

Saving Target Database DBID

In some recovery scenarios, you need to provide `DBID` to RMAN. As you learnt in the concepts lecture, if you do not have a recovery catalog, there is no easy and straightforward step to obtain the target database `DBID`. To make your life easier, you would better save the database `DBID` together with the backup files.

You will see in some future scenarios in the course that you need to provide the `DBID` value to RMAN before you proceed with your recovery.

In the following steps, you will obtain the `DBID` of the database and save it in a file. The file will be saved in the backup files destination.

- 48.** Invoke RMAN and connect to the local database as target.

```
rman target ''/ as SYSBACKUP''
```

- 49.** Obtain the `DBID` of the target database displayed by RMAN then exit from RMAN.

- 50.** Save the `DBID` in a file. Save the file in the backup files destination.

```
echo "<dbid>" > /u01/app/oracle/fra/ORADB/ORADB/ORADB_DBID.log
```

Summary

In this practice, you performed the full recovery procedure to the following scenarios:

- Complete recovery of the entire database in `NOARCHIVELOG` Mode
- Complete recovery of the entire database in `ARCHIVELOG` Mode
- Complete recovery of user tablespace loss

You also installed a script called "CrashSimulator", and obtained `ORADB` database `DBID` and saved it in an external file.

