# Practices for Lesson 15: Performing Complete Recovery

Practices for Lesson 15: Overview

Overview

In these practices, you will initiate a recovery operation by using RMAN commands. You will use the Data Recovery Advisor to recover a datafile.

Practice 15-1: Recovering from the Loss of a System-Critical Data File

Overview

In this practice, you recover your CDB after the data file for the SYSTEM tablespace (in the CDB root) has been inadvertently removed.

Tip

Because you use several windows at the same time in this practice, you may find it helpful to change the name of each of them in their banner at the top.

To set a title for a terminal window:

In the terminal window's menu, select **Terminal** and then **Set Title**. A Set Title dialog box is displayed.

In the Title box, enter the window number.

Click **OK**.

Assumptions

You are logged in as the oracle user.

You have configured the database for recovery.

It is assumed that the database and listener are running. You can use the pgrep -lf smon command to verify that the database is started and the pgrep -lf tns command to verify that the listener is started. If you need to restart the database and listener, use the dbstart.sh script.

Tasks

Configure the Database for Recovery

Execute the rec\_config.sh script from the $HOME/labs/DBMod\_Recovery/ directory. This script configures a minimal configuration to ensure that the database is recoverable. If you have already done the configuration the script does nothing and exits.

Perform a cold database backup.

Create a directory to preserve the backup.

Start RMAN.

Shut down the database, and bring it to the mount stage.

Perform the backup to a separate location that will be not be accessed unless the practice fails.

Open the database.

Exit RMAN.

Create a hot backup to the RMAN configured location.

The default location for the automatic channel allocation is the

db\_recovery\_file\_dest.

Perform the backup to the default location.

$ rman target /

...

connected to target database: ORCLCDB (DBID=2778750799)

RMAN> **BACKUP DATABASE;**

Starting backup at 27-JUN-19 allocated channel: ORA\_DISK\_1

channel ORA\_DISK\_1: SID=280 device type=DISK

channel ORA\_DISK\_1: starting full datafile backup set channel ORA\_DISK\_1: specifying datafile(s) in backup set

input datafile file number=00003 name=/u01/app/oracle/oradata/ORCLCDB/sysaux01.dbf

input datafile file number=00001 name=/u01/app/oracle/oradata/ORCLCDB/system01.dbf

input datafile file number=00004 name=/u01/app/oracle/oradata/ORCLCDB/undotbs01.dbf

input datafile file number=00007 name=/u01/app/oracle/oradata/ORCLCDB/users01.dbf

channel ORA\_DISK\_1: starting piece 1 at 27-JUN-19

channel ORA\_DISK\_1: finished piece 1 at 27-JUN-19 piece

handle=/u01/app/oracle/fast\_recovery\_area/ORCLCDB/backupset/2019

\_06\_27/o1\_mf\_nnndf\_TAG20190627T160931\_gk9tkztr\_.bkp tag=TAG20190627T160931 comment=NONE

channel ORA\_DISK\_1: backup set complete, elapsed time: 00:00:45 channel ORA\_DISK\_1: starting full datafile backup set

channel ORA\_DISK\_1: specifying datafile(s) in backup set

input datafile file number=00161 name=/u01/app/oracle/oradata/ORCLCDB/orclpdb1/sysaux01.dbf

input datafile file number=00163 name=/u01/app/oracle/oradata/ORCLCDB/orclpdb1/users01.dbf

input datafile file number=00160 name=/u01/app/oracle/oradata/ORCLCDB/orclpdb1/system01.dbf

input datafile file number=00162 name=/u01/app/oracle/oradata/ORCLCDB/orclpdb1/undotbs01.dbf

input datafile file number=00172 name=/u01/app/oracle/oradata/ORCLCDB/orclpdb1/INVENTORY01.DBF

channel ORA\_DISK\_1: starting piece 1 at 27-JUN-19 channel ORA\_DISK\_1: finished piece 1 at 27-JUN-19

piece handle=/u01/app/oracle/fast\_recovery\_area/ORCLCDB/8C28E6F854EB7D BBE0536210ED0AFDD9/backupset/2019\_06\_27/o1\_mf\_nnndf\_TAG20190627T 160931\_gk9tm8nb\_.bkp tag=TAG20190627T160931 comment=NONE

