【RAC】rac 环境下的数据库备份与还原

1.1 BLOG 文档结构图

1.2 前言部分

1.2.1 导读

各位技术爱好者，看完本文后，你可以掌握如下的技能，也可以学到一些其它你所不知道的知识，~O(∩_∩)O~：

① rac 环境下的数据库备份与还原

② rman 恢复数据库的一般步骤

③ rac 环境的简单操作

注意：本篇 BLOG 中代码部分需要特别关注的地方我都用黄色背景和红色字体来表示，比如下边的例子中，thread 1 的最大归档日志号为 33，thread 2 的最大归档日志号为 43 是需要特别关注的地方。

```
List of Archived Logs in backup set 11
Thrd Seq     Low SCN    Low Time            Next SCN   Next Time
---- ------- ---------- ------------------- ---------- ---------
1    32      1621589    2015-05-29 11:09:52 1625242    2015-05-29 11:15:48
1    33      1625242    2015-05-29 11:15:48 1625293    2015-05-29 11:15:58
2    42      1613951    2015-05-29 10:41:18 1625245    2015-05-29 11:15:49
2    43      1625245    2015-05-29 11:15:49 1625253    2015-05-29 11:15:53
```

本文如有错误或不完善的地方请大家多多指正，ITPUB 留言或 QQ 皆可，您的批评指正是我写作的最大动力。

1.2.2 实验环境介绍

目标库：11.2.0.1　RHEL6.5　rac 环境

1.2.3 相关参考文章链接

【RAC】将 RAC 备份集恢复为单实例数据库　http://blog.itpub.net/26736162/viewspace-1682255/

【RAC】将单实例备份集恢复为 rac 数据库　http://blog.itpub.net/26736162/viewspace-1682250/

【RAC】rac 环境下的数据库备份与还原　http://blog.itpub.net/26736162/viewspace-1682237/

rac 安装系列：

【推荐】 一步一步搭建 11gR2 rac+dg 之结尾篇(十)	http://blog.itpub.net/26736162/viewspace-1328156/
【推荐】 一步一步搭建 11gR2 rac+dg 之 DG SWITCHOVER 功能(九)	http://blog.itpub.net/26736162/viewspace-1328050/
一步一步搭建 11gR2 rac+dg 之配置单实例的 DG(八)	http://blog.itpub.net/26736162/viewspace-1298735/
一步一步搭建 11gR2 rac+dg 之 DG 机器配置(七)	http://blog.itpub.net/26736162/viewspace-1298733/
一步一步搭建 11gR2 rac+dg 之安装 rac 出现问题解决(六)	http://blog.itpub.net/26736162/viewspace-1297128/

一步一步搭建 oracle 11gR2 rac+dg 之 database 安装(五)	http://blog.itpub.net/26736162/viewspace-1297113/
一步一步搭建 oracle 11gR2 rac+dg 之 grid 安装(四)	http://blog.itpub.net/26736162/viewspace-1297101/
【推荐】 一步一步搭建 oracle 11gR2 rac+dg 之共享磁盘设置(三)	http://blog.itpub.net/26736162/viewspace-1291144/
【推荐】 一步一步搭建 oracle 11gR2 rac+dg 之环境准备(二)	http://blog.itpub.net/26736162/viewspace-1290416/
【推荐】 一步一步搭建 oracle 11gR2 rac + dg 之前传 （一）	http://blog.itpub.net/26736162/viewspace-1290405/

静默安装系列

【推荐】 【DBCA -SILENT】静默方式安装 11gR2 oracle 数据库软件	http://blog.itpub.net/26736162/viewspace-1589769/
【推荐】 【DBCA -SILENT】静默安装之 rac 数据库安装	http://blog.itpub.net/26736162/viewspace-1586352/
【推荐】 【DBCA -SILENT】静默安装如何启用归档模式	http://blog.itpub.net/26736162/viewspace-1585925/
【推荐】 DBCA 静默方式建库	http://blog.itpub.net/26736162/viewspace-1448220/

1.2.4 本文简介

本文基于如何将单实例的数据库备份恢复到 rac 环境下，至于 rac 环境的备份集如何恢复到单实例及 rac 环境的备份集恢复到 rac 环境的实验请参考相关文章链接部分。

实验的一些数据库环境参考如下表格：

项目	source db	target db
db 类型	rac 环境	rac 环境
db version	11.2.0.1	11.2.0.1
ORACLE_SID	orastrac1 和 orastrac2	orastrac1 和 orastrac2
db_name	orastrac	orastrac
主机 IP 地址：	192.168.1.31 192.168.1.32	192.168.1.31 192.168.1.32

