

HP Data Protector Software

HP Data Protector 6.0 and Oracle 10g Database:

Oracle Database migration to a remote Data Protector cell—Best practices

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Executive summary

This paper provides in-depth information on how to migrate an Oracle Database from one Data Protector cell to a different one.

Target audience

This paper is mainly aimed at system integrators and anyone trying to migrate an Oracle Database using Data Protector. Good understanding of Oracle Recovery Manager (RMAN) and Data Protector is recommended to follow this white paper.

Overview

The Data Protector Architecture organizes clients in cells. Each cell has its own cell Manager, which is the central point for managing the whole cell and storing the Data Protector Internal Database (IDB).

In an Enterprise environment with large number of clients dispersed over different geographical areas, it maybe advisable to split the environment in multiple cells. Listed below are some aspects to be taken into account when planning your environment:

- Geographical location of the clients
- Network connections available among the clients
- Organizational grouping

For disaster recovery purposes or due to enterprise reorganizations (that is, Data center consolidations), you may be required to host an application on a different Data Protector cell. On the other side, backup information for an Oracle Database is stored in the Data Protector IDB and the Oracle Control files (and Oracle Recovery Catalog, if configured).

While the Data Protector IDB stores media information, devices and channels used, and session information, the Oracle Control files (and Recovery Catalog) store information about the objects itself, the Oracle objects are included in every Oracle Backup set and the media contains the Backup set.

When planning to move an Oracle Database to a different Data Protector cell, the backup information contained in both, the IDB and in the Oracle Control File, is needed to perform a successful restore. While we can get the IDB information by importing the media in the target cell, we need to restore the original Oracle Control File to be able to start the restore of the database.

This white paper discusses the fundamentals of Oracle Control Files, Oracle Recovery Catalog, and Data Protector Media import. Finally, it will also cover different Oracle RMAN configuration scenarios providing step-by-step guidance.

This paper is not intended to replace the Oracle RMAN documentation nor the Data Protector Oracle integration documentation, but complement them.

Environment Configuration

The environment used for our testing contains two Data Protector cells, (cell 1 and cell 2), each on a different location (data center A and data center B).

Each cell has its own cell Manager and one Oracle Database server:

Cell 1 (data center A):

- Ita017:
 - (HP-UX) Data Protector cell Manager in cell1.
 - Oracle Server 10.2.0.3
 - Recovery Catalog RCVCAT.
- Ita022:
 - (HP-UX) Oracle Server running 10.2.0.3.
 - Oracle Database DB10g.
 - Data Protector File Library.

Cell 2 (data center B):

- hpu016:
 - (HP-UX) Data Protector cell Manager in cell2.
 - Oracle Server 10.2.0.3
 - Recovery Catalog RCAT
- hpu015
 - (HP-UX) Oracle Server running 10.2.0.3
 - Data Protector Jukebox.

Note:

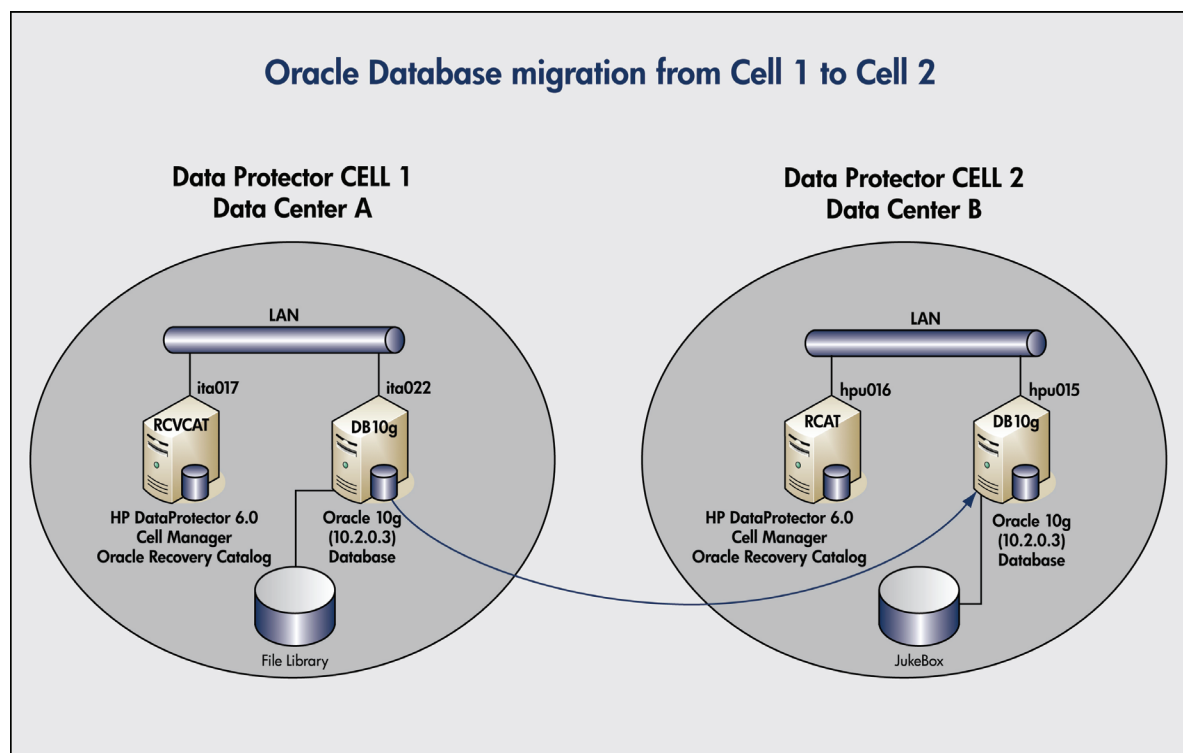
hpu015 will host the target database DB10g after the migration. Originally, only the Oracle Server software is installed on the server.

For the purpose of the testing, we need a database on hpu016 where we can import the source Recovery Catalog. We could use either an empty database or an existing Recovery Catalog. If we use an existing Recovery Catalog, then the source RCVCAT should be imported under a different user schema than the RCAT owner.

On hpu015 we use a Jukebox to be able to import the media from the File Library. See the Media export/import section for more information

The distance and network connection between both data centers plays only a role in case we decide to copy the media from the file library over the network link. While it may be feasible for small databases, it is not an option for larger ones. In such cases, the media should be shipped to the target data center.

Figure 1. Test Environment



As mentioned in the opening summary, there may be different reasons why we need to move a database to a different data center, different cell, and different location. We mention below the two key ones:

- Data center consolidation
- Disaster Recovery Plan (DRP)

In a data center consolidation scenario, normally downtime and migration time has been agreed ahead. In case of a disaster, all preparation steps for the DRP need to be done ahead.

Moreover, as the target database, cell and even data center may have been lost, we need to rely on our existing backups and our target system for the recovery. For this reason, a DRP scenario may require some more configuration steps.

Target System Preparation

The following subsections list a number of preparation steps that should be filled up before starting with the migration procedure. These steps are to be followed on the target system.

In case of a Disaster Recovery scenario, it is highly advised to have these steps done in advance.

Install the Oracle Software on the target System

While it is not necessary, it is recommended to install the Oracle software under the same path and the same Operating system user and group.

- Use the same Operating System user for the oracle software installation
- Install the Oracle Server Release on same location
- Apply the same Patch set level and patches as on the original system
- Prepare the oracle user environment (profile and needed environment variables)

Create the needed directories and password file

Since we are not installing the database on the target server but performing a migration, we have to create the required directories manually before we mount the database. The following figure shows a listing:

Figure 2: Needed Oracle directories on the target system

```
oracle@hpu015[DB10g]:/opt/oracle/admin/DB10g$ ll
total 176
drwxrwxrwx  2 oracle   dba          16384 May 14 10:53 adump
drwxrwxrwx  2 oracle   dba          57344 May 26 07:30 bdump
drwxrwxrwx  2 oracle   dba           96 Mar 13 12:23 cdump
drwxrwxrwx  2 oracle   dba          16384 May 14 10:53 udump
```

The Oracle password file can be created using the `orapwd` Oracle utility. The new created file has to be located under `$ORACLE_HOME/dbs` (on UNIX platforms)

Windows platforms:

Oracle password location is `$ORACLE_HOME/database`. Moreover, a service has to be created for the instance using the `ORADIM` Oracle utility. See Oracle documentation for more information.

Create listener configuration

Using the oracle utilities Network Configuration Assistant (`netca`) or Network Manager (`netmgr`), create the listener configuration and required `tnsnames.ora` entries.

Media export/media import

Transferring the media from data center A to data center B can be the most challenging part of the migration. While the export and import of the required media should not cause any major issues, the shipping of the physical media devices to the target location is normally the most time-consuming action of the whole process.

Note:

At this point, we assume a Full Backup (Database and Archive logs) has been taken successfully. This makes the migration easier as only one set of tapes needs to be located and there is no need to search for incremental backups.

We describe below two different scenarios, one using a SAN-attached tape library and the other one a file library.

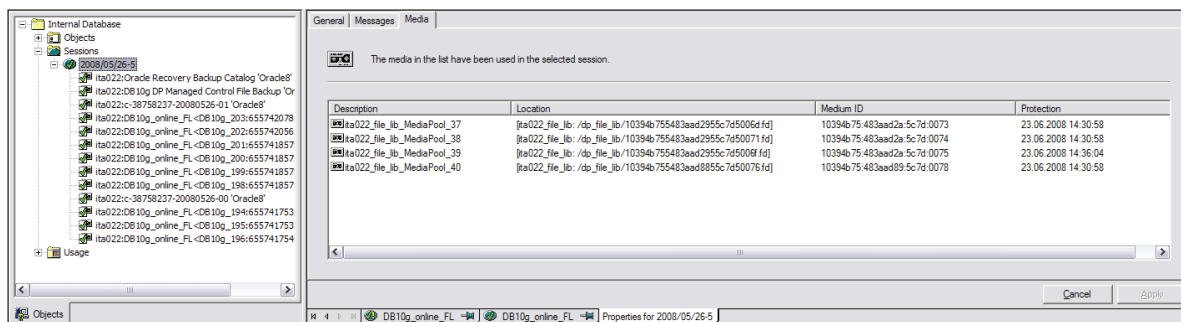
For both cases, tape library and file library, the main difference is the copying/moving and importing of the media on the target cell manager.

1. Find out which tapes were used in the backup session.

You can use any one of the following three methods:

- a. Data Protector GUI:
 - i. Internal Database → Sessions → Select a Session → Properties → Media TAB
 - ii. The following figure shows the media label and medium ID.