channel ORA\_DISK\_1: backup set complete, elapsed time: 00:00:07 channel ORA\_DISK\_1: starting full datafile backup set

channel ORA\_DISK\_1: specifying datafile(s) in backup set

input datafile file number=00014 name=/u01/app/oracle/oradata/ORCLCDB/orclpdb2/sysaux01.dbf

input datafile file number=00016 name=/u01/app/oracle/oradata/ORCLCDB/orclpdb2/users01.dbf

input datafile file number=00013 name=/u01/app/oracle/oradata/ORCLCDB/orclpdb2/system01.dbf

input datafile file number=00015 name=/u01/app/oracle/oradata/ORCLCDB/orclpdb2/undotbs01.dbf

channel ORA\_DISK\_1: starting piece 1 at 27-JUN-19 channel ORA\_DISK\_1: finished piece 1 at 27-JUN-19

piece handle=/u01/app/oracle/fast\_recovery\_area/ORCLCDB/8857B419BF707E 73E0536210ED0A54C7/backupset/2019\_06\_27/o1\_mf\_nnndf\_TAG20190627T 160931\_gk9tmhpl\_.bkp tag=TAG20190627T160931 comment=NONE

channel ORA\_DISK\_1: backup set complete, elapsed time: 00:00:07 channel ORA\_DISK\_1: starting full datafile backup set

channel ORA\_DISK\_1: specifying datafile(s) in backup set

input datafile file number=00006 name=/u01/app/oracle/oradata/ORCLCDB/pdbseed/sysaux01.dbf

input datafile file number=00005 name=/u01/app/oracle/oradata/ORCLCDB/pdbseed/system01.dbf

input datafile file number=00008 name=/u01/app/oracle/oradata/ORCLCDB/pdbseed/undotbs01.dbf

channel ORA\_DISK\_1: starting piece 1 at 27-JUN-19 channel ORA\_DISK\_1: finished piece 1 at 27-JUN-19

...

Starting Control File and SPFILE Autobackup at 27-JUN-19 piece

handle=/u01/app/oracle/fast\_recovery\_area/ORCLCDB/autobackup/201 9\_06\_27/o1\_mf\_s\_1012061437\_gk9tmych\_.bkp comment=NONE

Finished Control File and SPFILE Autobackup at 27-JUN-19

Exit RMAN.

Create a Loss of a System-Critical Data File

Window 1

Use the same terminal window as *Window 1*.

Execute the $HOME/labs/DBMod\_Recovery/RMAN\_crash.sh shell script to remove the data file of the SYSTEM tablespace in the CDB root.

**Note:** This script may end with an error showing that data file system01.dbf cannot be opened.

Attempt an administrative task, such as creating a user.

Start SQL\*Plus and connect to the CDB root as the SYSTEM user. Refer to *Course Practice Environment: Security Credentials* for the password value.

**Note:** At this point, any SQL statement gives an error.

Consider your recovery options.

**Question:** Which type of recovery is possible in this case?

**Answer:** A complete recovery is possible as long as you have all available backups required. This means that you have a backup (backup set or image copy) of the missing data file, all archive log files required to recover the restored data file up to the current SCN of the CDB including all redo log files (one member in each group will be sufficient).

**Question:** Which methods can you use to recover the data file?

**Answer:** RMAN is the best utility to recover data. You can use the RESTORE and

RECOVER commands or get help by using the LIST FAILURE command.

Determine the state of the database to choose the course of action in the next step. The output of step 3 matches with item b in this example.

If the SQL\*Plus login displays "ORA-01034: ORACLE not available", then the database instance is down. ***Action:*** *Read case 3 in step 6.*

If the SQL\*Plus login displays an error that includes "ORA-01116: error in opening database file 1", then database instance is still running, but impaired and must be terminated with shutdown abort. ***Action:*** *Read case 1 in step 6*

If the rman target / command shows an error and immediately disconnects then the database instance is down.