1.3 实验部分

1.3.1 实验目标

验证 rac 数据库环境下的备份和恢复操作。

1.3.2 查看 rac 环境

target 库已经有 4 个库，3 个 rac 库处于 close 状态，orastrac 处于 online 状态。

```
[root@node2 ~]# crsstat
Name                           Type                      Target    State     Host
------------------------------ ------------------------- --------- --------- -------
ora.ARCH.dg                    ora.diskgroup.type        ONLINE    ONLINE    node1
ora.DATA.dg                    ora.diskgroup.type        ONLINE    ONLINE    node1
ora.LISTENER.lsnr              ora.listener.type         ONLINE    ONLINE    node1
ora.LISTENER_SCAN1.lsnr        ora.scan_listener.type    ONLINE    ONLINE    node1
ora.OVDISK.dg                  ora.diskgroup.type        ONLINE    ONLINE    node1
ora.TEST.dg                    ora.diskgroup.type        ONLINE    ONLINE    node1
ora.asm                        ora.asm.type              ONLINE    ONLINE    node1
ora.db.db                      ora.database.type         OFFLINE   OFFLINE
ora.eons                       ora.eons.type             ONLINE    ONLINE    node1
ora.gsd                        ora.gsd.type              OFFLINE   OFFLINE
ora.jmrac.db                   ora.database.type         ONLINE    ONLINE    node1
ora.jmrac.haha.svc             ora.service.type          ONLINE    ONLINE    node1
ora.net1.network               ora.network.type          ONLINE    ONLINE    node1
ora.node1.ASM1.asm             application               ONLINE    ONLINE    node1
ora.node1.LISTENER_NODE1.lsnr  application               ONLINE    ONLINE    node1
ora.node1.gsd                  application               OFFLINE   OFFLINE
ora.node1.ons                  application               ONLINE    ONLINE    node1
ora.node1.vip                  ora.cluster_vip_net1.type ONLINE    ONLINE    node1
ora.node2.ASM2.asm             application               ONLINE    ONLINE    node2
ora.node2.LISTENER_NODE2.lsnr  application               ONLINE    ONLINE    node2
ora.node2.gsd                  application               OFFLINE   OFFLINE
ora.node2.ons                  application               ONLINE    ONLINE    node2
ora.node2.vip                  ora.cluster_vip_net1.type ONLINE    ONLINE    node2
ora.oc4j                       ora.oc4j.type             OFFLINE   OFFLINE
ora.ons                        ora.ons.type              ONLINE    ONLINE    node1
ora.ora11g.db                  ora.database.type         OFFLINE   OFFLINE
ora.registry.acfs              ora.registry.acfs.type    ONLINE    ONLINE    node1
ora.scan1.vip                  ora.scan_vip.type         ONLINE    ONLINE    node1
[root@node2 ~]# crsstat | grep ora.database.type
ora.db.db                      ora.database.type         OFFLINE   OFFLINE
ora.jmrac.db                   ora.database.type         OFFLINE   OFFLINE
ora.ora11g.db                  ora.database.type         OFFLINE   OFFLINE
[root@node2 ~]#
[root@node2 ~]#  crsstat | grep ora.database.type
ora.db.db                      ora.database.type         ONLINE    OFFLINE
ora.jmrac.db                   ora.database.type         OFFLINE   OFFLINE
ora.ora11g.db                  ora.database.type         OFFLINE   OFFLINE
ora.orastrac.db                ora.database.type         ONLINE    ONLINE    node1
[root@node2 ~]#
```

1.3.3 创建测试数据

```
[oracle@node2 ~]$ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.1.0 Production on Tue Jun 2 13:32:34 2015

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Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.1.0 - 64bit Production
With the Partitioning, Real Application Clusters, Automatic Storage Management, OLAP,
Data Mining and Real Application Testing options

SQL> show parameter name

NAME                                 TYPE        VALUE
------------------------------------ ----------- ------------------------------
db_file_name_convert                 string
db_name                              string      orastrac
db_unique_name                       string      orastrac
global_names                         boolean     FALSE
instance_name                        string      orastrac2
lock_name_space                      string
log_file_name_convert                string
service_names                        string      orastrac


SQL> create table lhr.rac_test as select * from dba_objects;

Table created.

SQL> select count(1) from lhr.rac_test;

  COUNT(1)
----------
     72469

SQL>
```

1.3.4 source 库执行备份操作

备份脚本如下，注意控制文件需要最后备份，在节点 2 上执行备份：

```
run
{
 allocate channel c1 type disk;
 allocate channel c2 type disk;
 backup database format  '/home/oracle/rman_back/full_%n_%T_%t_%s_%p.bak';
 sql 'alter system archive log current';
 backup archivelog all format '/home/oracle/rman_back/arch_%d_%T_%s_%p.bak' delete input;
 backup current controlfile format '/home/oracle/rman_back/ctl_%d_%T_%s_%p.bak';
 release channel c1;
 release channel c2;
}
```

