

【RMAN】rm -rf 误操作的恢复过程

----数据库在无备份且 open 情况下的恢复

BLOG 文档结构图

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▾ ---数据库在无备份且 open 情况下的恢复

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本文地址 URL：<http://blog.itpub.net/26736162/viewspace-1623938/>

很多 DBA 一定对 rm -rf 深恶痛绝吧，没准哪天自己一个犯迷糊就把数据库给消灭了，然后，就没有然后了……那万一……真的发生了这样的不幸，是否真的就无药可救了吗？未必，还是有解决方法的，也许某天当你不幸遇到，就可以用来救自己了。这里做恢复操作的前提是没有可用的 rman 备份，或者数据库冷备份等，也就是说，没有任何备份。

1.1 登录 SQLPLUS 查看基本信息

先创建一个测试库，在测试库上来练习：

```
[oracle@orcltest ~]$ dbca -silent -createDatabase -templateName General_Purpose.dbc -gdbname oratest -sid oratest -sysPassword lhr -systemPassword lhr -responseFile NO_VALUE -datafileDestination /u02/app/oracle/oradata/ -redoLogFileSize 50 -recoveryAreaDestination /u02/app/oracle/flash_recovery_area -storageType FS -characterSet ZHS16GBK -nationalCharacterSet ALI6UTF16 -sampleSchema true -memoryPercentage 30 -totalMemory 200 -databaseType OLTP -emConfiguration NONE -automaticMemoryManagement true
Copying database files
1% complete
3% complete
10% complete
17% complete
24% complete
35% complete
Creating and starting Oracle instance
37% complete
42% complete
47% complete
52% complete
53% complete
56% complete
58% complete
Registering database with Oracle Restart
```

- 1 -

```
64% complete
Completing Database Creation
68% complete
71% complete
75% complete
85% complete
96% complete
100% complete
Look at the log file "/u02/app/oracle/cfgtoollogs/dbca/oratest/oratest.log" for further details.
```

```
[oracle@orcltest ~]$ ORACLE_SID=oratest
[oracle@orcltest ~]$ sqlplus / as sysdba
```

```
SQL*Plus: Release 11.2.0.3.0 Production on Tue May 5 13:42:00 2015

Copyright (c) 1982, 2011, Oracle. All rights reserved.
```

```
Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 - 64bit Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options
```

```
SQL> show parameter name
```

NAME	TYPE	VALUE
db_file_name_convert	string	
db_name	string	oratest
db_unique_name	string	oratest
global_names	boolean	FALSE
instance_name	string	oratest
lock_name_space	string	
log_file_name_convert	string	
processor_group_name	string	
service_names	string	oratest

```
SQL> archive log list;
Database log mode          Archive Mode
Automatic archival        Enabled
Archive destination        USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence 4
Next log sequence to archive 6
Current log sequence       6
SQL>
```

```
SQL> select status from v$instance;
```

```
STATUS
-----
OPEN
```

```
SQL> set line 9999 pagesize 9999
SQL> col FILE_NAME format a60
SQL> select 'datafile' file_type, file#,name FILE_NAME,status,enabled from v$datafile
2 union all
3 select 'tempfile',file#,name FILE_NAME,status,enabled from v$tempfile
4 union all
5 select 'logfile',group# file#,member FILE_NAME,status,'' from v$logfile
6 union all
7 select 'controlfile', to_number('') ,name FILE_NAME,status,'' from v$controlfile
8 ;
```

FILE_TYPE	FILE#	FILE_NAME	STATUS	ENABLED
datafile	1	/u02/app/oracle/oradata/oratest/system01.dbf	SYSTEM	READ WRITE
datafile	2	/u02/app/oracle/oradata/oratest/sysaux01.dbf	ONLINE	READ WRITE
datafile	3	/u02/app/oracle/oradata/oratest/undotbs01.dbf	ONLINE	READ WRITE
datafile	4	/u02/app/oracle/oradata/oratest/users01.dbf	ONLINE	READ WRITE

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```
datafile          5 /u02/app/oracle/oradata/oratest/example01.dbf      ONLINE  READ  WRITE
tempfile          1 /u02/app/oracle/oradata/oratest/temp01.dbf      ONLINE  READ  WRITE
logfile           3 /u02/app/oracle/oradata/oratest/redo03.log
logfile           2 /u02/app/oracle/oradata/oratest/redo02.log
logfile           1 /u02/app/oracle/oradata/oratest/redo01.log
controlfile       /u02/app/oracle/oradata/oratest/control01.ctl
controlfile       /u02/app/oracle/flash_recovery_area/oratest/control02.ctl

11 rows selected.