Figure 3. Media labels and medium ID



b. Data Protector CLI:

- i. Select the backup session and execute the following command:
`omnidb -session SESSION_ID -media`

```
oracle@ita022[DB10g]:/opt/oracle $ omnidb -session 2008/05/26-5 -media
Medium Label                                Medium ID                                Free Blocks
=====
ita022_file_lib_MediaPool_37                10394b75:483aad2a:5c7d:0073              52428800
ita022_file_lib_MediaPool_38                10394b75:483aad2a:5c7d:0074              52428800
ita022_file_lib_MediaPool_39                10394b75:483aad2a:5c7d:0075              52428800
ita022_file_lib_MediaPool_40                10394b75:483aad89:5c7d:0078              52428800
```

c. Oracle RMAN

- i. Connected to the target database and recovery catalog
- ii. List the full backups of the database in a specific time window
- iii. List the backupsets containing your backup to the get the medium ID.

```
RMAN> list backup of database completed after 'SYSDATE -1 ';

List of Backup Sets
=====

BS Key   Type LV Size               Device Type Elapsed Time Completion Time
-----
43875    Incr 0  239.25M   SBT_TAPE    00:00:30    2008-05-26
BP Key: 43879  Status: AVAILABLE Compressed: NO  Tag: TAG20080526T142913
Handle: DB10g_online_FL<DB10g_196:655741754:1>.dbf  Media:
List of Datafiles in backup set 43875
File LV Type Ckp SCN      Ckp Time    Name
---
2      0  Incr 8387511  2008-05-26 /opt/oracle/oradata/DB10g/undotbs01.dbf
5      0  Incr 8387511  2008-05-26 /opt/oracle/oradata/DB10g/example01.dbf

BS Key   Type LV Size               Device Type Elapsed Time Completion Time
-----
43876    Incr 0  339.75M   SBT_TAPE    00:00:38    2008-05-26
BP Key: 43880  Status: AVAILABLE Compressed: NO  Tag: TAG20080526T142913
Handle: DB10g_online_FL<DB10g_195:655741753:1>.dbf  Media:
List of Datafiles in backup set 43876
File LV Type Ckp SCN      Ckp Time    Name
---
3      0  Incr 8387510  2008-05-26 /opt/oracle/oradata/DB10g/sysaux01.dbf
4      0  Incr 8387510  2008-05-26 /opt/oracle/oradata/DB10g/users01.dbf

BS Key   Type LV Size               Device Type Elapsed Time Completion Time
-----
43877    Incr 0  369.50M   SBT_TAPE    00:00:39    2008-05-26
BP Key: 43881  Status: AVAILABLE Compressed: NO  Tag: TAG20080526T142913
```

```

        Handle: DB10g_online_FL<DB10g_194:655741753:1>.dbf      Media:
List of Datafiles in backup set 43877
File LV Type Ckp SCN      Ckp Time    Name
-----
1      0   Incr 8387509      2008-05-26 /opt/oracle/oradata/DB10g/system01.dbf

RMAN> list backupset 43877 ; (#repeat for every backupset you need#)

List of Backup Sets
=====

BS Key   Type LV Size          Device Type Elapsed Time Completion Time
-----
43877    Incr 0   369.50M      SBT_TAPE    00:00:39      2008-05-26
        BP Key: 43881   Status: AVAILABLE Compressed: NO   Tag: TAG20080526T142913
        Handle: DB10g_online_FL<DB10g_194:655741753:1>.dbf      Media:
10394b75:483aad2a:5c7d:0075[ita022 file lib MediaPool 39]
List of Datafiles in backup set 43877
File LV Type Ckp SCN      Ckp Time    Name
-----
1      0   Incr 8387509      2008-05-26 /opt/oracle/oradata/DB10g/system01.dbf

RMAN>

```

Important Note

In case of object copies or device mirroring, RMAN will always store the media ID that belongs to the original tape. RMAN is not aware of object copies. If the original media expired or was exported, it does not exist in the IDB anymore, but only the COPY. In this case, the Media ID shown by RMAN may refer to an empty tape or to a tape that contains other backup.

2. Export media

- a. A media export, removes the information about the media and its content from the Internal Data Protector Database. However, its content remains intact.
- b. Before been able to export a media, the media protection has to be removed by recycling the media.
- c. The media export has to be done for all media used in the Backup.

Note:

It is not strictly necessary to export the media on the Source cell Manager.

While this step can be done in a data center Consolidation scenario, it obviously cannot be performed in a Disaster Recovery, when the Source cell Manager is not available.

3. Make the media available to target cell manager.

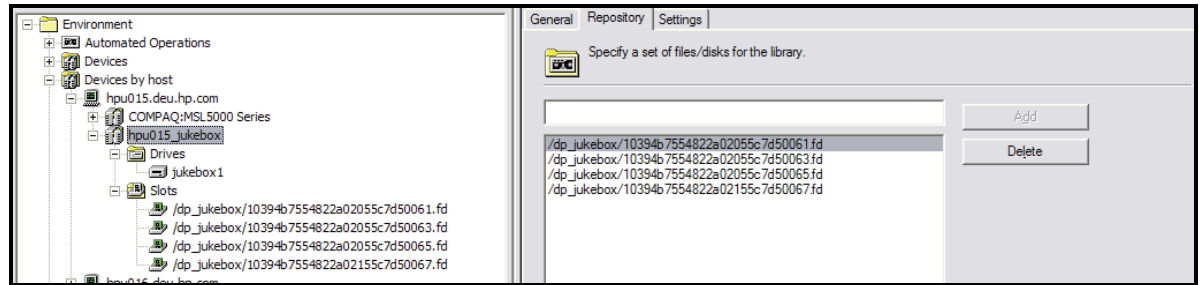
In our testing, we used a tape-based library and a disk-based library:

- a. **Tape Library:** The tape or tapes used for the backup need to be inserted in the target library slots
 - b. **File Library:** If a File Library was used for the backups:
 - i. Create a directory on the target system (our case hpu015) to allocate the file library files (for example, /dp_jukebox)
 - ii. Copy/Transfer the file depots from the source system to the target one, under the new created directory
-

Note

Exported file library media can only be imported into a Jukebox. This is a DP limitation

Figure 4. Jukebox configuration on hpu015



- iii. Add a device type Jukebox on the target system.
 - iv. ADD the files in the repository window
4. Import the media into the target cell.

An import will re-read all the backup session information in the media into the internal database.

- a. Scan the devices and import all media
- b. Verify after the import that you can see the session imported in the Internal Database.

Oracle Recovery Manager Settings

Control File Autobackup

Oracle Control Files backup should be a key element of every Oracle backup procedure. Starting with Oracle 9i, Oracle introduced the Control File Autobackup functionality.

Among other things, it enables to restore the Control File from a backup, although your current SPFILE Control File and recovery catalog are not available.

Every time the Control File autobackup is performed, it will be logged in the instance alert log file:

Figure 5: Alert log entry for the control file autobackup. Below the explanation for the red boxes

```
Starting control autobackup
Tue May 6 15:00:39 2008
Control autobackup written to SBT TAPE device
comment 'API Version 2.0,MMS Version 65.6.0.0',
media '10394b75:48205542:5c7d:0053[ita022_file_lib_MediaPool_27]' (1)
handle 'c-38758237-20080506-01'
(2) (3)
```

From in the above figure, we can gather the following information:

1. Data Protector media ID and media label
2. Database DBID
3. Data Protector Session ID (Backup Date - Session number)

As the Control File autobackup is stored in a well-known format and path, it can be restored with the following command:

```
RMAN> restore controlfile from autobackup;
```

While Oracle's recommendation is to have autobackup Control File set to ON, the default is currently set to OFF.

You can verify the current settings with the following RMAN command:

```
RMAN> show all;
```

To enable autobackup Control File, using RMAN, connect to the target database and recovery catalog (if used) and execute the following command:

```
RMAN> configure controlfile autobackup on;
```

Note:

Unless you have an explicit reason not to do it, set `controlfile autobackup` always to ON. It will definitely ease your restores.

In case `controlfile autobackup` is OFF (default), RMAN will backup the Control File and SPFILE if the backup statement includes the system tablespace.

RMAN Recovery Catalog

The Recovery Catalog is a set of tables and views working as a repository for RMAN to store its data. While it is optional to use it, it is highly recommended to do it.

One of the main advantages using a Recovery Catalog in a Disaster Recovery is that, in case we have lost our control files, the Recovery Catalog will provide you the needed information to perform the restore.

Using the RMAN Recovery Catalog does not replace the usage of the control file autobackup, but it complements it.

As we will see in the following scenarios, once we have lost the Control File, if we have the recovery catalog available, we can perform the control file restore without further issues.

How to determine the Database DBID

In disaster situations where the restore of the Oracle SPFILE and/or Control Files is required, we need to provide the DBID of the Database we want to restore. Depending on the recovery scenario, there are different ways to find out the DBID:

1. Check the Data Protector Backup Session report of the Oracle Database, it should be displayed there:

```
[Normal] From: ob2rman@ita022 "DB10g" Time: 05/08/08 08:38:58
Starting backup of target database.

Net service name: DB10g.
Instance status: OPEN.
Instance name: DB10g.
Database DBID = 38758237.
Database control file type: CURRENT
```

2. the Recovery Catalog (if available); connect to the recovery catalog database with the RMAN user:

```
oracle@ita022[DB10g]:/home/oracle$ sqlplus rman/xxx@rcvcat

SQL*Plus: Release 10.2.0.3.0 - Production on Wed May 21 14:28:20 2008

Copyright (c) 1982, 2006, Oracle. All Rights Reserved.

Connected to:
Oracle Database 10g Enterprise Edition Release 10.2.0.3.0 - 64bit Production
With the Partitioning, OLAP and Data Mining options

SQL> select * from rc_database ;

  DB_KEY  DBINC_KEY          DBID NAME          RESETLOGS_CHANGE# RESETLOGS
-----
          1            2 2216826430 RAC              547422 25-JUL-07
41601      41602 38758237 DB10G            3181685 17-MAR-08
```

Data Protector Settings

Data Protector-managed Control File backup

If enabled (default), Data Protector performs a Control File backup at the end of every Oracle backup session. This is a file system backup and no RMAN is used for it.

Figure 6. DP Managed Control File Backup

```
root@ita022:/.root# omnidb -session 2008/05/26-5

Object Name                                Object Type      Object Status      CopyID
=====
ita022:DB10g_online_FL<DB10g_196:655741754:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_195:655741753:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_194:655741753:1>.dbf Oracle8          Completed
ita022:c-38758237-20080526-00              Oracle8          Completed          148 (0)
ita022:DB10g_online_FL<DB10g_198:655741857:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_199:655741857:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_200:655741857:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_201:655741857:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_202:655742056:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_203:655742078:1>.dbf Oracle8          Completed
ita022:c-38758237-20080526-01              Oracle8          Completed          141 (0)
ita022:DB10g DP Managed Control File       Oracle8          Completed          91 (0)
ita022:Oracle Recovery Backup Catalog      Oracle8          Completed          95 (0)
```

The restore of the DP-managed Control File can be done through the Data Protector GUI. See the Data Protector Integration guide for Oracle for more information.

Recovery Catalog export

As for the Oracle Control File, Data Protector performs a backup of the Oracle Recovery Catalog at the end of every Oracle backup session by default. This functionality can be disabled in the Application Specific Options window, inside the Oracle backup specification.

First, the Oracle Recovery Catalog is exported to the file system and then, by means of a file system backup, copied to the target device.

For restore purposes, the DP GUI and the CLI can be used. Both are documented in the Oracle Integration Manual.

See Appendix D for more information on how to import the Recovery Catalog on the target system.

Restore Scenarios

Procedure Details

This section gives a step-by-step description of performing a restore and recovery of the Oracle database on the target system. We cover the procedure for three different scenarios:

1. Control File autobackup and Recovery Catalog are used
2. Recovery Catalog is used but no Control File autobackup
3. No Control File autobackup nor Recovery Catalog are used

We assume the following for all three scenarios:

- A full online backup (plus archive logs) from the DB10g database on ita022 was taken successfully
- The original tapes/media have already been imported into the target cell manager
- The source data center is not available
- The target system preparation has already been performed
- The RCVCAT recovery catalog, if used, has been imported in the target environment (RCAT)
- The DBID of the database to be restored is known. (Refer to the Appendix for more information.)
- The ORACLE_SID is set in the user environment
- Within the RMAN configuration, SBT_TAPE is set to default TYPE.

In the following scripts, no channel allocation command is used. The reason is, in the default RMAN configuration, SBT_TAPE is configured as the default type, thus, RMAN will allocate, if needed, TAPE channels in the scripts.

To activate it, (default TYPE is DISK), connect in RMAN to your target database (and Recovery Catalog if used) and issue the command:

```
RMAN> CONFIGURE DEFAULT DEVICE TYPE TO 'SBT_TAPE';
```

There is no need to set any OB2BARTYPE, OB2APPNAME, nor OB2BARLIST variables to be able to perform the restore.