执行过程如下：

```
[oracle@node2 ~]$ rman target /

Recovery Manager: Release 11.2.0.1.0 - Production on Tue Jun 2 13:36:21 2015

Copyright (c) 1982, 2009, Oracle and/or its affiliates.  All rights reserved.

connected to target database: ORASTRAC (DBID=1317814272)

RMAN> list backupset;

using target database control file instead of recovery catalog
specification does not match any backup in the repository

RMAN> run
2> {
3>  allocate channel c1 type disk;
4>  allocate channel c2 type disk;
5>  backup database format  '/home/oracle/rman_back/full_%n_%T_%t_%s_%p.bak';
6>  sql 'alter system archive log current';
7>  backup archivelog all format '/home/oracle/rman_back/arch_%d_%T_%s_%p.bak' delete input;
8>  backup current controlfile format '/home/oracle/rman_back/ctl_%d_%T_%s_%p.bak';
9>  release channel c1;
10>  release channel c2;
11> }

allocated channel: c1
channel c1: SID=33 instance=orastrac2 device type=DISK

allocated channel: c2
channel c2: SID=51 instance=orastrac2 device type=DISK

Starting backup at 02-JUN-2015 13:36:32
channel c1: starting full datafile backup set
channel c1: specifying datafile(s) in backup set
input datafile file number=00001 name=+DATA/orastrac/datafile/system.330.881251509
input datafile file number=00004 name=+DATA/orastrac/datafile/users.327.881251511
input datafile file number=00006 name=+DATA/orastrac/datafile/undotbs2.351.881252419
channel c1: starting piece 1 at 02-JUN-2015 13:36:33
channel c2: starting full datafile backup set
channel c2: specifying datafile(s) in backup set
input datafile file number=00002 name=+DATA/orastrac/datafile/sysaux.331.881251461
input datafile file number=00005 name=+DATA/orastrac/datafile/example.332.881251463
input datafile file number=00003 name=+DATA/orastrac/datafile/undotbs1.329.881251463
channel c2: starting piece 1 at 02-JUN-2015 13:36:33
channel c1: finished piece 1 at 02-JUN-2015 13:38:38
piece handle=/home/oracle/rman_back/full_ORASTRAC_20150602_881328992_9_1.bak tag=TAG20150602T133632 comment=NONE
channel c1: backup set complete, elapsed time: 00:02:05
channel c1: starting full datafile backup set
channel c1: specifying datafile(s) in backup set
channel c2: finished piece 1 at 02-JUN-2015 13:38:38
piece handle=/home/oracle/rman_back/full_ORASTRAC_20150602_881328993_10_1.bak tag=TAG20150602T133632 comment=NONE
channel c2: backup set complete, elapsed time: 00:02:05
channel c2: starting full datafile backup set
channel c2: specifying datafile(s) in backup set
including current SPFILE in backup set
channel c2: starting piece 1 at 02-JUN-2015 13:38:39
including current control file in backup set
channel c1: starting piece 1 at 02-JUN-2015 13:38:42
channel c2: finished piece 1 at 02-JUN-2015 13:38:42
```

```
piece handle=/home/oracle/rman_back/full_ORASTRAC_20150602_881329118_12_1.bak tag=TAG20150602T133632 comment=NONE
channel c2: backup set complete, elapsed time: 00:00:03
channel c1: finished piece 1 at 02-JUN-2015 13:38:43
piece handle=/home/oracle/rman_back/full_ORASTRAC_20150602_881329118_11_1.bak tag=TAG20150602T133632 comment=NONE
channel c1: backup set complete, elapsed time: 00:00:01
Finished backup at 02-JUN-2015 13:38:43

sql statement: alter system archive log current

Starting backup at 02-JUN-2015 13:38:56
current log archived
channel c1: starting archived log backup set
channel c1: specifying archived log(s) in backup set
input archived log thread=1 sequence=1 RECID=5 STAMP=881255375
input archived log thread=2 sequence=1 RECID=4 STAMP=881252641
input archived log thread=1 sequence=2 RECID=7 STAMP=881256606
input archived log thread=3 sequence=1 RECID=6 STAMP=881255612
input archived log thread=2 sequence=2 RECID=8 STAMP=881257349
input archived log thread=1 sequence=3 RECID=9 STAMP=881257704
input archived log thread=2 sequence=3 RECID=12 STAMP=881257709
channel c1: starting piece 1 at 02-JUN-2015 13:39:00
channel c2: starting archived log backup set
channel c2: specifying archived log(s) in backup set
input archived log thread=1 sequence=4 RECID=10 STAMP=881257707
input archived log thread=1 sequence=5 RECID=11 STAMP=881257708
input archived log thread=2 sequence=4 RECID=13 STAMP=881329134
channel c2: starting piece 1 at 02-JUN-2015 13:39:00
channel c2: finished piece 1 at 02-JUN-2015 13:39:01
piece handle=/home/oracle/rman_back/arch_ORASTRAC_20150602_14_1.bak tag=TAG20150602T133859 comment=NONE
channel c2: backup set complete, elapsed time: 00:00:01
channel c2: deleting archived log(s)
archived log file name=+ARCH/orastrac/archivelog/2015_06_01/thread_1_seq_4.366.881257705 RECID=10 STAMP=881257707
archived log file name=+ARCH/orastrac/archivelog/2015_06_01/thread_1_seq_5.368.881257709 RECID=11 STAMP=881257708
archived log file name=+ARCH/orastrac/archivelog/2015_06_02/thread_2_seq_4.360.881329131 RECID=13 STAMP=881329134
channel c2: starting archived log backup set
channel c2: specifying archived log(s) in backup set
input archived log thread=1 sequence=6 RECID=14 STAMP=881329136
input archived log thread=2 sequence=5 RECID=16 STAMP=881329139
input archived log thread=1 sequence=7 RECID=15 STAMP=881329138
channel c2: starting piece 1 at 02-JUN-2015 13:39:03
channel c1: finished piece 1 at 02-JUN-2015 13:39:03
piece handle=/home/oracle/rman_back/arch_ORASTRAC_20150602_13_1.bak tag=TAG20150602T133859 comment=NONE
channel c1: backup set complete, elapsed time: 00:00:03
channel c1: deleting archived log(s)
archived log file name=+ARCH/orastrac/archivelog/2015_06_01/thread_1_seq_1.357.881255367 RECID=5 STAMP=881255375
archived log file name=+ARCH/orastrac/archivelog/2015_06_01/thread_2_seq_1.355.881252641 RECID=4 STAMP=881252641
archived log file name=+ARCH/orastrac/archivelog/2015_06_01/thread_1_seq_2.362.881256605 RECID=7 STAMP=881256606
archived log file name=+ARCH/orastrac/archivelog/2015_06_01/thread_3_seq_1.361.881255613 RECID=6 STAMP=881255612
archived log file name=+ARCH/orastrac/archivelog/2015_06_01/thread_2_seq_2.363.881257349 RECID=8 STAMP=881257349
archived log file name=+ARCH/orastrac/archivelog/2015_06_01/thread_1_seq_3.365.881257705 RECID=9 STAMP=881257704
archived log file name=+ARCH/orastrac/archivelog/2015_06_01/thread_2_seq_3.367.881257709 RECID=12 STAMP=881257709
channel c2: finished piece 1 at 02-JUN-2015 13:39:03
piece handle=/home/oracle/rman_back/arch_ORASTRAC_20150602_15_1.bak tag=TAG20150602T133859 comment=NONE
channel c2: backup set complete, elapsed time: 00:00:00
channel c2: deleting archived log(s)
archived log file name=+ARCH/orastrac/archivelog/2015_06_02/thread_1_seq_6.359.881329131 RECID=14 STAMP=881329136
archived log file name=+ARCH/orastrac/archivelog/2015_06_02/thread_2_seq_5.370.881329139 RECID=16 STAMP=881329139
archived log file name=+ARCH/orastrac/archivelog/2015_06_02/thread_1_seq_7.358.881329137 RECID=15 STAMP=881329138
Finished backup at 02-JUN-2015 13:39:03

Starting backup at 02-JUN-2015 13:39:05
channel c1: starting full datafile backup set
channel c1: specifying datafile(s) in backup set
including current control file in backup set
channel c1: starting piece 1 at 02-JUN-2015 13:39:06
channel c1: finished piece 1 at 02-JUN-2015 13:39:07
piece handle=/home/oracle/rman_back/ctl_ORASTRAC_20150602_16_1.bak tag=TAG20150602T133905 comment=NONE
```

```
channel c1: backup set complete, elapsed time: 00:00:01
Finished backup at 02-JUN-2015 13:39:07

released channel: c1

released channel: c2

RMAN>

RMAN> list backupset summary;


List of Backups
===============
Key     TY LV S Device Type Completion Time      #Pieces #Copies Compressed Tag
------- -- -- - ----------- ------------------- ------- ------- ---------- ---
7       B  F  A DISK        02-JUN-2015 13:38:30 1       1       NO         TAG20150602T133632
8       B  F  A DISK        02-JUN-2015 13:38:35 1       1       NO         TAG20150602T133632
9       B  F  A DISK        02-JUN-2015 13:38:40 1       1       NO         TAG20150602T133632
10      B  F  A DISK        02-JUN-2015 13:38:42 1       1       NO         TAG20150602T133632
11      B  A  A DISK        02-JUN-2015 13:39:01 1       1       NO         TAG20150602T133859
12      B  A  A DISK        02-JUN-2015 13:39:01 1       1       NO         TAG20150602T133859
13      B  A  A DISK        02-JUN-2015 13:39:03 1       1       NO         TAG20150602T133859
14      B  F  A DISK        02-JUN-2015 13:39:06 1       1       NO         TAG20150602T133905

RMAN>
```