SQL>

SQL> create table aa  as select * from dba_objects;

Table created.

SQL> insert into  aa select * from aa;

75203 rows created.

SQL>
SQL> select count(1) from aa;

  COUNT(1)
-----
      150406

SQL>
```

这里不提交，，，我们看看数据是否可以恢复。

1.2 模拟 rm -rf 误操作

```
SQL> ! rm -rf /u02/app/oracle/oradata/oratest/*

SQL> ! rm -rf /u02/app/oracle/flash_recovery_area/oratest/*

SQL> ! ls -l /u02/app/oracle/oradata/oratest/*
ls: cannot access /u02/app/oracle/oradata/oratest/*: No such file or directory

SQL>

SQL> exit
Disconnected from Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 - 64bit Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options
[oracle@orcltest ~]$ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.3.0 Production on Tue May 5 13:58:54 2015

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```

```
Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 - 64bit Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options

SQL> select count(*) from dba_objects;

COUNT(*)
-----
       75202

SQL> select status from v$instance;

STATUS
-----
OPEN

SQL> select open_mode from v$database;
select open_mode from v$database
                *
ERROR at line 1:
ORA-00210: cannot open the specified control file
ORA-00202: control file: '/u02/app/oracle/oradata/oratest/control01.ctl'
ORA-27041: unable to open file
Linux-x86_64 Error: 2: No such file or directory
Additional information: 3

SQL> create table aa as select * from dba_objects;
create table aa as select * from dba_objects
                *
ERROR at line 1:
ORA-00604: error occurred at recursive SQL level 1
ORA-01116: error in opening database file 1
ORA-01110: data file 1: '/u02/app/oracle/oradata/oratest/system01.dbf'
ORA-27041: unable to open file
Linux-x86_64 Error: 2: No such file or directory
Additional information: 3

SQL>
```

由于数据文件都被删除，其中包括 system01.dbf，是存放数据字典的容器，想要再访问数据字典中得视图，当然是不可能的了，所以这里会报错，找不到文件，故障出现
--查看 alert.log 日志文件

Tue May 05 14:04:05 2015
Errors in file /u02/app/oracle/diag/rdbms/oratest/oratest/trace/oratest_m001_30851.trc:
ORA-00210: cannot open the specified control file
ORA-00202: control file: '/u02/app/oracle/oradata/oratest/control01.ctl'
ORA-27041: unable to open file
Linux-x86_64 Error: 2: No such file or directory
Additional information: 3