For all cases, we will follow the next restore and recovery sequence:

1. Connect to the Recovery Catalog using RMAN
2. Set the DBID
3. Startup nomount: as no SPFILE is available at this time, Oracle will startup the instance with a default SPFILE
4. Restore the SPFILE from the backup.

5. Startup `nomount force`: at this point, we want to have the instance running with the previously restored `SPFILE`. If you wish, you could also specify the `SPFILE` location in the `startup` command.
 6. Restore the control files using `RMAN`
 7. Mount the `database`: using the previously restored control files.
 8. Query the control files for available backup information; decide on the Point In Time Recovery
 9. Restore and Recover the database until the Point in Time (PITR)
 10. Open the database with the Reset logs option
-

Important Note:

When performing a `SPFILE` or Control File restore from autobackup, in cases where the search of the backup set seems to take longer than expected, it is recommended to use the following `omnirc` variable on the server performing the restore:

`OB2RETRYCOUNT=1`

This variable reduces the loop iterations when searching for the autobackup.

All sessions reports are in the Appendix fully listed

Validating RMAN Backups

Oracle RMAN offers two powerful commands to help us detecting physical block corruption on our backups:

- `BACKUP [...] VALIDATE`
RMAN will read the specified datafiles and ensure there is no corruption
- `RESTORE [...] VALIDATE`
As for the Backup validate, RMAN will read the content of the backup (from disk or tape) and verify there is no corruption.

It is also a method to verify the backup performance in our environment. While a backup validate will read the blocks into memory, it will not write the Backupset to disk or tape. This can help us to compare the time with a streaming backup to tape and verify where the time is spent.

When planning a restore of your database, remember to include a `RESTORE VALIDATE` in your restore procedure. This way, you can verify in advance, if the media to be shipped/copied is valid

Under some circumstances, it may happen that your backup data on tape or disk is corrupted. This can be caused by bad tape library firmware, network/SAN issues or even defect tapes. It is very uncommon but possible.

During backup, RMAN cannot verify the integrity of every single block written to the backup device. Thus, it may happen that an RMAN successful backup is not usable as one or more data blocks are corrupt.

In this case, the `RESTORE VALIDATE` option may help you identify the usability of the backup before performing the actual restore.

I. Restore with Control File autobackup ON and using Recovery Catalog

In this case, when the backup was taken, Control File autobackup was enabled, and the Recovery Catalog was used.

First, we start RMAN and connect to the RCAT recovery catalog on cell 2. Note that we do not connect to target yet.

Next, we set the database DBID (which is known in the recovery catalog) and then we can connect to the target.

```
oracle@hpu015[DB10g]:/opt/oracle$ rman catalog rman/xxx@rcat

Recovery Manager: Release 10.2.0.3.0 - Production on Wed May 7 08:27:15 2008

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

connected to recovery catalog database

RMAN> set dbid=38758237 ;

executing command: SET DBID

database name is "DB10G" and DBID is 38758237

RMAN> connect target /

connected to target database (not started)
```

As no SPFILE is available yet, Oracle will be started with a default SPFILE.

Once the instance is in NOMOUNT status, we can start the restore of the SPFILE from autobackup. Notice that if nothing is specified, RMAN looks for the autobackup starting in the current day.

```
RMAN> startup nomount;

startup failed: ORA-01078: failure in processing system parameters
LRM-00109: could not open parameter file '/opt/oracle/product/10.2.0/db_1/dbs/initDB10g.ora'

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

Total System Global Area      159383552 bytes

Fixed Size                     2056752 bytes
Variable Size                  67112400 bytes
Database Buffers               88080384 bytes
Redo Buffers                   2134016 bytes

RMAN>
RMAN> run {
    restore spfile from autobackup;
}

Starting restore at 2008-05-07
allocated channel: ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: sid=36 devtype=SBT TAPE
channel ORA_SBT_TAPE_1: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=35 devtype=DISK

channel ORA_SBT_TAPE_1: looking for autobackup on day: 20080507
channel ORA_SBT_TAPE_1: looking for autobackup on day: 20080506
channel ORA_DISK_1: looking for autobackup on day: 20080507
channel ORA_DISK_1: looking for autobackup on day: 20080506
channel ORA_DISK_1: skipped, autobackup already found
channel ORA_SBT_TAPE_1: autobackup found: c-38758237-20080506-01
[Normal] From: OB2BAR@hpu015.deu.hp.com "" Time: 05/07/08 09:42:59
Starting OB2BAR Restore: ita022:c-38758237-20080506-01 "Oracle8"
```

```
[Normal] From: OB2BAR@hpu015.deu.hp.com "" Time: 05/07/08 09:43:00
Completed OB2BAR Restore: ita022:c-38758237-20080506-01 "Oracle8"
```

```
channel ORA_SBT_TAPE_1: SPFILE restore from autobackup complete
Finished restore at 2008-05-07
```

Once the SPFILE is restored, we decide to restart the instance with the restored SPFILE and not leave it running with the default one.

Note:

The startup nomount force command is equivalent to first shutdown abort the instance and then startup nomount

The same is done for the Control File autobackup restore. Note that, when the restore is finished, the Control File is copied to the location specified in the SPFILE.

With the Control File in place, we can now mount the database.

```
RMAN> startup nomount force;

Oracle instance started

Total System Global Area      314572800 bytes

Fixed Size                    2057944 bytes
Variable Size                 100665640 bytes
Database Buffers              209715200 bytes
Redo Buffers                   2134016 bytes

RMAN> run {
    restore controlfile from autobackup;
}

Starting restore at 2008-05-07
allocated channel: ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: sid=101 devtype=SBT_TAPE
channel ORA_SBT_TAPE_1: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=100 devtype=DISK

channel ORA_SBT_TAPE_1: looking for autobackup on day: 20080507
channel ORA_SBT_TAPE_1: looking for autobackup on day: 20080506
channel ORA_DISK_1: looking for autobackup on day: 20080507
channel ORA_DISK_1: looking for autobackup on day: 20080506
channel ORA_DISK_1: skipped, autobackup already found
channel ORA_SBT_TAPE_1: autobackup found: c-38758237-20080506-01
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 09:50:33
Starting OB2BAR Restore: ita022:c-38758237-20080506-01 "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 09:50:36
Completed OB2BAR Restore: ita022:c-38758237-20080506-01 "Oracle8"

channel ORA_SBT_TAPE_1: control file restore from autobackup complete
output filename=/opt/oracle/oradata/DB10g/control01.ctl
output filename=/opt/oracle/oradata/DB10g/control02.ctl
output filename=/opt/oracle/oradata/DB10g/control03.ctl
Finished restore at 2008-05-07

RMAN>

RMAN> startup mount;

database is already started
database mounted
released channel: ORA_SBT_TAPE_1
released channel: ORA_DISK_1
```

At this point, we have a mounted database.

To move forward first we need to decide, from the available backups, which backup to use for our restore.

In case the number of backups is large, we can just list the backups between two specified dates.

Below we can see the different backup sets available between today and yesterday. It can be seen that all tags are the same (they belong to the same backup)

```
RMAN> list backup of database completed between 'SYSDATE -1' and 'SYSDATE' ;
```

List of Backup Sets

=====

BS Key	Type	LV	Size	Device	Type	Elapsed Time	Completion Time
38975	Incr	0	191.50M	SBT_TAPE		00:00:29	2008-05-06
BP Key: 38979 Status: AVAILABLE Compressed: NO Tag: TAG20080506T145513							
Handle: DB10g_online_FL<DB10g_159:654015314:1>.dbf Media:							
List of Datafiles in backup set 38975							
File	LV	Type	Ckp	SCN	Ckp Time	Name	
2	0	Incr	7375108		2008-05-06	/opt/oracle/oradata/DB10g/undotbs01.dbf	
5	0	Incr	7375108		2008-05-06	/opt/oracle/oradata/DB10g/example01.dbf	

BS Key	Type	LV	Size	Device	Type	Elapsed Time	Completion Time
38976	Incr	0	335.50M	SBT_TAPE		00:00:36	2008-05-06
BP Key: 38980 Status: AVAILABLE Compressed: NO Tag: TAG20080506T145513							
Handle: DB10g_online_FL<DB10g_158:654015314:1>.dbf Media:							
List of Datafiles in backup set 38976							
File	LV	Type	Ckp	SCN	Ckp Time	Name	
3	0	Incr	7375107		2008-05-06	/opt/oracle/oradata/DB10g/sysaux01.dbf	
4	0	Incr	7375107		2008-05-06	/opt/oracle/oradata/DB10g/users01.dbf	

BS Key	Type	LV	Size	Device	Type	Elapsed Time	Completion Time
38977	Incr	0	369.50M	SBT_TAPE		00:00:38	2008-05-06
BP Key: 38981 Status: AVAILABLE Compressed: NO Tag: TAG20080506T145513							
Handle: DB10g_online_FL<DB10g_157:654015313:1>.dbf Media:							
List of Datafiles in backup set 38977							
File	LV	Type	Ckp	SCN	Ckp Time	Name	
1	0	Incr	7375106		2008-05-06	/opt/oracle/oradata/DB10g/system01.dbf	

Next, we look for the archive logs available after the backup. It can be easily done with the following command:

```
RMAN> list backup of archivelog from scn=7375106 ;
```

List of Backup Sets

=====

BS Key	Size	Device	Type	Elapsed Time	Completion Time
39019	1.53G	SBT_TAPE		00:02:40	2008-05-06
BP Key: 39025 Status: AVAILABLE Compressed: NO Tag: TAG20080506T145657					
Handle: DB10g_online_FL<DB10g_164:654015418:1>.dbf Media:					
10394b75:482055a3:5c7d:0057[it022_file_lib_MediaPool_29]					

List of Archived Logs in backup set 39019

Thrd	Seq	Low SCN	Low Time	Next SCN	Next Time
1	96	7347881	2008-05-06	7375215	2008-05-06
1	97	7375215	2008-05-06	7375238	2008-05-06

Finally, we can create our restore and recovery RMAN script, specifying the point in time to recover.

Note that, as sequence, we specify the last archived log available in the backup, plus one. (If we want to recover up to sequence 97, inclusive, we need to specify the value 98 in the until sequence statement; the restore and recovery will be executed until the value 98, not included.)

The full session report can be found in the Appendix A.

```

RMAN> run {
        set until sequence = 98 thread 1;
        restore database;
        recover database;
        alter database open resetlogs;
    }

```

Once the recovery is finished, the Database will be opened and ready to be used.

II. Restore without Control File autobackup and using Recovery Catalog

In this case, when the backup was taken, the Control File autobackup was disabled but the Recovery Catalog was used. While it is very similar to the previous session, no restore from autobackup is possible.

However, as the recovery catalog is available, RMAN has the information about the backupset and Data Protector media where the last SPFILE and Control File backups are stored.