1.3.5 删除 spfile、控制文件和数据文件

删除 asm 文件，毁掉整个数据库：

```
[root@node2 rman_back]# srvctl stop database -d ORASTRAC
[root@node2 rman_back]# srvctl status database -d ORASTRAC
Instance orastrac1 is not running on node node1
Instance orastrac2 is not running on node node2
[root@node2 rman_back]# su - grid
[grid@node2 ~]$ asmcmd
ASMCMD> cd data
ASMCMD> ls
DB/
DB_UNKNOWN/
JMRAC/
MYRAC/
ORA11G/
ORASTRAC/
ASMCMD> rm -rf ORASTRAC/
ASMCMD> ls
DB/
DB_UNKNOWN/
JMRAC/
MYRAC/
ORA11G/
ASMCMD>
[oracle@node2 ~]$ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.1.0 Production on Tue Jun 2 13:55:46 2015

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```

```
Connected to an idle instance.

SQL> startup
ORA-01078: failure in processing system parameters
ORA-01565: error in identifying file '+DATA/orastrac/parameterfile/spfile.335.881250575'
ORA-17503: ksfdopn:2 Failed to open file +DATA/orastrac/parameterfile/spfile.335.881250575
ORA-15056: additional error message
ORA-17503: ksfdopn:DGOpenFile05 Failed to open file +DATA/orastrac/parameterfile/spfile.335.881250575
ORA-17503: ksfdopn:2 Failed to open file +DATA/orastrac/parameterfile/spfile.335.881250575
ORA-15173: entry 'orastrac' does not exist in directory '/'
ORA-06512: at line 4
SQL>
```

1.3.6 恢复数据库过程

1.3.6.1 恢复 spfile

首先利用 rman 恢复 spfile：

```
[oracle@node2 ~]$ ORACLE_SID=orastrac2
[oracle@node2 dbs]$  rman target /

Recovery Manager: Release 11.2.0.1.0 - Production on Tue Jun 2 14:15:52 2015

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connected to target database (not started)

RMAN> set dbid 1317814272

executing command: SET DBID

RMAN> startup nomount;

startup failed: ORA-01078: failure in processing system parameters
ORA-01565: error in identifying file '+DATA/orastrac/parameterfile/spfile.335.881250575'
ORA-17503: ksfdopn:2 Failed to open file +DATA/orastrac/parameterfile/spfile.335.881250575
ORA-15056: additional error message
ORA-17503: ksfdopn:DGOpenFile05 Failed to open file +DATA/orastrac/parameterfile/spfile.335.881250575
ORA-17503: ksfdopn:2 Failed to open file +DATA/orastrac/parameterfile/spfile.335.881250575
ORA-15173: entry 'orastrac' does not exist in directory '/'
ORA-06512: at line 4

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

Total System Global Area     158662656 bytes

Fixed Size                     2211448 bytes
Variable Size                 96469384 bytes
Database Buffers              54525952 bytes
Redo Buffers                   5455872 bytes

RMAN> restore spfile to '+DATA/orastrac/parameterfile/spfileorastrac.ora' from  '/home/oracle/rman_back/full_ORASTRAC_20150602_881329118_12_1.bak';

Starting restore at 02-JUN-2015 14:16:47
```

```
using target database control file instead of recovery catalog
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=24 device type=DISK

channel ORA_DISK_1: restoring spfile from AUTOBACKUP /home/oracle/rman_back/full_ORASTRAC_20150602_881329118_12_1.bak
RMAN-00571: ===========================================================
RMAN-00569: =============== ERROR MESSAGE STACK FOLLOWS ===============
RMAN-00571: ===========================================================
RMAN-03002: failure of restore command at 06/02/2015 14:16:49
ORA-19870: error while restoring backup piece /home/oracle/rman_back/full_ORASTRAC_20150602_881329118_12_1.bak
ORA-32015: unable to restore SPFILE
ORA-17502: ksfdcre:4 Failed to create file +DATA/orastrac/parameterfile/spfileorastrac.ora
ORA-15056: additional error message
ORA-17502: ksfdcre:4 Failed to create file +DATA/orastrac/parameterfile/spfileorastrac.ora
ORA-15173: entry 'orastrac' does not exist in directory '/'
```

创建相关路径后继续执行：

```
ASMCMD> mkdir orastrac
ASMCMD> cd orastrac
ASMCMD> mkdir parameterfile
ASMCMD> pwd
+data/orastrac
ASMCMD> cd parameterfile
```

```
RMAN> restore spfile to '+DATA/orastrac/parameterfile/spfileorastrac.ora' from  '/home/oracle/rman_back/full_ORASTRAC_20150602_881329118_12_1.bak';

Starting restore at 02-JUN-2015 14:18:07
using channel ORA_DISK_1

channel ORA_DISK_1: restoring spfile from AUTOBACKUP /home/oracle/rman_back/full_ORASTRAC_20150602_881329118_12_1.bak
channel ORA_DISK_1: SPFILE restore from AUTOBACKUP complete
Finished restore at 02-JUN-2015 14:18:08

RMAN>
```

查看 spfile：

```
ASMCMD> ls
spfileorastrac.ora
ASMCMD>
```

修改 pfile 文件后重启数据库：

```
[oracle@node2 dbs]$ more initorastrac2.ora
SPFILE='+DATA/orastrac/parameterfile/spfileorastrac.ora'
[oracle@node2 dbs]$

[oracle@node2 dbs]$  rman target /

Recovery Manager: Release 11.2.0.1.0 - Production on Tue Jun 2 14:21:18 2015

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connected to target database: DUMMY (not mounted)

RMAN> shutdown abort;
```

```
using target database control file instead of recovery catalog
Oracle instance shut down