1.3 开始恢复

1.3.1 判断句柄位置

其实这个时候，所有 oracle 的进程都还在，都是以 ora_开头的都是 oracle 的后台进程：

```
SQL> ! ps -ef|grep ora_
oracle  31843      1  0 14:41 ?        00:00:00 ora_pmon_oratest
oracle  31845      1  0 14:41 ?        00:00:00 ora_psp0_oratest
oracle  31847      1  0 14:41 ?        00:00:00 ora_vktm_oratest
oracle  31851      1  0 14:41 ?        00:00:00 ora_gen0_oratest
oracle  31853      1  0 14:41 ?        00:00:00 ora_diag_oratest
oracle  31855      1  0 14:41 ?        00:00:00 ora_dbrm_oratest
oracle  31857      1  0 14:41 ?        00:00:00 ora_dia0_oratest
oracle  31859      1  0 14:41 ?        00:00:00 ora_mman_oratest
oracle  31861      1  0 14:41 ?        00:00:00 ora_dbw0_oratest
oracle  31863      1  0 14:41 ?        00:00:00 ora_lgwr_oratest
oracle  31865      1  0 14:41 ?        00:00:00 ora_ckpt_oratest
oracle  31867      1  0 14:41 ?        00:00:00 ora_smon_oratest
oracle  31869      1  0 14:41 ?        00:00:00 ora_reco_oratest
oracle  31871      1  0 14:41 ?        00:00:00 ora_mmon_oratest
oracle  31873      1  0 14:41 ?        00:00:00 ora_mmn1_oratest
oracle  31875      1  0 14:41 ?        00:00:00 ora_d000_oratest
oracle  31877      1  0 14:41 ?        00:00:00 ora_s000_oratest
oracle  31927      1  0 14:41 ?        00:00:00 ora_arc0_oratest
oracle  31935      1  0 14:41 ?        00:00:00 ora_arc1_oratest
oracle  31937      1  0 14:41 ?        00:00:00 ora_arc2_oratest
oracle  31939      1  0 14:41 ?        00:00:00 ora_arc3_oratest
oracle  31941      1  0 14:41 ?        00:00:00 ora_qmnc_oratest
oracle  31957      1  0 14:41 ?        00:00:00 ora_cjq0_oratest
oracle  31967      1  0 14:42 ?        00:00:00 ora_q000_oratest
oracle  31969      1  0 14:42 ?        00:00:00 ora_q001_oratest
oracle  31976      1  0 14:45 ?        00:00:00 ora_smco_oratest
oracle  31978      1  0 14:46 ?        00:00:00 ora_w000_oratest
oracle  32013      1  0 14:50 ?        00:00:00 ora_w001_oratest
oracle  32063 31989  0 14:57 pts/4    00:00:00 /bin/bash -c ps -ef|grep ora_
oracle  32065 32063  0 14:57 pts/4    00:00:00 grep ora_

SQL>
```

--查看 lgwr 进程，判断需要恢复文件句柄所在目录

```
SQL> !ps -ef|grep ora_lgwr
oracle  31863      1  0 14:41 ?        00:00:00 ora_lgwr_oratest
oracle  31995 31989  0 14:48 pts/4    00:00:00 /bin/bash -c ps -ef|grep ora_lgwr
oracle  31997 31995  0 14:48 pts/4    00:00:00 grep ora_lgwr

SQL>
```

由此可知，我们需要的被删除的文件句柄在/proc/31863/fd 下

此时，告警日志：

Tue May 05 14:09:05 2015

Errors in file /u02/app/oracle/diag/rdbms/oratest/oratest/trace/oratest_m000_30871.trc:

ORA-01116: error in opening database file 1

ORA-01110: data file 1: '/u02/app/oracle/oradata/oratest/system01.dbf'

ORA-27041: unable to open file

Linux-x86_64 Error: 2: No such file or directory

Additional information: 3

Errors in file /u02/app/oracle/diag/rdbms/oratest/oratest/trace/oratest_m000_30871.trc:

ORA-01116: error in opening database file 2

ORA-01110: data file 2: '/u02/app/oracle/oradata/oratest/sysaux01.dbf'

ORA-27041: unable to open file

Linux-x86_64 Error: 2: No such file or directory

Additional information: 3

Errors in file /u02/app/oracle/diag/rdbms/oratest/oratest/trace/oratest_m000_30871.trc:

ORA-01116: error in opening database file 4

ORA-01110: data file 4: '/u02/app/oracle/oradata/oratest/users01.dbf'

ORA-27041: unable to open file

Linux-x86_64 Error: 2: No such file or directory

Additional information: 3

Errors in file /u02/app/oracle/diag/rdbms/oratest/oratest/trace/oratest_m000_30871.trc:

ORA-01116: error in opening database file 5

ORA-01110: data file 5: '/u02/app/oracle/oradata/oratest/example01.dbf'

ORA-27041: unable to open file

Linux-x86_64 Error: 2: No such file or directory

Additional information: 3

Errors in file /u02/app/oracle/diag/rdbms/oratest/oratest/trace/oratest_m000_30871.trc:

ORA-01116: error in opening database file 201

ORA-01110: data file 201: '/u02/app/oracle/oradata/oratest/temp01.dbf'

ORA-27041: unable to open file

Linux-x86_64 Error: 2: No such file or directory

Additional information: 3

Errors in file /u02/app/oracle/diag/rdbms/oratest/oratest/trace/oratest_m000_30871.trc:

ORA-01116: error in opening database file 3

ORA-01110: data file 3: '/u02/app/oracle/oradata/oratest/undotbs01.dbf'