If RMAN connects but the restore datafile 1 command fails with errors about datafile 1, then the database is impaired and must be terminated with shutdown abort.

The exact commands that you will use vary based on the state of the database instance. Follow each case in order.

Case 1: The database instance is not down, but impaired and must be terminated with shutdown abort.The database instance will likely shutdown automatically at some point. Use RMAN to shutdown abort the database instance, then skip to Case 3.

Case 2: The RMAN utility will not connect. Use SQL\*Plus to shutdown abort the database instance. Proceed to Case 3 to bring the database instance to the mount state using RMAN.

Case 3: The database instance is down. Use RMAN or SQL\*Plus to bring the database instance to the mount state.

Recover the Database by Using the RESTORE and RECOVER Commands

Window 1

Restore the missing data file.

RMAN> **RESTORE DATAFILE 1;**

Starting restore at 27-JUN-19

using target database control file instead of recovery catalog allocated channel: ORA\_DISK\_1

channel ORA\_DISK\_1: SID=256 device type=DISK

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

/u01/app/oracle/oradata/ORCLCDB/system01.dbf

channel ORA\_DISK\_1: reading from backup piece

/u01/app/oracle/fast\_recovery\_area/ORCLCDB/backupset/2019\_06\_27/ o1\_mf\_nnndf\_TAG20190627T160931\_gk9tkztr\_.bkp

channel ORA\_DISK\_1: piece handle=/u01/app/oracle/fast\_recovery\_area/ORCLCDB/backupset/2019

\_06\_27/o1\_mf\_nnndf\_TAG20190627T160931\_gk9tkztr\_.bkp tag=TAG20190627T160931

channel ORA\_DISK\_1: restored backup piece 1

channel ORA\_DISK\_1: restore complete, elapsed time: 00:00:07 Finished restore at 27-JUN-19

RMAN>

Recover the missing data file.

Open the CDB root.

Open all PDBs.

Exit RMAN.

Start SQL\*Plus and connect to the CDB root as the SYSDBA user.

Show pdb status.

Exit SQL\*Plus. Keep Window 1 open for the next section.

Use the Data Recovery Advisor to Recover the Database

**Window 2:** Open a new terminal window and execute the RMAN\_crash.sh script to create a failure. This window will be referred to as *Window 2*.

**Note:** This script may end with an error showing that data file system01.dbf cannot be opened.

**Window 1:** Try to connect to the database.

If the database appears to be running attempt a simple query.

**Window 1:** Shut down the database instance.

**Window 1:** Exit SQL\*Plus.

**Window 1:** Start RMAN and connect to the target database.

**Window 1:** Start the database instance in MOUNT mode.

**Window 1:** Use the LIST FAILURE command to determine the error. The value in the

Summary column tells you that system01.dbf is missing.

**Window 1:** Display repair options. At the very end of the results, a repair script is listed.

**Window 1:** Use the REPAIR FAILURE PREVIEW command to generate a script with all repair actions and comments.

**Window 1:** Use the REPAIR FAILURE command to repair database failures identified by the Data Recovery Advisor. When prompted, enter YES to execute the repair. When prompted to open the database, enter YES.

channel ORA\_DISK\_1: restoring datafile 00001 to

/u01/app/oracle/oradata/ORCLCDB/system01.dbf

channel ORA\_DISK\_1: reading from backup piece

/u01/app/oracle/fast\_recovery\_area/ORCLCDB/backupset/2019\_06\_27/ o1\_mf\_nnndf\_TAG20190627T160931\_gk9tkztr\_.bkp

channel ORA\_DISK\_1: piece handle=/u01/app/oracle/fast\_recovery\_area/ORCLCDB/backupset/2019

\_06\_27/o1\_mf\_nnndf\_TAG20190627T160931\_gk9tkztr\_.bkp tag=TAG20190627T160931

channel ORA\_DISK\_1: restored backup piece 1

channel ORA\_DISK\_1: restore complete, elapsed time: 00:00:15 Finished restore at 27-JUN-19