Remember, if Control File autobackup is OFF, the SPFILE and Control File will be backed up every time the system tablespace is part of the backup.

```

oracle@hpu015[DB10g]:/home/oracle$ rman catalog rman/xxx@rcat

Recovery Manager: Release 10.2.0.3.0 - Production on Wed May 7 13:18:58 2008

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

connected to recovery catalog database

RMAN> set dbid=38758237 ;

executing command: SET DBID
database name is "DB10G" and DBID is 38758237

RMAN> connect target / ;

connected to target database (not started)

RMAN> startup nomount;

startup failed: ORA-01078: failure in processing system parameters
LRM-00109: could not open parameter file '/opt/oracle/product/10.2.0/db_1/dbs/initDB10g.ora'

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

Total System Global Area      159383552 bytes

Fixed Size                     2056752 bytes
Variable Size                  67112400 bytes
Database Buffers               88080384 bytes
Redo Buffers                   2134016 bytes

RMAN> restore spfile;

Starting restore at 2008-05-07
allocated channel: ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: sid=36 devtype=SBT_TAPE
channel ORA_SBT_TAPE_1: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=35 devtype=DISK

channel ORA_SBT_TAPE_1: starting datafile backupset restore
channel ORA_SBT_TAPE_1: restoring SPFILE
output filename=/opt/oracle/product/10.2.0/db_1/dbs/spfileDB10g.ora
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_174:654105081:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:20:27
        Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_174:654105081:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:20:30
        Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_174:654105081:1>.dbf
"Oracle8"

```



```
channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_174:654105081:1>.dbf tag=TAG20080507T155104
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:00:45
Finished restore at 2008-05-07
```

```
RMAN>
```

```
RMAN> startup nomount force;
```

```
Oracle instance started
```

```
Total System Global Area      314572800 bytes
```

```
Fixed Size                     2057944 bytes
```

```
Variable Size                  100665640 bytes
```

```
Database Buffers               209715200 bytes
```

```
Redo Buffers                   2134016 bytes
```

As before, we can now proceed with the Control File restore and mount the database:

```
RMAN> restore controlfile;
```

```
Starting restore at 2008-05-07
```

```
allocated channel: ORA_SBT_TAPE_1
```

```
channel ORA_SBT_TAPE_1: sid=101 devtype=SBT_TAPE
```

```
channel ORA_SBT_TAPE_1: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_
```

```
allocated channel: ORA_DISK_1
```

```
channel ORA_DISK_1: sid=100 devtype=DISK
```

```
channel ORA_SBT_TAPE_1: starting datafile backupset restore
```

```
channel ORA_SBT_TAPE_1: restoring control file
```

```
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_180:654105439:1>.dbf
```

```
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:23:07
```

```
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_180:654105439:1>.dbf "Oracle8"
```

```
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:23:09
```

```
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_180:654105439:1>.dbf
```

```
"Oracle8"
```

```
channel ORA_SBT_TAPE_1: restored backup piece 1
```

```
piece handle=DB10g_online_FL<DB10g_180:654105439:1>.dbf tag=TAG20080507T155719
```

```
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:00:45
```

```
output filename=/opt/oracle/oradata/DB10g/control01.ctl
```

```
output filename=/opt/oracle/oradata/DB10g/control02.ctl
```

```
output filename=/opt/oracle/oradata/DB10g/control03.ctl
```

```
Finished restore at 2008-05-07
```

```
RMAN> startup mount;
```

```
database is already started
```

```
database mounted
```

```
released channel: ORA_SBT_TAPE_1
```

```
released channel: ORA_DISK_1
```

In this case, we can see that more than one backup is available in the period listed:

```
RMAN> list backup of database completed after 'SYSDATE';
```

```
List of Backup Sets
```

```
=====
```

BS Key	Type	LV	Size	Device Type	Elapsed Time	Completion Time
40321	Incr	0	896.50M	SBT_TAPE	00:00:46	2008-05-07
BP Key: 40325 Status: AVAILABLE Compressed: NO Tag: TAG20080507T154635						
Handle: DB10g_online_FL<DB10g_167:654104795:1>.dbf Media:						
List of Datafiles in backup set 40321						
File	LV	Type	Ckp SCN	Ckp Time	Name	
1	0	Incr	7463277	2008-05-07	/opt/oracle/oradata/DB10g/system01.dbf	
2	0	Incr	7463277	2008-05-07	/opt/oracle/oradata/DB10g/undotbs01.dbf	
3	0	Incr	7463277	2008-05-07	/opt/oracle/oradata/DB10g/sysaux01.dbf	
4	0	Incr	7463277	2008-05-07	/opt/oracle/oradata/DB10g/users01.dbf	
5	0	Incr	7463277	2008-05-07	/opt/oracle/oradata/DB10g/example01.dbf	

```

BS Key   Type LV Size          Device Type Elapsed Time Completion Time
-----
40354    Incr 0   191.50M      SBT_TAPE    00:00:43      2008-05-07
        BP Key: 40361   Status: AVAILABLE Compressed: NO   Tag: TAG20080507T155104
        Handle: DB10g_online_FL<DB10g_172:654105065:1>.dbf   Media:
        List of Datafiles in backup set 40354
        File LV Type Ckp SCN      Ckp Time    Name
        ----
        2      0   Incr 7463627    2008-05-07 /opt/oracle/oradata/DB10g/undotbs01.dbf
        5      0   Incr 7463627    2008-05-07 /opt/oracle/oradata/DB10g/example01.dbf

```

```

BS Key   Type LV Size          Device Type Elapsed Time Completion Time
-----
40355    Incr 0   369.50M      SBT_TAPE    00:00:45      2008-05-07
        BP Key: 40362   Status: AVAILABLE Compressed: NO   Tag: TAG20080507T155104
        Handle: DB10g_online_FL<DB10g_170:654105065:1>.dbf   Media:
        List of Datafiles in backup set 40355
        File LV Type Ckp SCN      Ckp Time    Name
        ----
        1      0   Incr 7463625    2008-05-07 /opt/oracle/oradata/DB10g/system01.dbf

```

```

BS Key   Type LV Size          Device Type Elapsed Time Completion Time
-----
40356    Incr 0   335.75M      SBT_TAPE    00:00:50      2008-05-07
        BP Key: 40363   Status: AVAILABLE Compressed: NO   Tag: TAG20080507T155104
        Handle: DB10g_online_FL<DB10g_171:654105065:1>.dbf   Media:
        List of Datafiles in backup set 40356
        File LV Type Ckp SCN      Ckp Time    Name
        ----
        3      0   Incr 7463626    2008-05-07 /opt/oracle/oradata/DB10g/sysaux01.dbf
        4      0   Incr 7463626    2008-05-07 /opt/oracle/oradata/DB10g/users01.dbf

```

RMAN> list backup of archivelog from scn=7463625;

List of Backup Sets

=====

```

BS Key   Size          Device Type Elapsed Time Completion Time
-----
40387    256.00K      SBT_TAPE    00:00:04      2008-05-07
        BP Key: 40394   Status: AVAILABLE Compressed: NO   Tag: TAG20080507T155201
        Handle: DB10g_online_FL<DB10g_179:654105279:1>.dbf   Media:
10394b75:4821b3d4:5c7d:005f[ita022_file_lib_MediaPool_31]

```

```

        List of Archived Logs in backup set 40387
        Thrd Seq      Low SCN      Low Time    Next SCN      Next Time
        ----
        1      102      7463712    2008-05-07 7463723      2008-05-07

```

```

BS Key   Size          Device Type Elapsed Time Completion Time
-----
40388    1.59G        SBT_TAPE    00:04:58      2008-05-07
        BP Key: 40395   Status: AVAILABLE Compressed: NO   Tag: TAG20080507T155201
        Handle: DB10g_online_FL<DB10g_178:654105122:1>.dbf   Media:
10394b75:4821b3d4:5c7d:0060[ita022_file_lib_MediaPool_32]

```

```

        List of Archived Logs in backup set 40388
        Thrd Seq      Low SCN      Low Time    Next SCN      Next Time
        ----
        1      101      7463367    2008-05-07 7463712      2008-05-07

```

As the last available archived log is the one with sequence 102, we perform our incomplete recovery until sequence 103:

```
RMAN> run {  
    set until sequence = 103 ;  
    restore database ;  
    recover database ;  
    alter database open resetlogs;  
}
```

III. Restore without Control File autobackup and No Recovery Catalog

In this case, we do not have a recovery catalog or Control File autobackup specified. This means, RMAN has no information about where the Control File backup is located. It is not even aware if there is even a backup of the Control File.

We also assume, no Data Protector managed Control File was taken. There is also no backup of the Recovery Catalog available. This is one of the worst and recovery scenarios you can think about.

In this case, we need to proceed with a different approach:

Instead of relying on Oracle's RMAN for locating the Control File backup, we need to provide RMAN with the Backup Set holding the backup of the Control File.

As our data center A is not available, there is no way to access the Backup Session of the source database. This would have provided us with the Backup set information where the Control File is stored.

However, it should be relatively easy to find the session containing the Oracle Database backup from ita022 as no more backups for this host should be available on this cell. Moreover, the Session ID of the imported backup can also be retrieved from the Media Import Session.

We start querying the Data Protector Internal Database (IDB) for the session we just imported. There are different ways to query the IDB to find out the session. Two of them are listed below:

- Get a list of the sessions in the IDB and filter them with the source hostname
- Query the IDB for backup sessions on a specific day. In our example, it just returns one.

```
hpu015:[/.root]# omnidb -session | grep ita022  
2008/05/08-3      Backup      Completed      oracle.dba@ita022  
  
hpu015:[/.root]# omnidb -session -type backup -since 2008/05/08 -detail  
SessionID : 2008/05/08-3  
Backup Specification: Oracle8 DB10g_online_FL  
Session type       : Backup (full)  
Started            : Thu May  8 05:39:18 2008  
Finished           : Thu May  8 05:43:24 2008  
Status             : Completed  
Number of warnings : 0  
Number of errors   : 0  
User               : oracle  
Group              : dba  
Host               : ita022
```

Important Note:

It has to be mentioned that Data Protector has no information about which files are contained in each of these backup objects.

Remember, RMAN is streaming the data to Data Protector's channels, but DP has no information about the files been sent through the channels. Only RMAN does.

Once we have the imported session, we can get a list of the objects it contains using the following command:

```
omnidb -session "Session_ID"
```

```
hpu015:[/.root]# omnidb -session "2008/05/08-3"
Object Name                                Object Type      Object Status      CopyID
=====
ita022:DB10g_online_FL<DB10g_184:654165548:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_181:654165548:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_182:654165548:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_183:654165548:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_185:654165575:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_187:654165598:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_186:654165598:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_188:654165598:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_189:654165598:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_190:654165764:1>.dbf Oracle8          Completed
ita022:DB10g_online_FL<DB10g_191:654165773:1>.dbf Oracle8          Completed
ita022:DB10g DP Managed Control File Oracle8          Completed      508 (O)
ita022:Oracle Recovery Backup Catalog Oracle8          Completed      506 (O)
```

As we can see in the preceding figure, there are 11 Oracle RMAN objects and two Data Protector objects in this session.

Next, we startup nomount the instance to be able to start the restore:

```
$ rman
RMAN> set dbid=38758237 ;
RMAN> connect target /
RMAN> startup nomount force;
```

Unfortunately, there is no process to find out in which of the objects the SPFILE and Control File are stored. We need to create a small RMAN script and feed the restore clause with the different Object Names until the restore finds the SPFILE.

For a large number of objects in the backup set, it may be more convenient to write a small shell script to perform it automatically. See the Appendix for a sample script to run the restore.