ORA-27041: unable to open file

Linux-x86_64 Error: 2: No such file or directory

Additional information: 3

Tue May 05 14:09:05 2015

Errors in file /u02/app/oracle/diag/rdbms/oratest/oratest/trace/oratest_m001_30873.trc:

ORA-00210: cannot open the specified control file

ORA-00202: control file: '/u02/app/oracle/oradata/oratest/control01.ctl'

ORA-27041: unable to open file

Linux-x86_64 Error: 2: No such file or directory

Additional information: 3

1.3.2 恢复数据文件、控制文件、tmp 文件和 online log 文件

```
SQL> exit
Disconnected from Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 - 64bit Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options
[oracle@orcltest ~]$ cd /proc/31863/fd
-bash: cd: /proc/30335/fd: Permission denied
[oracle@orcltest ~]$ cd /proc/31863/
[oracle@orcltest 30335]$ su - root
Password:
[root@orcltest ~]# cd /proc/31863/fd
[root@orcltest fd]# ll
total 0
lr-x----- 1 oracle oinstall 64 May  5 14:48 0 -> /dev/null
l-wx----- 1 oracle oinstall 64 May  5 14:48 1 -> /dev/null
lr-x----- 1 oracle oinstall 64 May  5 14:48 10 -> /dev/zero
lr-x----- 1 oracle oinstall 64 May  5 14:48 11 -> /dev/zero
lrwx----- 1 oracle oinstall 64 May  5 14:48 12 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/hc_oratest.dat
lr-x----- 1 oracle oinstall 64 May  5 14:48 13 -> /u02/app/oracle/product/11.2.0/dbhome_1/rdbms/mesg/oraus.msb
lr-x----- 1 oracle oinstall 64 May  5 14:48 14 -> /proc/31863/fd
lr-x----- 1 oracle oinstall 64 May  5 14:48 15 -> /dev/zero
lrwx----- 1 oracle oinstall 64 May  5 14:48 16 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/hc_oratest.dat
lrwx----- 1 oracle oinstall 64 May  5 14:48 17 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/lkORATEST
lr-x----- 1 oracle oinstall 64 May  5 14:48 18 -> /u02/app/oracle/product/11.2.0/dbhome_1/rdbms/mesg/oraus.msb
l-wx----- 1 oracle oinstall 64 May  5 14:48 2 -> /dev/null
lrwx----- 1 oracle oinstall 64 May  5 14:48 256 -> /u02/app/oracle/oradata/oratest/control01.ctl (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 257 -> /u02/app/oracle/flash_recovery_area/oratest/control02.ctl (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 258 -> /u02/app/oracle/oradata/oratest/redo01.log (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 259 -> /u02/app/oracle/oradata/oratest/redo02.log (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 260 -> /u02/app/oracle/oradata/oratest/redo03.log (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 261 -> /u02/app/oracle/oradata/oratest/system01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 262 -> /u02/app/oracle/oradata/oratest/sysaux01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 263 -> /u02/app/oracle/oradata/oratest/undotbs01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 264 -> /u02/app/oracle/oradata/oratest/users01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 265 -> /u02/app/oracle/oradata/oratest/example01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 266 -> /u02/app/oracle/oradata/oratest/temp01.dbf (deleted)
lr-x----- 1 oracle oinstall 64 May  5 14:48 3 -> /dev/null
lr-x----- 1 oracle oinstall 64 May  5 14:48 4 -> /dev/null
lrwx----- 1 oracle oinstall 64 May  5 14:48 5 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/hc_oratest.dat
lr-x----- 1 oracle oinstall 64 May  5 14:48 6 -> /dev/null
lr-x----- 1 oracle oinstall 64 May  5 14:48 7 -> /dev/null
lr-x----- 1 oracle oinstall 64 May  5 14:48 8 -> /dev/null
lr-x----- 1 oracle oinstall 64 May  5 14:48 9 -> /dev/null
[root@orcltest fd]#

[root@orcltest fd]# ll | grep deleted
lrwx----- 1 oracle oinstall 64 May  5 14:48 256 -> /u02/app/oracle/oradata/oratest/control01.ctl (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 257 -> /u02/app/oracle/flash_recovery_area/oratest/control02.ctl (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 258 -> /u02/app/oracle/oradata/oratest/redo01.log (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 259 -> /u02/app/oracle/oradata/oratest/redo02.log (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 260 -> /u02/app/oracle/oradata/oratest/redo03.log (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 261 -> /u02/app/oracle/oradata/oratest/system01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 262 -> /u02/app/oracle/oradata/oratest/sysaux01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 263 -> /u02/app/oracle/oradata/oratest/undotbs01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 264 -> /u02/app/oracle/oradata/oratest/users01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 265 -> /u02/app/oracle/oradata/oratest/example01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 266 -> /u02/app/oracle/oradata/oratest/temp01.dbf (deleted)
[root@orcltest fd]#
```