Starting recover at 27-JUN-19 using channel ORA\_DISK\_1

starting media recovery

archived log for thread 1 with sequence 118 is already on disk as file

/u01/app/oracle/fast\_recovery\_area/ORCLCDB/archivelog/2019\_06\_27

/o1\_mf\_1\_118\_gk9vttll\_.arc

archived log for thread 1 with sequence 119 is already on disk as file

/u01/app/oracle/fast\_recovery\_area/ORCLCDB/archivelog/2019\_06\_27

/o1\_mf\_1\_119\_gk9vttmm\_.arc

archived log for thread 1 with sequence 120 is already on disk as file

/u01/app/oracle/fast\_recovery\_area/ORCLCDB/archivelog/2019\_06\_27

/o1\_mf\_1\_120\_gk9wo0l1\_.arc

archived log for thread 1 with sequence 121 is already on disk as file

/u01/app/oracle/fast\_recovery\_area/ORCLCDB/archivelog/2019\_06\_27

/o1\_mf\_1\_121\_gkb16db7\_.arc

archived log for thread 1 with sequence 122 is already on disk as file

/u01/app/oracle/fast\_recovery\_area/ORCLCDB/archivelog/2019\_06\_27

/o1\_mf\_1\_122\_gkb16dck\_.arc

archived log file name=/u01/app/oracle/fast\_recovery\_area/ORCLCDB/archivelog/2019\_ 06\_27/o1\_mf\_1\_118\_gk9vttll\_.arc thread=1 sequence=118

archived log file name=/u01/app/oracle/fast\_recovery\_area/ORCLCDB/archivelog/2019\_ 06\_27/o1\_mf\_1\_119\_gk9vttmm\_.arc thread=1 sequence=119

archived log file name=/u01/app/oracle/fast\_recovery\_area/ORCLCDB/archivelog/2019\_ 06\_27/o1\_mf\_1\_120\_gk9wo0l1\_.arc thread=1 sequence=120

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

**Window 1:** Open all the PDBs.

**Window 1:** Exit RMAN.

**Window 2:** Close the second terminal window.

Practice 15-2: Recovering from the Loss of an Application Data File

Overview

In this practice, you recover a PDB data file that has been inadvertently removed.

Assumptions

You are logged in as the oracle user.

orclcdb and the listener are started.

Tasks

Set Up Your Environment for the Practice

Execute the $HOME/labs/DBMod\_Recovery/setup\_pdb1.sh shell script. This script creates the TBS\_APP tablespace and ODR schema in ORCLPDB1. You can ignore object creation error messages.

Start RMAN and connect to the CDB root as the SYS user.

Back up ORCLPDB1.

input datafile file number=00177 name=/u01/app/oracle/oradata/ORCLCDB/orclpdb1/tbs\_app01.dbf

input datafile file number=00161 name=/u01/app/oracle/oradata/ORCLCDB/orclpdb1/sysaux01.dbf

input datafile file number=00163 name=/u01/app/oracle/oradata/ORCLCDB/orclpdb1/users01.dbf

input datafile file number=00160 name=/u01/app/oracle/oradata/ORCLCDB/orclpdb1/system01.dbf

input datafile file number=00162 name=/u01/app/oracle/oradata/ORCLCDB/orclpdb1/undotbs01.dbf

input datafile file number=00172 name=/u01/app/oracle/oradata/ORCLCDB/orclpdb1/INVENTORY01.DBF

channel ORA\_DISK\_1: starting piece 1 at 27-JUN-19

channel ORA\_DISK\_1: finished piece 1 at 27-JUN-19 piece

handle=/u01/app/oracle/fast\_recovery\_area/ORCLCDB/8C28E6F854EB7D BBE0536210ED0AFDD9/backupset/2019\_06\_27/o1\_mf\_nnndf\_TAG20190627T 182426\_gkb2gvt1\_.bkp tag=TAG20190627T182426 comment=NONE

channel ORA\_DISK\_1: backup set complete, elapsed time: 00:00:07 Finished backup at 27-JUN-19

Starting Control File and SPFILE Autobackup at 27-JUN-19 piece

handle=/u01/app/oracle/fast\_recovery\_area/ORCLCDB/autobackup/201 9\_06\_27/o1\_mf\_s\_1012069474\_gkb2h2gx\_.bkp comment=NONE

Finished Control File and SPFILE Autobackup at 27-JUN-19

RMAN>

Exit RMAN.