Below, we see a successful restore session with the object that contains the SPFILE:

```
RMAN> run { allocate channel dev_0 type sbt_tape;
           restore spfile from 'ita022:DB10g_online_FL<DB10g_185:654165575:1>.dbf' ;
         }

allocated channel: dev_0
channel dev_0: sid=36 devtype=SBT_TAPE
channel dev_0: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_

Starting restore at 2008-05-08

channel dev_0: autobackup found: ita022:DB10g_online_FL<DB10g_185:654165575:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "" Time: 05/08/08 11:16:21
        Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_185:654165575:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "" Time: 05/08/08 11:16:25
        Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_185:654165575:1>.dbf
"Oracle8"

channel dev_0: SPFILE restore from autobackup complete
Finished restore at 2008-05-08
released channel: dev_0
```

As in the preceding case, we have to provide the right object that contains the Control File backup. Again, below the session with the restore of the Control File:

```

RMAN> run { allocate channel dev_0 type sbt_tape;
           restore controlfile from 'ita022:DB10g_online_FL<DB10g_191:654165773:1>.dbf'
;
           }

allocated channel: dev_0
channel dev_0: sid=101_devtype=SBT_TAPE
channel dev_0: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_

Starting restore at 2008-05-08

channel dev_0: restoring control file
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "" Time: 05/08/08 11:33:29
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_191:654165773:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "" Time: 05/08/08 11:33:32
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_191:654165773:1>.dbf
"Oracle8"

channel dev_0: restore complete, elapsed time: 00:00:46
output filename=/opt/oracle/oradata/DB10g/control01.ctl
output filename=/opt/oracle/oradata/DB10g/control02.ctl
output filename=/opt/oracle/oradata/DB10g/control03.ctl
Finished restore at 2008-05-08
released channel: dev_0

RMAN> alter database mount;

database mounted

```

As for the other scenarios, we perform a Point in Time restore and recovery of the database:

```

RMAN> list backup of database completed after 'SYSDATE -1';

List of Backup Sets
=====

BS Key   Type LV Size       Device Type Elapsed Time Completion Time
-----
172      Incr 0  369.50M   SBT_TAPE    00:00:42    2008-05-08
BP Key: 172   Status: AVAILABLE Compressed: NO Tag: TAG20080508T083907
Handle: DB10g_online_FL<DB10g_181:654165548:1>.dbf Media:
List of Datafiles in backup set 172
File LV Type Ckp SCN      Ckp Time  Name
-----
1      0   Incr 7525243  2008-05-08 /opt/oracle/oradata/DB10g/system01.dbf

RMAN> list backup of archivelog from scn=7525243 ;

List of Backup Sets
=====

BS Key   Size       Device Type Elapsed Time Completion Time
-----
177      113.75M    SBT_TAPE    00:00:06    2008-05-08
BP Key: 177   Status: AVAILABLE Compressed: NO Tag: TAG20080508T083957
Handle: DB10g_online_FL<DB10g_190:654165764:1>.dbf Media:
10394b75:4822a021:5c7d:006a[ita022_file_lib_MediaPool_34]

List of Archived Logs in backup set 177
Thrd Seq      Low SCN      Low Time     Next SCN     Next Time
-----
1      104          7511046      2008-05-08  7525289      2008-05-08
1      105          7525289      2008-05-08  7525300      2008-05-08

RMAN> run
{
set until sequence = 106 ;
restore database ;
recover database;
alter database open resetlogs;
}

```

Recommendations

This is a summary of the recommendations described along this paper:

- Verify and document your Recovery Plan regularly
- Always enable CONTROL FILE AUTOBACKUP
- Use a Recovery Catalog in your environment
- Plan a RESTORE VALIDATE on a regular basis.

Limitations

This is a summary of the issues that were discovered during the white paper investigation:

- Currently, it is not possible to restore the DP-managed Control File to a server where the Oracle integration has not been configured previously
 - The current Oracle integration requires the instance to be configured, although it is a file system restore. By default, the Oracle instance configuration files on the cell manager are accessed to retrieve instance specific information, as login, `ORACLE_HOME` and so on.
 - For the disaster/migration scenarios discussed here, it means, the DP managed Control File cannot be used for the initial restore, but we need to rely on the RMAN Control File backup.
 - The problem has been addressed to the LAB and has been investigated. The fix will be released in the next future.
- Exported media from a File Library can only be imported into a Jukebox, and not on a file library. This needs to be taken into account when planning a migration.
- Only RMAN knows which Oracle objects are stored on which backup sets. This limitation becomes critical in the situation where neither Control File autobackup nor Recovery Catalog is used.
- When using Object Copy or Device Mirroring be aware that, if the original tape expired or was exported, the media ID stored by RMAN (original) may point to a tape that contains other backups. This needs to be taken into account when selecting the media to be used in the migration. RMAN stores in its catalog the media ID of the original tape, and does not know about object copies.

Summary

Disaster recovery involving Oracle databases is a task that requires careful planning. Data Protector Catalog information and Oracle control files availability are crucial to have a successful restore.

On the other hand, if the required configuration steps have been followed, the whole process can be achieved very smoothly.

HP Software Data Protector jointly with Oracle databases is your best bet for a successful database migration.

Appendix A: Session Reports

Session 1: Control File autobackup ON and Recovery Catalog

```
oracle@hpu015[DB10g]:/opt/oracle/product/10.2.0/db_1/dbs$ rman catalog rman/xxx@rcat

Recovery Manager: Release 10.2.0.3.0 - Production on Wed May 7 08:27:15 2008

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

connected to recovery catalog database

RMAN> set dbid=38758237 ;

executing command: SET DBID
database name is "DB10G" and DBID is 38758237

RMAN> connect target /

connected to target database (not started)

RMAN> startup nomount;

startup failed: ORA-01078: failure in processing system parameters
LRM-00109: could not open parameter file '/opt/oracle/product/10.2.0/db_1/dbs/initDB10g.ora'

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

Total System Global Area      159383552 bytes

Fixed Size                    2056752 bytes
Variable Size                  67112400 bytes
Database Buffers               88080384 bytes
Redo Buffers                   2134016 bytes

RMAN>
RMAN> run {
2> restore spfile from autobackup;
3> }

Starting restore at 2008-05-07
allocated channel: ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: sid=36 devtype=SBT_TAPE
channel ORA_SBT_TAPE_1: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=35 devtype=DISK

channel ORA_SBT_TAPE_1: looking for autobackup on day: 20080507
channel ORA_SBT_TAPE_1: looking for autobackup on day: 20080506
channel ORA_DISK_1: looking for autobackup on day: 20080507
channel ORA_DISK_1: looking for autobackup on day: 20080506
channel ORA_DISK_1: skipped, autobackup already found
channel ORA_SBT_TAPE_1: autobackup found: c-38758237-20080506-01
[Normal] From: OB2BAR@hpu015.deu.hp.com "" Time: 05/07/08 09:42:59
        Starting OB2BAR Restore: ita022:c-38758237-20080506-01 "Oracle8"

[Normal] From: OB2BAR@hpu015.deu.hp.com "" Time: 05/07/08 09:43:00
        Completed OB2BAR Restore: ita022:c-38758237-20080506-01 "Oracle8"

channel ORA_SBT_TAPE_1: SPFILE restore from autobackup complete
Finished restore at 2008-05-07

RMAN>

RMAN> startup nomount force;

Oracle instance started

Total System Global Area      314572800 bytes
```

```

Fixed Size                2057944 bytes
Variable Size             100665640 bytes
Database Buffers          209715200 bytes
Redo Buffers              2134016 bytes

RMAN> run {
2> restore controlfile from autobackup;
3> }

Starting restore at 2008-05-07
allocated channel: ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: sid=101 devtype=SBT_TAPE
channel ORA_SBT_TAPE_1: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=100 devtype=DISK

channel ORA_SBT_TAPE_1: looking for autobackup on day: 20080507
channel ORA_SBT_TAPE_1: looking for autobackup on day: 20080506
channel ORA_DISK_1: looking for autobackup on day: 20080507
channel ORA_DISK_1: looking for autobackup on day: 20080506
channel ORA_DISK_1: skipped, autobackup already found
channel ORA_SBT_TAPE_1: autobackup found: c-38758237-20080506-01
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 09:50:33
        Starting OB2BAR Restore: ita022:c-38758237-20080506-01 "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 09:50:36
        Completed OB2BAR Restore: ita022:c-38758237-20080506-01 "Oracle8"

channel ORA_SBT_TAPE_1: control file restore from autobackup complete
output filename=/opt/oracle/oradata/DB10g/control01.ctl
output filename=/opt/oracle/oradata/DB10g/control02.ctl
output filename=/opt/oracle/oradata/DB10g/control03.ctl
Finished restore at 2008-05-07

RMAN>

RMAN> startup mount;

database is already started
database mounted
released channel: ORA_SBT_TAPE_1
released channel: ORA_DISK_1

RMAN>

RMAN> list backup of database completed between 'SYSDATE -1' and 'SYSDATE' ;

List of Backup Sets
=====

BS Key   Type LV Size       Device Type Elapsed Time Completion Time
-----
38975    Incr 0  191.50M   SBT_TAPE    00:00:29    2008-05-06
        BP Key: 38979   Status: AVAILABLE Compressed: NO   Tag: TAG20080506T145513
        Handle: DB10g_online_FL<DB10g_159:654015314:1>.dbf Media:
        List of Datafiles in backup set 38975
        File LV Type Ckp SCN      Ckp Time    Name
        ----
        2      0  Incr 7375108  2008-05-06 /opt/oracle/oradata/DB10g/undotbs01.dbf
        5      0  Incr 7375108  2008-05-06 /opt/oracle/oradata/DB10g/example01.dbf

BS Key   Type LV Size       Device Type Elapsed Time Completion Time
-----
38976    Incr 0  335.50M   SBT_TAPE    00:00:36    2008-05-06
        BP Key: 38980   Status: AVAILABLE Compressed: NO   Tag: TAG20080506T145513
        Handle: DB10g_online_FL<DB10g_158:654015314:1>.dbf Media:
        List of Datafiles in backup set 38976
        File LV Type Ckp SCN      Ckp Time    Name
        ----
        3      0  Incr 7375107  2008-05-06 /opt/oracle/oradata/DB10g/sysaux01.dbf
        4      0  Incr 7375107  2008-05-06 /opt/oracle/oradata/DB10g/users01.dbf

```



```

BS Key   Type LV Size          Device Type Elapsed Time Completion Time
-----
38977    Incr 0   369.50M    SBT_TAPE    00:00:38    2008-05-06
BP Key: 38981    Status: AVAILABLE Compressed: NO Tag: TAG20080506T145513
Handle: DB10g_online_FL<DB10g_157:654015313:1>.dbf Media:
List of Datafiles in backup set 38977
File LV Type Ckp SCN      Ckp Time  Name
-----
1      0   Incr 7375106    2008-05-06 /opt/oracle/oradata/DB10g/system01.dbf

RMAN>

RMAN> list backup of archivelog from scn=7375106 ;

List of Backup Sets
=====

BS Key   Size          Device Type Elapsed Time Completion Time
-----
39019    1.53G          SBT_TAPE    00:02:40    2008-05-06
BP Key: 39025    Status: AVAILABLE Compressed: NO Tag: TAG20080506T145657
Handle: DB10g_online_FL<DB10g_164:654015418:1>.dbf Media:
10394b75:482055a3:5c7d:0057[ita022_file_lib_MediaPool_29]

List of Archived Logs in backup set 39019
Thrd Seq      Low SCN      Low Time     Next SCN     Next Time
-----
1      96          7347881     2008-05-06  7375215     2008-05-06
1      97          7375215     2008-05-06  7375238     2008-05-06

RMAN>

RMAN> run {
2> set until sequence = 98 thread 1;
3> restore database;
4> recover database;
5> alter database open resetlogs;
6> }

executing command: SET until clause

Starting restore at 2008-05-07
allocated channel: ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: sid=100 devtype=SBT_TAPE
channel ORA_SBT_TAPE_1: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=101 devtype=DISK

channel ORA_SBT_TAPE_1: starting datafile backupset restore
channel ORA_SBT_TAPE_1: specifying datafile(s) to restore from backup set
restoring datafile 00002 to /opt/oracle/oradata/DB10g/undotbs01.dbf
restoring datafile 00005 to /opt/oracle/oradata/DB10g/example01.dbf
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_159:654015314:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 10:35:48
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_159:654015314:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 10:36:16
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_159:654015314:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_159:654015314:1>.dbf tag=TAG20080506T145513
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:01:15
channel ORA_SBT_TAPE_1: starting datafile backupset restore
channel ORA_SBT_TAPE_1: specifying datafile(s) to restore from backup set
restoring datafile 00003 to /opt/oracle/oradata/DB10g/sysaux01.dbf
restoring datafile 00004 to /opt/oracle/oradata/DB10g/users01.dbf
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_158:654015314:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 10:37:03
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_158:654015314:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 10:37:58