分析: 可以看句柄 256-266 的文件末尾被标记(deleted), 这是由刚才的 `rm -rf` 操作所导致的, 误删除后只要 Oracle 数据库未重启, 进程就不会停止, 那么就可以通过 `/proc/#oracle DBWn 进程号/fd` 目录中的文件句柄号, 来对这些被 `delete` 的文件进行恢复, 方法就是 `cp` 文件句柄到原路径, 注意一点这里如果不是在 `fd` 目录, 那就要用绝对路径来指定文件句柄, 如果删除文件后就, 又对数据库进行了关闭操作, 那就无解了, 只能想想 `rman` 了。

如果采用 secureCRT 软件来作为终端查看的话，可以看到这几个 deleted 的文件是一直闪动的，截了 2 张图：

```
[root@orcltest fd]# ll
total 0
lr-x----- 1 oracle oinstall 64 May 5 14:48 0 -> /dev/null
l-wx----- 1 oracle oinstall 64 May 5 14:48 1 -> /dev/null
lr-x----- 1 oracle oinstall 64 May 5 14:48 10 -> /dev/zero
lr-x----- 1 oracle oinstall 64 May 5 14:48 11 -> /dev/zero
lrwx----- 1 oracle oinstall 64 May 5 14:48 12 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/hc_oratest.dat
lr-x----- 1 oracle oinstall 64 May 5 14:48 13 -> /u02/app/oracle/product/11.2.0/dbhome_1/rdbms/mesg/oraus.msb
lr-x----- 1 oracle oinstall 64 May 5 14:48 14 -> /proc/31863/fd
lr-x----- 1 oracle oinstall 64 May 5 14:48 15 -> /dev/zero
lrwx----- 1 oracle oinstall 64 May 5 14:48 16 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/hc_oratest.dat
lrwx----- 1 oracle oinstall 64 May 5 14:48 17 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/lkORATEST
lr-x----- 1 oracle oinstall 64 May 5 14:48 18 -> /u02/app/oracle/product/11.2.0/dbhome_1/rdbms/mesg/oraus.msb
l-wx----- 1 oracle oinstall 64 May 5 14:53 19 -> /u02/app/oracle/diag/rdbms/oratest/oratest/trace/oratest_lgwr_31863.trc
l-wx----- 1 oracle oinstall 64 May 5 14:48 2 -> /dev/null
l-wx----- 1 oracle oinstall 64 May 5 14:53 20 -> /u02/app/oracle/diag/rdbms/oratest/oratest/trace/oratest_lgwr_31863.trm
lrwx----- 1 oracle oinstall 64 May 5 14:48 256 -> /u02/app/oracle/oradata/oratest/control01.ctl (deleted)
lrwx----- 1 oracle oinstall 64 May 5 14:48 257 -> /u02/app/oracle/flash_recovery_area/oratest/control02.ctl (deleted)
lrwx----- 1 oracle oinstall 64 May 5 14:48 258 -> /u02/app/oracle/oradata/oratest/redo01.log (deleted)
lrwx----- 1 oracle oinstall 64 May 5 14:48 259 -> /u02/app/oracle/oradata/oratest/redo02.log (deleted)
lrwx----- 1 oracle oinstall 64 May 5 14:48 260 -> /u02/app/oracle/oradata/oratest/redo03.log (deleted)
lrwx----- 1 oracle oinstall 64 May 5 14:48 261 -> /u02/app/oracle/oradata/oratest/system01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May 5 14:48 262 -> /u02/app/oracle/oradata/oratest/sysaux01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May 5 14:48 263 -> /u02/app/oracle/oradata/oratest/undotbs01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May 5 14:48 264 -> /u02/app/oracle/oradata/oratest/users01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May 5 14:48 265 -> /u02/app/oracle/oradata/oratest/example01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May 5 14:48 266 -> /u02/app/oracle/oradata/oratest/temp01.dbf (deleted)