Remove a Data File

In this section, you run a script that removes a data file from ORCLPDB1. You research the problem and discover which data file is missing.

Execute the $HOME/labs/DBMod\_Recovery/RMAN\_crash\_app.sh script.

**Note:** A file that has been removed by the OS in Unix-based systems is still available to any application that has it open until the application closes the file. By default the Oracle database opens all the files when the database instance is opened, and holds them open.

A database health checker runs frequently, when then data file is detected as missing the PDB is aborted. An attempt to write to the file will also trigger detection.

Create an application table and insert data into it.

Connect to the CDB root as the SYS user with the SYSDBA privilege.

Connect to ORCLPDB1 as the SYS user.

Create a table named ODR.TEST. and insert a row into the table.

What is the status of the PDB?

**Note:** The output could also be as below, if the checker has not aborted the PDB yet.

Exit and reconnect to the database as sys.

If PDB ORCLPDB is open, close it. This may show an error.

Attempt to open the PDB.

Exit SQL\*Plus.

Restore and Recover ORCLPDB1

In this section, you use Recovery Manager to restore and recover ORCLPDB1.

**Question:** Which type of recovery is possible in this case?

**Answer:** A complete recovery is possible as long as you have all available backups required. This means that you have a backup (backup set or image copy) of the missing data file and all archive log files required to recover the restored data file up to the current SCN of the PDB including all redo log files (one member in each group will be sufficient).

**Question:** Which methods can you use to recover?

**Answer:** RMAN is the best utility to recover data. You can use the RESTORE and RECOVER commands, or you can get help with the LIST FAILURE commands. You can also use the simple REPAIR command.

Start RMAN and connect to ORCLPDB1 as the SYS user. Refer to *Course Practice Environment: Security Credentials* for the password value.

Issue the REPORT SCHEMA command to list the names of the data files (permanent and temporary) and tablespaces for ORCLPDB1. In this example, data file number 177 is part of the TBS\_APP tablespace in ORCLPDB1 and shows a size of 0MB. Identify the entry for the TBS\_APP tablespace on your system.

Optionally, if ORCLPDB1 were open, you would close ORCLPDB1 in IMMEDIATE mode (which puts the PDB into MOUNTED mode) before restoring the PDB; otherwise, you will get the error "cannot obtain exclusive enqueue for datafile...".

Restore ORCLPDB1.

Recover the database. Notice the line "starting media recovery." If you had tried to restore and recover just the data file or just the tablespace, you might have encountered media recovery errors for other data files in the tablespace.

RMAN> **RECOVER DATABASE;**

Starting recover at 27-JUN-19 using channel ORA\_DISK\_1

starting media recovery

archived log for thread 1 with sequence 124 is already on disk as file

/u01/app/oracle/fast\_recovery\_area/ORCLCDB/archivelog/2019\_06\_27

/o1\_mf\_1\_124\_gkb2l6wf\_.arc

…

archived log for thread 1 with sequence 127 is already on disk as file

/u01/app/oracle/fast\_recovery\_area/ORCLCDB/archivelog/2019\_06\_27

/o1\_mf\_1\_127\_gkb2lqtd\_.arc

archived log file name=/u01/app/oracle/fast\_recovery\_area/ORCLCDB/archivelog/2019\_ 06\_27/o1\_mf\_1\_124\_gkb2l6wf\_.arc thread=1 sequence=124

archived log file name=/u01/app/oracle/fast\_recovery\_area/ORCLCDB/archivelog/2019\_ 06\_27/o1\_mf\_1\_125\_gkb2l6xk\_.arc thread=1 sequence=125

media recovery complete, elapsed time: 00:00:00 Finished recover at 27-JUN-19

RMAN>

Start ORCLPDB1.

Issue the REPORT SCHEMA command again. Notice that the TBS\_APP tablespace now has a size of 800MB.

Exit RMAN.