```

```

Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_158:654015314:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_158:654015314:1>.dbf tag=TAG20080506T145513
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:01:35
channel ORA_SBT_TAPE_1: starting datafile backupset restore
channel ORA_SBT_TAPE_1: specifying datafile(s) to restore from backup set
restoring datafile 00001 to /opt/oracle/oradata/DB10g/system01.dbf
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_157:654015313:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 10:38:39
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_157:654015313:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 10:37:58
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_158:654015314:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_158:654015314:1>.dbf tag=TAG20080506T145513
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:01:35
channel ORA_SBT_TAPE_1: starting datafile backupset restore
channel ORA_SBT_TAPE_1: specifying datafile(s) to restore from backup set
restoring datafile 00001 to /opt/oracle/oradata/DB10g/system01.dbf
channel ORA_SBT_TAPE_1: reading from backup piece
DB10g_online_FL<DB10g_157:654015313:1>.dbf[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com
"DB10g" Time: 05/07/08 10:39:42
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_157:654015313:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_157:654015313:1>.dbf tag=TAG20080506T145513
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:01:45
Finished restore at 2008-05-07

Starting recover at 2008-05-07
using channel ORA_SBT_TAPE_1
using channel ORA_DISK_1

starting media recovery

channel ORA_SBT_TAPE_1: starting archive log restore to default destination
channel ORA_SBT_TAPE_1: restoring archive log
archive log thread=1 sequence=96
channel ORA_SBT_TAPE_1: restoring archive log
archive log thread=1 sequence=97
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_164:654015418:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 10:40:33
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_164:654015418:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 10:41:24
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_164:654015418:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_164:654015418:1>.dbf tag=TAG20080506T145657
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:01:35
archive log filename=/opt/oracle/oradata/DB10g/arc/1_96_649590802.dbf thread=1 sequence=96
archive log filename=/opt/oracle/oradata/DB10g/arc/1_97_649590802.dbf thread=1 sequence=97
media recovery complete, elapsed time: 00:00:03
Finished recover at 2008-05-07

database opened
new incarnation of database registered in recovery catalog
starting full resync of recovery catalog
full resync complete

RMAN>

```

Session 2: Control File autobackup OFF and Recovery Catalog

```
oracle@hpu015[DB10g]:/home/oracle$ rman catalog rman/xxx@rcat

Recovery Manager: Release 10.2.0.3.0 - Production on Wed May 7 13:18:58 2008

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

connected to recovery catalog database

RMAN> set dbid=38758237 ;

executing command: SET DBID
database name is "DB10G" and DBID is 38758237

RMAN> connect target / ;

connected to target database (not started)

RMAN> startup nomount;

startup failed: ORA-01078: failure in processing system parameters
LRM-00109: could not open parameter file '/opt/oracle/product/10.2.0/db_1/dbs/initDB10g.ora'

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

Total System Global Area      159383552 bytes

Fixed Size                    2056752 bytes
Variable Size                  67112400 bytes
Database Buffers               88080384 bytes
Redo Buffers                   2134016 bytes

RMAN> restore spfile;

Starting restore at 2008-05-07
allocated channel: ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: sid=36 devtype=SBT_TAPE
channel ORA_SBT_TAPE_1: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=35 devtype=DISK

channel ORA_SBT_TAPE_1: starting datafile backupset restore
channel ORA_SBT_TAPE_1: restoring SPFILE
output filename=/opt/oracle/product/10.2.0/db_1/dbs/spfileDB10g.ora
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_174:654105081:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:20:27
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_174:654105081:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:20:30
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_174:654105081:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_174:654105081:1>.dbf tag=TAG20080507T155104
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:00:45
Finished restore at 2008-05-07

RMAN>

RMAN> startup nomount force;

Oracle instance started

Total System Global Area      314572800 bytes

Fixed Size                    2057944 bytes
Variable Size                  100665640 bytes
Database Buffers               209715200 bytes
Redo Buffers                   2134016 bytes

RMAN> restore controlfile;

Starting restore at 2008-05-07
allocated channel: ORA_SBT_TAPE_1
```

```

channel ORA_SBT_TAPE_1: sid=101 devtype=SBT_TAPE
channel ORA_SBT_TAPE_1: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=100 devtype=DISK

channel ORA_SBT_TAPE_1: starting datafile backupset restore
channel ORA_SBT_TAPE_1: restoring control file
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_180:654105439:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:23:07
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_180:654105439:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:23:09
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_180:654105439:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_180:654105439:1>.dbf tag=TAG20080507T155719
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:00:45
output filename=/opt/oracle/oradata/DB10g/control01.ctl
output filename=/opt/oracle/oradata/DB10g/control02.ctl
output filename=/opt/oracle/oradata/DB10g/control03.ctl
Finished restore at 2008-05-07

RMAN>
RMAN> startup mount;

database is already started
database mounted
released channel: ORA_SBT_TAPE_1
released channel: ORA_DISK_1

RMAN> list backup of database completed after 'SYSDATE';

List of Backup Sets
=====

BS Key Type LV Size Device Type Elapsed Time Completion Time
-----
40321 Incr 0 896.50M SBT_TAPE 00:00:46 2008-05-07
BP Key: 40325 Status: AVAILABLE Compressed: NO Tag: TAG20080507T154635
Handle: DB10g_online_FL<DB10g_167:654104795:1>.dbf Media:
List of Datafiles in backup set 40321
File LV Type Ckp SCN Ckp Time Name
----
1 0 Incr 7463277 2008-05-07 /opt/oracle/oradata/DB10g/system01.dbf
2 0 Incr 7463277 2008-05-07 /opt/oracle/oradata/DB10g/undotbs01.dbf
3 0 Incr 7463277 2008-05-07 /opt/oracle/oradata/DB10g/sysaux01.dbf
4 0 Incr 7463277 2008-05-07 /opt/oracle/oradata/DB10g/users01.dbf
5 0 Incr 7463277 2008-05-07 /opt/oracle/oradata/DB10g/example01.dbf

BS Key Type LV Size Device Type Elapsed Time Completion Time
-----
40354 Incr 0 191.50M SBT_TAPE 00:00:43 2008-05-07
BP Key: 40361 Status: AVAILABLE Compressed: NO Tag: TAG20080507T155104
Handle: DB10g_online_FL<DB10g_172:654105065:1>.dbf Media:
List of Datafiles in backup set 40354
File LV Type Ckp SCN Ckp Time Name
----
2 0 Incr 7463627 2008-05-07 /opt/oracle/oradata/DB10g/undotbs01.dbf
5 0 Incr 7463627 2008-05-07 /opt/oracle/oradata/DB10g/example01.dbf

BS Key Type LV Size Device Type Elapsed Time Completion Time
-----
40355 Incr 0 369.50M SBT_TAPE 00:00:45 2008-05-07
BP Key: 40362 Status: AVAILABLE Compressed: NO Tag: TAG20080507T155104
Handle: DB10g_online_FL<DB10g_170:654105065:1>.dbf Media:
List of Datafiles in backup set 40355
File LV Type Ckp SCN Ckp Time Name
----
1 0 Incr 7463625 2008-05-07 /opt/oracle/oradata/DB10g/system01.dbf

BS Key Type LV Size Device Type Elapsed Time Completion Time
-----
40356 Incr 0 335.75M SBT_TAPE 00:00:50 2008-05-07
BP Key: 40363 Status: AVAILABLE Compressed: NO Tag: TAG20080507T155104

```

```

        Handle: DB10g_online_FL<DB10g_171:654105065:1>.dbf      Media:
List of Datafiles in backup set 40356
File LV Type Ckp SCN      Ckp Time    Name
-----
3      0  Incr 7463626    2008-05-07 /opt/oracle/oradata/DB10g/sysaux01.dbf
4      0  Incr 7463626    2008-05-07 /opt/oracle/oradata/DB10g/users01.dbf

RMAN> list backup of archivelog from scn=7463625;

List of Backup Sets
=====

BS Key   Size          Device Type Elapsed Time Completion Time
-----
40387    256.00K       SBT_TAPE    00:00:04     2008-05-07
        BP Key: 40394      Status: AVAILABLE Compressed: NO   Tag: TAG20080507T155201
        Handle: DB10g_online_FL<DB10g_179:654105279:1>.dbf      Media:
10394b75:4821b3d4:5c7d:005f[ita022_file_lib_MediaPool_31]

List of Archived Logs in backup set 40387
Thrd Seq      Low SCN      Low Time     Next SCN     Next Time
-----
1      102          7463712     2008-05-07  7463723     2008-05-07

BS Key   Size          Device Type Elapsed Time Completion Time
-----
40388    1.59G         SBT_TAPE    00:04:58     2008-05-07
        BP Key: 40395      Status: AVAILABLE Compressed: NO   Tag: TAG20080507T155201
        Handle: DB10g_online_FL<DB10g_178:654105122:1>.dbf      Media:
10394b75:4821b3d4:5c7d:0060[ita022_file_lib_MediaPool_32]

List of Archived Logs in backup set 40388
Thrd Seq      Low SCN      Low Time     Next SCN     Next Time
-----
1      101          7463367     2008-05-07  7463712     2008-05-07

RMAN> run {
2> set until sequence = 103 ;
3> restore database ;
4> recover database ;
5> alter database open resetlogs;
6> }

executing command: SET until clause

Starting restore at 2008-05-07
allocated channel: ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: sid=100 devtype=SBT_TAPE
channel ORA_SBT_TAPE_1: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=101 devtype=DISK

channel ORA_SBT_TAPE_1: starting datafile backupset restore
channel ORA_SBT_TAPE_1: specifying datafile(s) to restore from backup set
restoring datafile 00002 to /opt/oracle/oradata/DB10g/undotbs01.dbf
restoring datafile 00005 to /opt/oracle/oradata/DB10g/example01.dbf
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_172:654105065:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:41:26
        Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_172:654105065:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:42:00
        Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_172:654105065:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_172:654105065:1>.dbf tag=TAG20080507T155104
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:01:25
channel ORA_SBT_TAPE_1: starting datafile backupset restore
channel ORA_SBT_TAPE_1: specifying datafile(s) to restore from backup set
restoring datafile 00003 to /opt/oracle/oradata/DB10g/sysaux01.dbf
restoring datafile 00004 to /opt/oracle/oradata/DB10g/users01.dbf
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_171:654105065:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:42:51
        Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_171:654105065:1>.dbf "Oracle8"

```

```

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:43:49
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_171:654105065:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_171:654105065:1>.dbf tag=TAG20080507T155104
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:01:46
channel ORA_SBT_TAPE_1: starting datafile backupset restore
channel ORA_SBT_TAPE_1: specifying datafile(s) to restore from backup set
restoring datafile 00001 to /opt/oracle/oradata/DB10g/system01.dbf
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_170:654105065:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:44:36
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_170:654105065:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:45:40
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_170:654105065:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_170:654105065:1>.dbf tag=TAG20080507T155104
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:01:45
Finished restore at 2008-05-07

Starting recover at 2008-05-07
using channel ORA_SBT_TAPE_1
using channel ORA_DISK_1 1

starting media recovery

channel ORA_SBT_TAPE_1: starting archive log restore to default destination
channel ORA_SBT_TAPE_1: restoring archive log
archive log thread=1 sequence=102
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_179:654105279:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:46:31
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_179:654105279:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:46:31
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_179:654105279:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_179:654105279:1>.dbf tag=TAG20080507T155201
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:00:45
channel ORA_SBT_TAPE_1: starting archive log restore to default destination
channel ORA_SBT_TAPE_1: restoring archive log
archive log thread=1 sequence=101
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_178:654105122:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:47:17
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_178:654105122:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/07/08 13:49:52
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_178:654105122:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_178:654105122:1>.dbf tag=TAG20080507T155201
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:03:26
archive log filename=/opt/oracle/oradata/DB10g/arc/1_101_649590802.dbf thread=1 sequence=101
archive log filename=/opt/oracle/oradata/DB10g/arc/1_102_649590802.dbf thread=1 sequence=102
media recovery complete, elapsed time: 00:00:03
Finished recover at 2008-05-07

database opened
new incarnation of database registered in recovery catalog
starting full resync of recovery catalog
full resync complete

RMAN>