RMAN> startup nomount;

connected to target database (not started)
Oracle instance started

Total System Global Area     409194496 bytes

Fixed Size                     2213856 bytes
Variable Size                360712224 bytes
Database Buffers              41943040 bytes
Redo Buffers                   4325376 bytes

RMAN>
```

1.3.6.2 恢复控制文件

```
[oracle@node2 dbs]$  rman target /

Recovery Manager: Release 11.2.0.1.0 - Production on Tue Jun 2 14:22:52 2015

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connected to target database: ORASTRAC (not mounted)

RMAN>  startup nomount force;

Oracle instance started

Total System Global Area     409194496 bytes

Fixed Size                     2213856 bytes
Variable Size                360712224 bytes
Database Buffers              41943040 bytes
Redo Buffers                   4325376 bytes

RMAN>  restore controlfile   from '/home/oracle/rman_back/ctl_ORASTRAC_20150602_16_1.bak';

Starting restore at 02-JUN-2015 14:23:30
using target database control file instead of recovery catalog
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=33 instance=orastrac2 device type=DISK

channel ORA_DISK_1: restoring control file
channel ORA_DISK_1: restore complete, elapsed time: 00:00:01
output file name=+DATA/orastrac/controlfile/control01.ctl
output file name=+DATA/orastrac/controlfile/current.329.881331811
output file name=+ARCH/orastrac/controlfile/current.364.881257391
Finished restore at 02-JUN-2015 14:23:32

RMAN>

RMAN> alter database mount;

database mounted
released channel: ORA_DISK_1
```

```
RMAN>
```

1.3.6.3 还原及恢复数据文件

查看备份集及还原数据库：

```
RMAN>  list backupset;


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


BS Key  Type LV Size       Device Type Elapsed Time Completion Time
------- ---- -- ---------- ----------- ------------ --------------------
7       Full    440.72M    DISK        00:01:57     02-JUN-2015 13:38:30
        BP Key: 7   Status: AVAILABLE  Compressed: NO  Tag: TAG20150602T133632
        Piece Name: /home/oracle/rman_back/full_ORASTRAC_20150602_881328993_10_1.bak
  List of Datafiles in backup set 7
  File LV Type Ckp SCN    Ckp Time             Name
  ---- -- ---- ---------- -------------------- ----
  2       Full 1079018    02-JUN-2015 13:36:33 +DATA/orastrac/datafile/sysaux.331.881251461
  3       Full 1079018    02-JUN-2015 13:36:33 +DATA/orastrac/datafile/undotbs1.329.881251463
  5       Full 1079018    02-JUN-2015 13:36:33 +DATA/orastrac/datafile/example.332.881251463

BS Key  Type LV Size       Device Type Elapsed Time Completion Time
------- ---- -- ---------- ----------- ------------ --------------------
8       Full    610.17M    DISK        00:02:03     02-JUN-2015 13:38:35
        BP Key: 8   Status: AVAILABLE  Compressed: NO  Tag: TAG20150602T133632
        Piece Name: /home/oracle/rman_back/full_ORASTRAC_20150602_881328992_9_1.bak
  List of Datafiles in backup set 8
  File LV Type Ckp SCN    Ckp Time             Name
  ---- -- ---- ---------- -------------------- ----
  1       Full 1078985    02-JUN-2015 13:36:33 +DATA/orastrac/datafile/system.330.881251509
  4       Full 1078985    02-JUN-2015 13:36:33 +DATA/orastrac/datafile/users.327.881251511
  6       Full 1078985    02-JUN-2015 13:36:33 +DATA/orastrac/datafile/undotbs2.351.881252419

BS Key  Type LV Size       Device Type Elapsed Time Completion Time
------- ---- -- ---------- ----------- ------------ --------------------
9       Full    80.00K     DISK        00:00:02     02-JUN-2015 13:38:40
        BP Key: 9   Status: AVAILABLE  Compressed: NO  Tag: TAG20150602T133632
        Piece Name: /home/oracle/rman_back/full_ORASTRAC_20150602_881329118_12_1.bak
  SPFILE Included: Modification time: 02-JUN-2015 11:16:55
  SPFILE db_unique_name: ORASTRAC

BS Key  Type LV Size       Device Type Elapsed Time Completion Time
------- ---- -- ---------- ----------- ------------ --------------------
10      Full    9.33M      DISK        00:00:04     02-JUN-2015 13:38:42
        BP Key: 10   Status: AVAILABLE  Compressed: NO  Tag: TAG20150602T133632
        Piece Name: /home/oracle/rman_back/full_ORASTRAC_20150602_881329118_11_1.bak
  Control File Included: Ckp SCN: 1079103      Ckp time: 02-JUN-2015 13:38:38
```

```
BS Key  Size       Device Type Elapsed Time Completion Time
------- ---------- ----------- ------------ --------------------
11      15.97M     DISK        00:00:01     02-JUN-2015 13:39:01
        BP Key: 11   Status: AVAILABLE  Compressed: NO  Tag: TAG20150602T133859
        Piece Name: /home/oracle/rman_back/arch_ORASTRAC_20150602_14_1.bak

  List of Archived Logs in backup set 11
  Thrd Seq     Low SCN    Low Time             Next SCN   Next Time
  ---- ------- ---------- -------------------- ---------- ---------
  1    4       1057778    01-JUN-2015 17:48:24 1057780    01-JUN-2015 17:48:24
  1    5       1057780    01-JUN-2015 17:48:24 1057786    01-JUN-2015 17:48:25
  2    4       1057893    01-JUN-2015 17:48:27 1079126    02-JUN-2015 13:38:49

BS Key  Size       Device Type Elapsed Time Completion Time
------- ---------- ----------- ------------ --------------------
12      6.78M      DISK        00:00:01     02-JUN-2015 13:39:01
        BP Key: 12   Status: AVAILABLE  Compressed: NO  Tag: TAG20150602T133859
        Piece Name: /home/oracle/rman_back/arch_ORASTRAC_20150602_13_1.bak