Try again to create a table named ODR.TEST in ORCLPDB1.

Connect to the CDB root as the SYS user with the SYSDBA privilege.

Connect to ORCLPDB1 as the SYS user.

Try to re-create the odr.test table.

The table exists. Are there any rows?

**Note:** The table was not created because the table definition exists in the SYSTEM tablespace, but there are no rows because the tablespace TBS\_APP was missing when you attempted to insert the row.

Exit SQL\*Plus.

Use the REPAIR Command

In this section, you re-create the environment where you have a missing data file. You then use RMAN's REPAIR command to perform all the necessary operations (for example, restore and recovery) to fully recover the data file.

Execute the script to remove the data file named tbs\_app01.dbf from ORCLPDB1 again.

Create an application table and try to insert data into it.

Connect to the CDB root as the SYS user with the SYSDBA privilege.

Connect to ORCLPDB1 as the SYS user.

Show the open mode of ORCLPDB1. The result shows that ORCLPDB1 is still open.

Create a table named ODR.TEST. and insert a row into the table.

Show the open mode of ORCLPDB1. The result may show that ORCLPDB1 is still open or it may fail.

Exit and reconnect to the database as sys.

If ORCLPDB1 is still open, close it.

Attempt to open the PDB.

Exit SQL\*Plus.

Start RMAN and log in to the target database as the SYS user.

Execute the REPAIR command. This command restores and recovers the data file.

allocated channel: ORA\_DISK\_1

channel ORA\_DISK\_1: SID=274 device type=DISK Executing: alter database datafile 160 offline Executing: alter database datafile 161 offline Executing: alter database datafile 162 offline Executing: alter database datafile 163 offline Executing: alter database datafile 172 offline Executing: alter database datafile 177 offline

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 00160 to

/u01/app/oracle/oradata/ORCLCDB/orclpdb1/system01.dbf

…

channel ORA\_DISK\_1: restoring datafile 00177 to

/u01/app/oracle/oradata/ORCLCDB/orclpdb1/tbs\_app01.dbf

channel ORA\_DISK\_1: reading from backup piece

/u01/app/oracle/fast\_recovery\_area/ORCLCDB/8C28E6F854EB7DBBE0536 210ED0AFDD9/backupset/2019\_06\_27/o1\_mf\_nnndf\_TAG20190627T182426\_ gkb2gvt1\_.bkp

channel ORA\_DISK\_1: piece handle=/u01/app/oracle/fast\_recovery\_area/ORCLCDB/8C28E6F854EB7D BBE0536210ED0AFDD9/backupset/2019\_06\_27/o1\_mf\_nnndf\_TAG20190627T 182426\_gkb2gvt1\_.bkp tag=TAG20190627T182426

channel ORA\_DISK\_1: restored backup piece 1

channel ORA\_DISK\_1: restore complete, elapsed time: 00:00:15 Finished restore at 27-JUN-19

Starting recover at 27-JUN-19 using channel ORA\_DISK\_1

starting media recovery

archived log for thread 1 with sequence 124 is already on disk as file

/u01/app/oracle/fast\_recovery\_area/ORCLCDB/archivelog/2019\_06\_27

/o1\_mf\_1\_124\_gkb2l6wf\_.arc

…

archived log for thread 1 with sequence 129 is already on disk as file

/u01/app/oracle/fast\_recovery\_area/ORCLCDB/archivelog/2019\_06\_27

/o1\_mf\_1\_129\_gkb9grvl\_.arc

archived log file name=/u01/app/oracle/fast\_recovery\_area/ORCLCDB/archivelog/2019\_ 06\_27/o1\_mf\_1\_124\_gkb2l6wf\_.arc thread=1 sequence=124

Open ORCLPDB1.

Exit RMAN.

Try to insert data into the ODR.TEST table again.

Start SQL\*Plus and connect to ORCLPDB1 as the SYSTEM user. Refer to *Course Practice Environment: Security Credentials* for the password value.

Issue the INSERT command. The operation succeeds, which means the REPAIR

command recovered the data file.

Commit the transaction.

Exit SQL\*Plus.