```

Session 3: Control File autobackup OFF and NO Recovery Catalog

```

oracle@hpu015[DB10g]:/home/oracle$ omnidb -session "2008/05/08-3"
Object Name                                Object Type    Object Status    CopyID
=====
ita022:DB10g_online_FL<DB10g_184:654165548:1>.dbf Oracle8        Completed
ita022:DB10g_online_FL<DB10g_181:654165548:1>.dbf Oracle8        Completed
ita022:DB10g_online_FL<DB10g_182:654165548:1>.dbf Oracle8        Completed
ita022:DB10g_online_FL<DB10g_183:654165548:1>.dbf Oracle8        Completed
ita022:DB10g_online_FL<DB10g_185:654165575:1>.dbf Oracle8        Completed
ita022:DB10g_online_FL<DB10g_187:654165598:1>.dbf Oracle8        Completed
ita022:DB10g_online_FL<DB10g_186:654165598:1>.dbf Oracle8        Completed
ita022:DB10g_online_FL<DB10g_188:654165598:1>.dbf Oracle8        Completed
ita022:DB10g_online_FL<DB10g_189:654165598:1>.dbf Oracle8        Completed
ita022:DB10g_online_FL<DB10g_190:654165764:1>.dbf Oracle8        Completed
ita022:DB10g_online_FL<DB10g_191:654165773:1>.dbf Oracle8        Completed
ita022:DB10g DP Managed Control File      Oracle8        Completed        508 (0)
ita022:Oracle Recovery Backup Catalog     Oracle8        Completed        506 (0)

RMAN> set dbid=38758237 ;

executing command: SET DBID

RMAN> connect target /

connected to target database:  (not mounted)

RMAN> startup nomount force;

startup failed: ORA-01078: failure in processing system parameters
LRM-00109: could not open parameter file '/opt/oracle/product/10.2.0/db_1/dbs/initDB10g.ora'

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

Total System Global Area      159383552 bytes

Fixed Size                    2056752 bytes
Variable Size                 67112400 bytes
Database Buffers              88080384 bytes
Redo Buffers                   2134016 bytes

RMAN> run { allocate channel dev_0 type sbt_tape;
2> restore spfile from 'ita022:DB10g_online_FL<DB10g_185:654165575:1>.dbf' ; }

allocated channel: dev_0
channel dev_0: sid=36 devtype=SBT_TAPE
channel dev_0: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_

Starting restore at 2008-05-08

channel dev_0: autobackup found: ita022:DB10g_online_FL<DB10g_185:654165575:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "" Time: 05/08/08 11:16:21
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_185:654165575:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "" Time: 05/08/08 11:16:25
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_185:654165575:1>.dbf
"Oracle8"

channel dev_0: SPFILE restore from autobackup complete
Finished restore at 2008-05-08
released channel: dev_0

RMAN> run { allocate channel dev_0 type sbt_tape;
2> restore controlfile from 'ita022:DB10g_online_FL<DB10g_191:654165773:1>.dbf' ; }

allocated channel: dev_0
channel dev_0: sid=101 devtype=SBT_TAPE
channel dev_0: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_

Starting restore at 2008-05-08

channel dev_0: restoring control file
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "" Time: 05/08/08 11:33:29
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_191:654165773:1>.dbf "Oracle8"

```

```
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "" Time: 05/08/08 11:33:32
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_191:654165773:1>.dbf
"Oracle8"
```

```
channel dev_0: restore complete, elapsed time: 00:00:46
output filename=/opt/oracle/oradata/DB10g/control01.ctl
output filename=/opt/oracle/oradata/DB10g/control02.ctl
output filename=/opt/oracle/oradata/DB10g/control03.ctl
Finished restore at 2008-05-08
released channel: dev_0
```

```
RMAN> alter database mount;
```

```
database mounted
```

```
RMAN> list backup of database completed after 'SYSDATE -1';
```

```
List of Backup Sets
=====
```

BS Key	Type	LV	Size	Device	Type	Elapsed Time	Completion Time
172	Incr	0	369.50M	SBT_TAPE		00:00:42	2008-05-08
	BP Key:	172	Status:	AVAILABLE	Compressed:	NO	Tag: TAG20080508T083907
	Handle:	DB10g_online_FL<DB10g_181:654165548:1>.dbf	Media:				
	List of Datafiles in backup set 172						
	File	LV	Type	Ckp	SCN	Ckp Time	Name
	1	0	Incr	7525243	2008-05-08	/opt/oracle/oradata/DB10g/system01.dbf	

```
RMAN> list backup of archivelog from scn=7525243 ;
```

```
List of Backup Sets
=====
```

BS Key	Size	Device	Type	Elapsed Time	Completion Time		
177	113.75M	SBT_TAPE		00:00:06	2008-05-08		
	BP Key:	177	Status:	AVAILABLE	Compressed:	NO	Tag: TAG20080508T083957
	Handle:	DB10g_online_FL<DB10g_190:654165764:1>.dbf	Media:				
	10394b75:4822a021:5c7d:006a[ita022_file_lib_MediaPool_34]						
	List of Archived Logs in backup set 177						
	Thrd	Seq	Low SCN	Low Time	Next SCN	Next Time	
	1	104	7511046	2008-05-08	7525289	2008-05-08	
	1	105	7525289	2008-05-08	7525300	2008-05-08	

```
RMAN> run
2> {
3> set until sequence = 106 ;
4> restore database ;
5> recover database;
6> alter database open resetlogs;
7> }
```

```
executing command: SET until clause
```

```
Starting restore at 2008-05-08
allocated channel: ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: sid=101 devtype=SBT_TAPE
channel ORA_SBT_TAPE_1: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=100 devtype=DISK

channel ORA_SBT_TAPE_1: starting datafile backupset restore
channel ORA_SBT_TAPE_1: specifying datafile(s) to restore from backup set
restoring datafile 00002 to /opt/oracle/oradata/DB10g/undotbs01.dbf
restoring datafile 00005 to /opt/oracle/oradata/DB10g/example01.dbf
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_183:654165548:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/08/08 11:58:34
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_183:654165548:1>.dbf "Oracle8"
```

```
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/08/08 11:59:02
```



```

Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_183:654165548:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_183:654165548:1>.dbf tag=TAG20080508T083907
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:01:15
channel ORA_SBT_TAPE_1: starting datafile backupset restore
channel ORA_SBT_TAPE_1: specifying datafile(s) to restore from backup set
restoring datafile 00003 to /opt/oracle/oradata/DB10g/sysaux01.dbf
restoring datafile 00004 to /opt/oracle/oradata/DB10g/users01.dbf
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_182:654165548:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/08/08 11:59:49
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_182:654165548:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/08/08 12:00:44
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_182:654165548:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_182:654165548:1>.dbf tag=TAG20080508T083907
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:01:46
channel ORA_SBT_TAPE_1: starting datafile backupset restore
channel ORA_SBT_TAPE_1: specifying datafile(s) to restore from backup set
restoring datafile 00001 to /opt/oracle/oradata/DB10g/system01.dbf
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_181:654165548:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/08/08 12:01:34
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_181:654165548:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/08/08 12:02:32
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_181:654165548:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_181:654165548:1>.dbf tag=TAG20080508T083907
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:01:45
Finished restore at 2008-05-08

Starting recover at 2008-05-08
using channel ORA_SBT_TAPE_1
using channel ORA_DISK_1

starting media recovery

channel ORA_SBT_TAPE_1: starting archive log restore to default destination
channel ORA_SBT_TAPE_1: restoring archive log
archive log thread=1 sequence=104
channel ORA_SBT_TAPE_1: restoring archive log
archive log thread=1 sequence=105
channel ORA_SBT_TAPE_1: reading from backup piece DB10g_online_FL<DB10g_190:654165764:1>.dbf
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/08/08 12:03:22
Starting OB2BAR Restore: ita022:DB10g_online_FL<DB10g_190:654165764:1>.dbf "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "DB10g" Time: 05/08/08 12:03:28
Completed OB2BAR Restore: ita022:DB10g_online_FL<DB10g_190:654165764:1>.dbf
"Oracle8"

channel ORA_SBT_TAPE_1: restored backup piece 1
piece handle=DB10g_online_FL<DB10g_190:654165764:1>.dbf tag=TAG20080508T083957
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:00:55
archive log filename=/opt/oracle/oradata/DB10g/arc/1_104_649590802.dbf thread=1 sequence=104
archive log filename=/opt/oracle/oradata/DB10g/arc/1_105_649590802.dbf thread=1 sequence=105
media recovery complete, elapsed time: 00:00:03
Finished recover at 2008-05-08

database opened

RMAN>

```

Appendix B: How to restore the DP Managed Control File

```
root@ita022:/.root# export OB2APPNAME=DB10g
root@ita022:/.root# /opt/omni/sbin/ob2rman.pl -restore_controlfile -session 2008/03/19-1
[Normal] From: ob2rman@ita022 "DB10g" Time: 03/19/08 16:26:37
        Starting restore of target database.

        Net service name: DB10g.
        Instance status: OPEN.
        Instance name: DB10g.
        Database DBID = 38758237.
        Database control file type: CURRENT.
        Database log mode: ARCHIVELOG.

[Normal] From: ob2rman@ita022 "DB10g" Time: 03/19/08 16:26:43
        Starting restore of Data Protector managed control file backup.

[Normal] From: ob2rman@ita022 "DB10g" Time: 03/19/08 16:27:24
        Restore of Data Protector managed control file backup completed.
        Location: /var/opt/omni/tmp/ctrl_DB10g.dbf.

[Normal] From: ob2rman@ita022 "DB10g" Time: 03/19/08 16:27:25
        Restore of target database completed.
```

Once the file system restore of the DP-managed Control File is finished, we can start the restore of the Control File using RMAN.

```
run {
allocate channel 'dev0' type disk;
restore controlfile from '/var/opt/omni/tmp/ctrl_DB10g.dbf';
release channel 'dev0';
}
```

The same applies to the Recovery Catalog. In this case the option to be used is the following:

```
/opt/omni/sbin/ob2rman.pl -restore_catalog -session 2008/03/19-1
```

Appendix C: Sample RMAN script to duplicate the Database

In this case, we assume the backup contains a Control File autobackup and we are using a Recovery Catalog:

- Set the DBID of your database
- Set the until clause (either time or sequence)

```
rman catalog rman/xxx@RCVCAT << EOF
set dbid = 38758237 ;
connect target / ;
startup nomount force;
run {
allocate channel dev_0 type sbt_tape;
restore spfile from autobackup;
release channel dev_0;
}
startup nomount force;
run {
allocate channel dev_0 type sbt_tape;
restore controlfile from autobackup;
}
startup mount;
run {
allocate channel dev_0 type sbt_tape;
allocate channel dev_1 type sbt_tape;
# choose one of the following:
# set until time "to_date( '19-03-2008 16:00:00', 'DD-MM-RRRR HH24:MI:SS')";
# set until sequence 6 ;
restore database;
recover database;
alter database open resetlogs;
}
EOF
```

Appendix D: How to import the Recovery Catalog in the new cell

In this example, we export the Recovery Catalog on ita017 and import it into hpu015.

We assume no Recovery Catalog backup was taken previously with Data Protector, or this backup is not available.