  List of Archived Logs in backup set 12
  Thrd Seq     Low SCN    Low Time             Next SCN   Next Time
  ---- ------- ---------- -------------------- ---------- ---------
  1    1       1027357    01-JUN-2015 16:09:51 1049321    01-JUN-2015 17:09:25
  1    2       1049321    01-JUN-2015 17:09:25 1056322    01-JUN-2015 17:30:05
  1    3       1056520    01-JUN-2015 17:30:48 1057778    01-JUN-2015 17:48:24
  2    1       1028434    01-JUN-2015 16:23:50 1028446    01-JUN-2015 16:24:01
  2    2       1049792    01-JUN-2015 17:15:06 1057412    01-JUN-2015 17:42:28
  2    3       1057776    01-JUN-2015 17:48:24 1057893    01-JUN-2015 17:48:27
  3    1       1049702    01-JUN-2015 17:13:10 1049717    01-JUN-2015 17:13:32

BS Key  Size       Device Type Elapsed Time Completion Time
------- ---------- ----------- ------------ --------------------
13      5.05M      DISK        00:00:00     02-JUN-2015 13:39:03
        BP Key: 13   Status: AVAILABLE  Compressed: NO  Tag: TAG20150602T133859
        Piece Name: /home/oracle/rman_back/arch_ORASTRAC_20150602_15_1.bak

  List of Archived Logs in backup set 13
  Thrd Seq     Low SCN    Low Time             Next SCN   Next Time
  ---- ------- ---------- -------------------- ---------- ---------
  1    6       1060589    02-JUN-2015 10:16:25 1079130    02-JUN-2015 13:38:49
  1    7       1079130    02-JUN-2015 13:38:49 1079140    02-JUN-2015 13:38:56
  2    5       1079126    02-JUN-2015 13:38:49 1079144    02-JUN-2015 13:38:58

RMAN> restore database;

Starting restore at 02-JUN-2015 14:25:59
Starting implicit crosscheck backup at 02-JUN-2015 14:25:59
allocated channel: ORA_DISK_1
Crosschecked 7 objects
Finished implicit crosscheck backup at 02-JUN-2015 14:25:59

Starting implicit crosscheck copy at 02-JUN-2015 14:25:59
using channel ORA_DISK_1
Finished implicit crosscheck copy at 02-JUN-2015 14:26:00

searching for all files in the recovery area
cataloging files...
cataloging done

List of Cataloged Files
=======================
File Name: +arch/ORASTRAC/CONTROLFILE/current.369.881258379
File Name: +arch/ORASTRAC/ARCHIVELOG/2015_06_02/thread_2_seq_6.358.881329829
File Name: +arch/ORASTRAC/ARCHIVELOG/2015_06_02/thread_1_seq_8.370.881329829
File Name: +arch/ORASTRAC/ARCHIVELOG/2015_06_02/thread_2_seq_7.359.881329831

using channel ORA_DISK_1
```

```
channel ORA_DISK_1: starting datafile backup set restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup set
channel ORA_DISK_1: restoring datafile 00002 to +DATA/orastrac/datafile/sysaux.331.881251461
channel ORA_DISK_1: restoring datafile 00003 to +DATA/orastrac/datafile/undotbs1.329.881251463
channel ORA_DISK_1: restoring datafile 00005 to +DATA/orastrac/datafile/example.332.881251463
channel ORA_DISK_1: reading from backup piece /home/oracle/rman_back/full_ORASTRAC_20150602_881328993_10_1.bak
channel ORA_DISK_1: piece handle=/home/oracle/rman_back/full_ORASTRAC_20150602_881328993_10_1.bak tag=TAG20150602T133632
channel ORA_DISK_1: restored backup piece 1
channel ORA_DISK_1: restore complete, elapsed time: 00:00:45
channel ORA_DISK_1: starting datafile backup set restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup set
channel ORA_DISK_1: restoring datafile 00001 to +DATA/orastrac/datafile/system.330.881251509
channel ORA_DISK_1: restoring datafile 00004 to +DATA/orastrac/datafile/users.327.881251511
channel ORA_DISK_1: restoring datafile 00006 to +DATA/orastrac/datafile/undotbs2.351.881252419
channel ORA_DISK_1: reading from backup piece /home/oracle/rman_back/full_ORASTRAC_20150602_881328992_9_1.bak
channel ORA_DISK_1: piece handle=/home/oracle/rman_back/full_ORASTRAC_20150602_881328992_9_1.bak tag=TAG20150602T133632
channel ORA_DISK_1: restored backup piece 1
channel ORA_DISK_1: restore complete, elapsed time: 00:00:45
Finished restore at 02-JUN-2015 14:27:31

RMAN> RUN
2> {
3> set until sequence 7 thread 1;
set until sequence 5 thread 2;
recover database;
4> 5> 6> }

executing command: SET until clause

executing command: SET until clause

Starting recover at 02-JUN-2015 14:28:42
using channel ORA_DISK_1

starting media recovery

channel ORA_DISK_1: starting archived log restore to default destination
channel ORA_DISK_1: restoring archived log
archived log thread=2 sequence=4
channel ORA_DISK_1: reading from backup piece /home/oracle/rman_back/arch_ORASTRAC_20150602_14_1.bak
channel ORA_DISK_1: piece handle=/home/oracle/rman_back/arch_ORASTRAC_20150602_14_1.bak tag=TAG20150602T133859
channel ORA_DISK_1: restored backup piece 1
channel ORA_DISK_1: restore complete, elapsed time: 00:00:03
archived log file name=+ARCH/orastrac/archivelog/2015_06_02/thread_2_seq_4.367.881332133 thread=2 sequence=4
channel ORA_DISK_1: starting archived log restore to default destination
channel ORA_DISK_1: restoring archived log
archived log thread=1 sequence=6
channel ORA_DISK_1: reading from backup piece /home/oracle/rman_back/arch_ORASTRAC_20150602_15_1.bak
channel ORA_DISK_1: piece handle=/home/oracle/rman_back/arch_ORASTRAC_20150602_15_1.bak tag=TAG20150602T133859
channel ORA_DISK_1: restored backup piece 1
channel ORA_DISK_1: restore complete, elapsed time: 00:00:03
archived log file name=+ARCH/orastrac/archivelog/2015_06_02/thread_1_seq_6.365.881332137 thread=1 sequence=6
channel default: deleting archived log(s)
archived log file name=+ARCH/orastrac/archivelog/2015_06_02/thread_2_seq_4.367.881332133 RECID=26 STAMP=881332134
channel default: deleting archived log(s)
archived log file name=+ARCH/orastrac/archivelog/2015_06_02/thread_1_seq_6.365.881332137 RECID=27 STAMP=881332137
media recovery complete, elapsed time: 00:00:00
Finished recover at 02-JUN-2015 14:28:58