lr-x----- 1 oracle oinstall 64 May 5 14:48 3 -> /dev/null
lr-x----- 1 oracle oinstall 64 May 5 14:48 4 -> /dev/null
lrwx----- 1 oracle oinstall 64 May 5 14:48 5 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/hc_oratest.dat
lr-x----- 1 oracle oinstall 64 May 5 14:48 6 -> /dev/null
lr-x----- 1 oracle oinstall 64 May 5 14:48 7 -> /dev/null
lr-x----- 1 oracle oinstall 64 May 5 14:48 8 -> /dev/null
lr-x----- 1 oracle oinstall 64 May 5 14:48 9 -> /dev/null
```



```
[root@orc]test fd]# ll
total 0
lr-x----- 1 oracle oinstall 64 May 5 14:48 0 -> /dev/null
l-wx----- 1 oracle oinstall 64 May 5 14:48 1 -> /dev/null
lr-x----- 1 oracle oinstall 64 May 5 14:48 10 -> /dev/zero
lr-x----- 1 oracle oinstall 64 May 5 14:48 11 -> /dev/zero
lrwx----- 1 oracle oinstall 64 May 5 14:48 12 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/hc_oratest.dat
lr-x----- 1 oracle oinstall 64 May 5 14:48 13 -> /u02/app/oracle/product/11.2.0/dbhome_1/rdbms/mesg/oraus.msb
lr-x----- 1 oracle oinstall 64 May 5 14:48 14 -> /proc/31863/fd
lr-x----- 1 oracle oinstall 64 May 5 14:48 15 -> /dev/zero
lrwx----- 1 oracle oinstall 64 May 5 14:48 16 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/hc_oratest.dat
lrwx----- 1 oracle oinstall 64 May 5 14:48 17 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/lkORATEST
lr-x----- 1 oracle oinstall 64 May 5 14:48 18 -> /u02/app/oracle/product/11.2.0/dbhome_1/rdbms/mesg/oraus.msb
l-wx----- 1 oracle oinstall 64 May 5 14:53 19 -> /u02/app/oracle/diag/rdbms/oratest/oratest/trace/oratest_lgwr_31863.trc
l-wx----- 1 oracle oinstall 64 May 5 14:48 2 -> /dev/null
l-wx----- 1 oracle oinstall 64 May 5 14:53 20 -> /u02/app/oracle/diag/rdbms/oratest/oratest/trace/oratest_lgwr_31863.trm
lrwx----- 1 oracle oinstall 64 May 5 14:48 256 ->
lrwx----- 1 oracle oinstall 64 May 5 14:48 257 ->
lrwx----- 1 oracle oinstall 64 May 5 14:48 258 ->
lrwx----- 1 oracle oinstall 64 May 5 14:48 259 ->
lrwx----- 1 oracle oinstall 64 May 5 14:48 260 ->
lrwx----- 1 oracle oinstall 64 May 5 14:48 261 ->
lrwx----- 1 oracle oinstall 64 May 5 14:48 262 ->
lrwx----- 1 oracle oinstall 64 May 5 14:48 263 ->
lrwx----- 1 oracle oinstall 64 May 5 14:48 264 ->
lrwx----- 1 oracle oinstall 64 May 5 14:48 265 ->
lrwx----- 1 oracle oinstall 64 May 5 14:48 266 ->
lr-x----- 1 oracle oinstall 64 May 5 14:48 3 -> /dev/null
lr-x----- 1 oracle oinstall 64 May 5 14:48 4 -> /dev/null
lrwx----- 1 oracle oinstall 64 May 5 14:48 5 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/hc_oratest.dat
lr-x----- 1 oracle oinstall 64 May 5 14:48 6 -> /dev/null
lr-x----- 1 oracle oinstall 64 May 5 14:48 7 -> /dev/null
lr-x----- 1 oracle oinstall 64 May 5 14:48 8 -> /dev/null
lr-x----- 1 oracle oinstall 64 May 5 14:48 9 -> /dev/null
[root@orc]test fd]#
```