On the source system (ita017), export the recovery catalog owned by the user RMAN and copy it to the target system:

```
oracle@ita017[RCVCAT]:/home/oracle$ exp rman/xxx@rcvcat file=rcvcat.dmp owner=rman

Export: Release 10.2.0.3.0 - Production on Wed Mar 19 11:34:38 2008

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

Connected to: Oracle Database 10g Enterprise Edition Release 10.2.0.3.0 - 64bit
Production
With the Partitioning, OLAP and Data Mining options

...

oracle@ita017[RCVCAT]:/home/oracle$ scp rcvcat.dmp oracle@hpu015:/home/oracle/
```

On the target system (hpu015), create the user RMAN and grant it the needed privileges:

NOTE:

If there is already a Recovery Catalog, then create a new recovery catalog owner; in our case there is already an RMAN user; we create another user called RMANI for the new recovery catalog

```
oracle@hpu015[RCVCAT]:/home/oracle$ sq

SQL*Plus: Release 10.2.0.3.0 - Production on Wed Mar 19 11:36:10 2008

Copyright (c) 1982, 2006, Oracle. All Rights Reserved.

Connected to:
Oracle Database 10g Enterprise Edition Release 10.2.0.3.0 - 64bit Production
With the Partitioning, OLAP and Data Mining options

SQL> select username,default_tablespace from dba_users;

USERNAME                                DEFAULT_TABLESPACE
-----
MGMT_VIEW                               SYSTEM
SYS                                     SYSTEM
SYSTEM                                  SYSTEM
DBSNMP                                  SYSAUX
SYSMAN                                  SYSAUX
RMAN                                    RCVCAT
OUTLN                                   SYSTEM
WM SYS                                  SYSAUX
ORDSYS                                  SYSAUX
EXFSYS                                  SYSAUX
XDB                                     SYSAUX

USERNAME                                DEFAULT_TABLESPACE
-----
DMSYS                                  SYSAUX
OLAPSYS                                 SYSAUX
SI_INFORMTN_SCHEMA                     SYSAUX
ORDPLUGINS                             SYSAUX
MDSYS                                  SYSAUX
```

```

CTXSYS          SYSAUX
ANONYMOUS       SYSAUX
MDDATA          USERS
TSMSYS          USERS
DIP             USERS
SCOTT           USERS

SQL> create user rmani identified by xxx default tablespace RCVCAT;

User created.

SQL> grant RECOVERY_CATALOG_OWNER TO rmani;

Grant succeeded.

SQL> alter user rmani quota unlimited on RCVCAT;

User altered.

SQL> grant connect,resource to rmani;

Grant succeeded.

SQL> connect rmani/xxx
Connected.

SQL>

```

Once the new RMAN user (RMANI) is created, we can start the import of the Recovery Catalog in their schema:

```

oracle@hpu015[RCVCAT]:/home/oracle$ imp userid=rmani/xxx@RCVCAT file=rcvcat.dmp
fromuser=rman \ touser=rmani

Import: Release 10.2.0.3.0 - Production on Wed Mar 19 11:50:21 2008

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

Connected to: Oracle Database 10g Enterprise Edition Release 10.2.0.3.0 - 64bit Production
With the Partitioning, OLAP and Data Mining options

Export file created by EXPORT:V10.02.01 via conventional path

...

oracle@hpu015[RCVCAT]:/home/oracle$ rman catalog rmani/xxx@RCVCAT

Recovery Manager: Release 10.2.0.3.0 - Production on Wed Mar 19 11:54:23 2008

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

connected to recovery catalog database

RMAN>

```

The Recovery catalog has been imported into our target system, hpu015, and is ready to be used.

Appendix E: Script to restore the SPFILE and Control File providing the Backupset.

These scripts may help you to perform the restore of the SPFILE and Control File from within a Data Protector Session, by providing the different objects to the RMAN restore command. It can be used in the case neither recovery catalog nor Control File autobackup is available.

Assume the session we want to restore from is '2008/05/08-3'. It may need to be changed based on your requirements and environment.

Restore of the SPFILE providing the session ID:

```
# Main script to restore the SPFILE
# Script calls restore_spfile.sh

for i in `omnidb -sess 2008/05/08-3 | awk '{print $1}' | grep dbf | sort`
do
echo '
echo =====
echo Running restore with Object $i
echo =====
echo '
if [ -f $ORACLE_HOME/dbs/spfile$ORACLE_SID.ora ]
then break 2
fi
/home/oracle/restore_spfile.sh $i
done
```

```
# restore_spfile.sh
rman << EOF
set dbid=38758237 ;
connect target / ;
startup force nomount;
run {
allocate channel dev_0 type sbt_tape;
restore spfile from "$1" ;
}
EOF
```

Restore of the Control File providing the session ID:

```
# Main script to restore the controlfile
# Script calls restore_ctl.sh

for i in `omnidb -sess 2008/05/08-3 | awk '{print $1}' | grep dbf | sort`
do
echo '
echo =====
echo Running restore with Object $i
echo =====
echo '
if [ -f $ORACLE_HOME/dbs/spfile$ORACLE_SID.ora ]
then break 2
fi
/home/oracle/restore_ctl.sh $i
done
```

```
# restore_ctl.sh
rman << EOF
set dbid=38758237 ;
connect target / ;
run {
allocate channel dev_0 type sbt_tape;
restore controlfile from "$1" ;
}
EOF
```

Appendix F: Restore scenario: RAC Database to a Single instance

Assume a disaster scenario where we need to restore our RAC database from cell 1 to cell2. However, in cell 2 only one host is available. In this case, we will restore a RAC database which was running on 4 nodes into a single instance running on a different node (in a different Data Protector cell).

We assume the following prerequisites have been fulfilled:

- A full backup of the RAC database has been taken, and this backup has been made available to the new cell. In our case, the tapes have inserted in the target library and have been imported.
- For this example, Control File autobackup is ON and the recovery catalog is available on the target cell.
- The Database is called RAC and the instance on the target is called RAC1

As we can see throughout this section, the process is identical to the scenarios described in previous sections. On the other hand, there are some RAC specific steps that need to be followed:

- We need a PFILE to startup the single instance database. This PFILE has to be edited. The PFILE can either be created on the original RAC database (if available), or once we have restored the SPFILE from autobackup.
- Once the PFILE is available and before we mount the database with it, following parameters need to be changed/deleted:
 - Remove all RAC specific parameters: CLUSTER_DATABASE, CLUSTER_DATABASE_INSTANCES, and so on.
 - Verify that all directories specified in the PFILE exist on the target system (do not forget the Control Files path)
 - Remove all parameters related to all RAC instances other than RAC1.

On the target system, we list the objects belonging to the imported session:

```
oracle@hpu015[RAC1]:/home/oracle$ omnidb -sess 2008/07/01-3
Object Name                                Object Type    Object Status    CopyID
=====
ita018:RAC1_online_del<RAC_760:658944460:1>.dbf Oracle8        Completed
ita018:RAC1_online_del<RAC_759:658944460:1>.dbf Oracle8        Completed
ita018:c-2216826430-20080701-00            Oracle8        Completed        1 (0)
ita018:RAC1_online_del<RAC_762:658948786:1>.dbf Oracle8        Completed
ita018:RAC1_online_del<RAC_763:658948786:1>.dbf Oracle8        Completed
ita018:RAC1_online_del<RAC_764:658948825:1>.dbf Oracle8        Completed
ita018:RAC1_online_del<RAC_765:658948839:1>.dbf Oracle8        Completed
ita018:c-2216826430-20080701-01            Oracle8        Completed        657 (0)
```

Once we the database is in NOMOUNT status, we can restore the SPFILE and Control File from autobackup:

```
oracle@hpu015[RAC1]:/home/oracle$ rman target / catalog rman/rman@rcat

Recovery Manager: Release 10.2.0.3.0 - Production on Wed Jul 2 12:15:03 2008

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

RMAN> startup nomount

startup failed: ORA-01078: failure in processing system parameters
LRM-00109: could not open parameter file '/opt/oracle/product/10.2.0/db_1/dbs/initRAC1.ora'
```

```

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

Total System Global Area      159383552 bytes

Fixed Size                    2056752 bytes
Variable Size                 67112400 bytes
Database Buffers              88080384 bytes
Redo Buffers                  2134016 bytes

RMAN> restore spfile from autobackup;

Starting restore at 2008-07-02
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=40 devtype=DISK
allocated channel: ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: sid=35 devtype=SBT_TAPE
channel ORA_SBT_TAPE_1: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_
allocated channel: ORA_SBT_TAPE_2
channel ORA_SBT_TAPE_2: sid=34 devtype=SBT_TAPE
channel ORA_SBT_TAPE_2: Data Protector A.06.00/PHSS_37147/PHSS_37148/DPSOL_00306/DPLNX_

channel ORA_SBT_TAPE_1: looking for autobackup on day: 20080702
channel ORA_SBT_TAPE_1: looking for autobackup on day: 20080701
channel ORA_SBT_TAPE_2: looking for autobackup on day: 20080702
channel ORA_SBT_TAPE_2: looking for autobackup on day: 20080701
channel ORA_SBT_TAPE_2: skipped, autobackup already found
channel ORA_DISK_1: looking for autobackup on day: 20080702
channel ORA_DISK_1: looking for autobackup on day: 20080701
channel ORA_DISK_1: skipped, autobackup already found
channel ORA_SBT_TAPE_1: autobackup found: c-2216826430-20080701-01
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "RAC1" Time: 07/02/08 12:21:23
        Starting OB2BAR Restore: ita018:c-2216826430-20080701-01 "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "RAC1" Time: 07/02/08 12:21:29
        Completed OB2BAR Restore: ita018:c-2216826430-20080701-01 "Oracle8"

channel ORA_SBT_TAPE_1: SPFILE restore from autobackup complete
Finished restore at 2008-07-02

RMAN> restore controlfile from autobackup;

Starting restore at 2008-07-02
using channel ORA_DISK_1
using channel ORA_SBT_TAPE_1
using channel ORA_SBT_TAPE_2

channel ORA_SBT_TAPE_1: looking for autobackup on day: 20080702
channel ORA_SBT_TAPE_1: looking for autobackup on day: 20080701
channel ORA_SBT_TAPE_2: looking for autobackup on day: 20080702
channel ORA_SBT_TAPE_2: looking for autobackup on day: 20080701
channel ORA_SBT_TAPE_2: skipped, autobackup already found
channel ORA_DISK_1: looking for autobackup on day: 20080702
channel ORA_DISK_1: looking for autobackup on day: 20080701
channel ORA_DISK_1: skipped, autobackup already found
channel ORA_SBT_TAPE_1: autobackup found: c-2216826430-20080701-01
[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "RAC1" Time: 07/02/08 12:33:47
        Starting OB2BAR Restore: ita018:c-2216826430-20080701-01 "Oracle8"

[Normal] From: OB2BAR_Oracle8@hpu015.deu.hp.com "RAC1" Time: 07/02/08 12:33:52
        Completed OB2BAR Restore: ita018:c-2216826430-20080701-01 "Oracle8"

channel ORA_SBT_TAPE_1: control file restore from autobackup complete
output filename=/opt/oracle/product/10.2.0/db_1/dbs/cntrlRAC1.dbf
Finished restore at 2008-07-02

```

In our case the Control File has been restored to \$ORACLE_HOME/dbs. You may need to update the PFILE control file location.

Before proceeding with the next step (mounting the DB), edit the PFILE as mentioned above.

If you are not able to create a `PFILE` from the original RAC database (not available), you may want to create a file system copy of the restored `SPFILE` (binary file) and remove with your ASCII editor the binary characters (officially unsupported)

```

RMAN> startup mount force pfile='/opt/oracle/product/10.2.0/db_1/dbs/initRAC1.ora'

Oracle instance started
database mounted

Total System Global Area      4294967296 bytes

Fixed Size                     2063792 bytes
Variable Size                  754975312 bytes
Database Buffers               3523215360 bytes
Redo Buffers                   14712832 bytes

RMAN>
```

At this point, we can follow as on the other scenarios with the restore and the recovery of the database.

In case the datafiles location has changed, remember to include the following command on your RMAN script:

```
set newname for datafile 1 to 'new datafile path';
```

Appendix G: Reference documentation

HP

- HP Data Protector Software Documentation and White Papers

Oracle

- Oracle 10g Backup and Recovery Advanced User's Guide

For more information

- HP Data Protector Software
<http://www.hp.com/go/dataprotector>

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