RMAN>
```

告警日志：

```
Tue Jun 02 14:26:14 2015
Full restore complete of datafile 5 +DATA/orastrac/datafile/example.331.881331961.  Elapsed time: 0:00:13
  checkpoint is 1079018
  last deallocation scn is 965277
Full restore complete of datafile 3 +DATA/orastrac/datafile/undotbs1.353.881331961.  Elapsed time: 0:00:13
  checkpoint is 1079018
  last deallocation scn is 1075330
  Undo Optimization current scn is 1074104
Tue Jun 02 14:26:40 2015
Full restore complete of datafile 2 +DATA/orastrac/datafile/sysaux.332.881331961.  Elapsed time: 0:00:39
  checkpoint is 1079018
  last deallocation scn is 1026156
Tue Jun 02 14:26:50 2015
Full restore complete of datafile 6 +DATA/orastrac/datafile/undotbs2.335.881332007.  Elapsed time: 0:00:04
  checkpoint is 1078985
  Undo Optimization current scn is 1074104
Full restore complete of datafile 4 +DATA/orastrac/datafile/users.357.881332007.  Elapsed time: 0:00:05
  checkpoint is 1078985
Tue Jun 02 14:27:28 2015
Full restore complete of datafile 1 +DATA/orastrac/datafile/system.334.881332007.  Elapsed time: 0:00:41
  checkpoint is 1078985
  last deallocation scn is 1025383
  Undo Optimization current scn is 1074104
Tue Jun 02 14:28:47 2015
alter database recover datafile list clear
Completed: alter database recover datafile list clear
alter database recover datafile list
 1 , 2 , 3 , 4 , 5 , 6
Completed: alter database recover datafile list
 1 , 2 , 3 , 4 , 5 , 6
alter database recover if needed
 start until cancel using backup controlfile
Media Recovery Start
Serial Media Recovery started
ORA-279 signalled during: alter database recover if needed
 start until cancel using backup controlfile
...
alter database recover logfile '+ARCH/orastrac/archivelog/2015_06_02/thread_2_seq_4.367.881332133'
Media Recovery Log +ARCH/orastrac/archivelog/2015_06_02/thread_2_seq_4.367.881332133
ORA-279 signalled during: alter database recover logfile '+ARCH/orastrac/archivelog/2015_06_02/thread_2_seq_4.367.881332133'...
Tue Jun 02 14:28:58 2015
alter database recover logfile '+ARCH/orastrac/archivelog/2015_06_02/thread_1_seq_6.365.881332137'
Media Recovery Log +ARCH/orastrac/archivelog/2015_06_02/thread_1_seq_6.365.881332137
ORA-279 signalled during: alter database recover logfile '+ARCH/orastrac/archivelog/2015_06_02/thread_1_seq_6.365.881332137'...
alter database recover cancel
Media Recovery Canceled
Completed: alter database recover cancel
```

1.3.6.4 RESETLOGS 打开数据库并验证数据

```
RMAN>  alter database open resetlogs;
```

```
database opened

RMAN>

RMAN> exit


Recovery Manager complete.

[oracle@node2 dbs]$ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.1.0 Production on Tue Jun 2 14:32:25 2015

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Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.1.0 - 64bit Production
With the Partitioning, Real Application Clusters, Automatic Storage Management, OLAP,
Data Mining and Real Application Testing options

SQL> select count(1) from lhr.rac_test;

  COUNT(1)
----------
     72469

SQL>
SQL> set line 9999
SQL> col HOST_NAME format a10
SQL> select INSTANCE_NAME,HOST_NAME,VERSION,STARTUP_TIME,STATUS,ACTIVE_STATE,INSTANCE_ROLE,DATABASE_STATUS from gv$INSTANCE;

INSTANCE_NAME    HOST_NAME  VERSION           STARTUP_TIME        STATUS       ACTIVE_ST INSTANCE_ROLE      DATABASE_STATUS
---------------- ---------- ----------------- ------------------- ------------ --------- ------------------ -----------------
orastrac2        node2      11.2.0.1.0        2015-06-02 14:22:55 OPEN         NORMAL    PRIMARY_INSTANCE   ACTIVE

SQL> select INST_ID,name , open_mode, log_mode,force_logging from gv$database;

   INST_ID NAME      OPEN_MODE            LOG_MODE     FOR
---------- --------- -------------------- ------------ ---
         2 ORASTRAC  READ WRITE           ARCHIVELOG   NO

SQL>
```

告警日志：

```
Tue Jun 02 14:30:03 2015
alter database open resetlogs
Archived Log entry 28 added for thread 1 sequence 7 ID 0x4e8bbda6 dest 1:
Expanded controlfile section 11 from 28 to 172 records
Requested to grow by 144 records; added 6 blocks of records
Archived Log entry 29 added for thread 1 sequence 8 ID 0x4e8bbda6 dest 1:
Archived Log entry 30 added for thread 1 sequence 9 ID 0x4e8bbda6 dest 1:
ARCH: Archiving disabled thread 2 sequence 7
Archived Log entry 31 added for thread 2 sequence 7 ID 0x4e8bbda6 dest 1:
Archived Log entry 32 added for thread 2 sequence 5 ID 0x4e8bbda6 dest 1:
Archived Log entry 33 added for thread 2 sequence 6 ID 0x4e8bbda6 dest 1:
RESETLOGS after incomplete recovery UNTIL CHANGE 1079126
Resetting resetlogs activation ID 1317780902 (0x4e8bbda6)
Tue Jun 02 14:30:16 2015
Setting recovery target incarnation to 4
Tue Jun 02 14:30:16 2015
```

```
This instance was first to open
Picked broadcast on commit scheme to generate SCNs
Tue Jun 02 14:30:17 2015
Assigning activation ID 1317937735 (0x4e8e2247)
LGWR: STARTING ARCH PROCESSES
Tue Jun 02 14:30:17 2015
ARC0 started with pid=36, OS id=24160
ARC0: Archival started
LGWR: STARTING ARCH PROCESSES COMPLETE
ARC0: STARTING ARCH PROCESSES
Tue Jun 02 14:30:18 2015
ARC1 started with pid=37, OS id=24164
Tue Jun 02 14:30:18 2015
ARC2 started with pid=38, OS id=24168
ARC1: Archival started
ARC2: Archival started
ARC1: Becoming the 'no FAL' ARCH
ARC1: Becoming the 'no SRL' ARCH
Tue Jun 02 14:30:18 2015
ARC3 started with pid=39, OS id=24172
ARC2: Becoming the heartbeat ARCH
Thread 2 opened at log sequence 1
  Current log# 4 seq# 1 mem# 0: +ARCH/orastrac/onlinelog/group_4.352.881252545
Successful open of redo thread 2
MTTR advisory is disabled because FAST_START_MTTR_TARGET is not set
Tue Jun 02 14:30:18 2015
SMON: enabling cache recovery
Instance recovery: looking for dead threads
Instance recovery: lock domain invalid but no dead threads
ARC3: Archival started
ARC0: STARTING ARCH PROCESSES COMPLETE
Redo thread 1 internally disabled at seq 1 (CKPT)
ARC3: Archiving disabled thread 1 sequence 1
Archived Log entry 34 added for thread 1 sequence 1 ID 0x0 dest 1:
Successfully onlined Undo Tablespace 5.
Dictionary check beginning
Tue Jun 02 14:30:22 2015
Errors in file /u01/app/oracle/diag/rdbms/orastrac/orastrac2/trace/orastrac2_dbw0_23597.trc:
ORA-01157: cannot identify/lock data file 201 - see DBWR trace file
ORA-01110: data file 201: '+DATA/orastrac/tempfile/temp.333.881251803'
ORA-17503: ksfdopn:2 Failed to open file +DATA/orastrac/tempfile/temp.333.881251803
ORA-15012: ASM file '+DATA/orastrac/tempfile/temp.333.881251803' does not exist
Errors in file /u01/app/oracle/diag/rdbms/orastrac/orastrac2/trace/orastrac2_dbw0_23597.trc:
ORA-01186: file 201 failed verification tests
ORA-01157: cannot identify/lock data file 201 - see DBWR trace file
ORA-01110: data file 201: '+DATA/orastrac/tempfile/temp.333.881251803'
File 201 not verified due to error ORA-01157
Dictionary check complete
Verifying file header compatibility for 11g tablespace encryption..
Verifying 11g file header compatibility for tablespace encryption completed
SMON: enabling tx recovery
Re-creating tempfile +DATA/orastrac/tempfile/temp.333.881251803 as +DATA/orastrac/tempfile/temp.313.881332223
Database Characterset is ZHS16GBK
No Resource Manager plan active
Starting background process GTX0
Tue Jun 02 14:30:23 2015
GTX0 started with pid=40, OS id=24179
Starting background process RCBG
Tue Jun 02 14:30:23 2015
RCBG started with pid=41, OS id=24183
replication_dependency_tracking turned off (no async multimaster replication found)
Tue Jun 02 14:30:27 2015
Starting background process QMNC
Tue Jun 02 14:30:27 2015
QMNC started with pid=42, OS id=24187
LOGSTDBY: Validating controlfile with logical metadata
LOGSTDBY: Validation complete
```

```
Tue Jun 02 14:30:48 2015
Completed: alter database open resetlogs
Tue Jun 02 14:30:50 2015
db_recovery_file_dest_size of 3882 MB is 4.43% used. This is a
user-specified limit on the amount of space that will be used by this
database for recovery-related files, and does not reflect the amount of
space available in the underlying filesystem or ASM diskgroup.
Tue Jun 02 14:30:51 2015
Starting background process CJQ0
Tue Jun 02 14:30:51 2015
CJQ0 started with pid=48, OS id=24265
```

可以看到数据已经恢复，但是实例只启动了一个，我们来启动第二个实例：

1.3.6.5 修复另一个节点的 pfile

```
[oracle@node1 dbs]$ more initorastrac1.ora
SPFILE='+DATA/orastrac/parameterfile/spfileorastrac.ora'
[oracle@node1 dbs]$
[oracle@node1 dbs]$ srvctl modify database -d orastrac  -p +DATA/orastrac/parameterfile/spfileorastrac.ora
[oracle@node1 dbs]$ srvctl start database -d orastrac
[oracle@node1 dbs]$
[oracle@node1 dbs]$ srvctl status database -d orastrac
Instance orastrac1 is running on node node1
Instance orastrac2 is running on node node2
[oracle@node1 dbs]$
```

```
[oracle@node2 dbs]$ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.1.0 Production on Tue Jun 2 14:45:43 2015

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With the Partitioning, Real Application Clusters, Automatic Storage Management, OLAP,
Data Mining and Real Application Testing options

SQL> set line 9999
SQL> col HOST_NAME format a10
SQL> select INSTANCE_NAME,HOST_NAME,VERSION,STARTUP_TIME,STATUS,ACTIVE_STATE,INSTANCE_ROLE,DATABASE_STATUS from gv$INSTANCE;

INSTANCE_NAME    HOST_NAME  VERSION           STARTUP_TIME        STATUS       ACTIVE_ST INSTANCE_ROLE      DATABASE_STATUS
---------------- ---------- ----------------- ------------------- ------------ --------- ------------------ ------------------
orastrac2        node2      11.2.0.1.0        2015-06-02 14:44:30 OPEN         NORMAL    PRIMARY_INSTANCE   ACTIVE
orastrac1        node1      11.2.0.1.0        2015-06-02 14:44:33 OPEN         NORMAL    PRIMARY_INSTANCE   ACTIVE

SQL> select INST_ID,name , open_mode, log_mode,force_logging from gv$database;

   INST_ID NAME      OPEN_MODE            LOG_MODE     FOR
---------- --------- -------------------- ------------ ---
         1 ORASTRAC  READ WRITE           ARCHIVELOG   NO
         2 ORASTRAC  READ WRITE           ARCHIVELOG   NO

SQL>
```

1.3.7 实验总结

采用 asm 来存储的 rac 环境下的数据库备份和还原与单实例下 os 文件系统的备份和还原基本一样，不同的是 recover 的时候，需要设置 2 个 thread。

1.4 总结

到此所有的处理算是基本完毕，过程很简单，但是不同的场景处理方式有很多种，我们应该学会灵活变通。

1.5 About Me

本文作者：小麦苗，只专注于数据库的技术，更注重技术的运用

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