执行恢复，执行如下脚本：

```
cp 256 /u02/app/oracle/oradata/oratest/control01.ctl
cp 257 /u02/app/oracle/flash_recovery_area/oratest/control02.ctl
cp 258 /u02/app/oracle/oradata/oratest/redo01.log
cp 259 /u02/app/oracle/oradata/oratest/redo02.log
cp 260 /u02/app/oracle/oradata/oratest/redo03.log
cp 261 /u02/app/oracle/oradata/oratest/system01.dbf
cp 262 /u02/app/oracle/oradata/oratest/sysaux01.dbf
cp 263 /u02/app/oracle/oradata/oratest/undotbs01.dbf
cp 264 /u02/app/oracle/oradata/oratest/users01.dbf
cp 265 /u02/app/oracle/oradata/oratest/example01.dbf
cp 266 /u02/app/oracle/oradata/oratest/temp01.dbf
```

注意，这里一定要注意权限问题，要用 oracle 用户去 cp，如果用 root 去 cp 出来的文件，oracle 进程是没有权限操作的，当然，你也可以在用 root 恢复完后，再 chown 一下：

```
[root@ora10g fd]# chown oracle.oinstall /u01/app/oracle -R
```

但是一定要注意，必须等全部数据文件恢复后才可以做 chown 操作，因为一旦执行了该操作，原来的 ora_ 进程会停止!!! 你再也无法恢复丢失的数据了!!! 这也是为什么推荐用 oracle 用户来 cp 的原因，有的时候 oracle 的权限不足，就只能使用 root 来 copy 了。

```
[root@orcltest fd]# cp 256 /u02/app/oracle/oradata/oratest/control01.ctl
[root@orcltest fd]# cp 257 /u02/app/oracle/flash_recovery_area/oratest/control02.ctl
[root@orcltest fd]# cp 258 /u02/app/oracle/oradata/oratest/redo01.log
[root@orcltest fd]# cp 259 /u02/app/oracle/oradata/oratest/redo02.log
[root@orcltest fd]# cp 260 /u02/app/oracle/oradata/oratest/redo03.log
[root@orcltest fd]# cp 261 /u02/app/oracle/oradata/oratest/system01.dbf
[root@orcltest fd]# cp 262 /u02/app/oracle/oradata/oratest/sysaux01.dbf
[root@orcltest fd]# cp 263 /u02/app/oracle/oradata/oratest/undotbs01.dbf
[root@orcltest fd]# cp 264 /u02/app/oracle/oradata/oratest/users01.dbf
[root@orcltest fd]# cp 265 /u02/app/oracle/oradata/oratest/example01.dbf
[root@orcltest fd]# cp 266 /u02/app/oracle/oradata/oratest/temp01.dbf

[root@orcltest fd]# chown oracle.oinstall /u02/app/oracle/oradata/oratest/*
[root@orcltest fd]# chown oracle.oinstall /u02/app/oracle/flash_recovery_area/oratest/control02.ctl
```

对文件进行恢复以后，直接查询 fd 目录下的文件状态，依然可以看到是(deleted)的，但是没关系，实际上文件已经恢复成功了

```
[root@orcltest fd]# ll
total 0
lr-x----- 1 oracle oinstall 64 May  5 14:48 0 -> /dev/null
l-wx----- 1 oracle oinstall 64 May  5 14:48 1 -> /dev/null
lr-x----- 1 oracle oinstall 64 May  5 14:48 10 -> /dev/zero
lr-x----- 1 oracle oinstall 64 May  5 14:48 11 -> /dev/zero
lrwx----- 1 oracle oinstall 64 May  5 14:48 12 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/hc_oratest.dat
lr-x----- 1 oracle oinstall 64 May  5 14:48 13 -> /u02/app/oracle/product/11.2.0/dbhome_1/rdbms/mesg/oraus.msb
lr-x----- 1 oracle oinstall 64 May  5 14:48 14 -> /proc/31863/fd
lr-x----- 1 oracle oinstall 64 May  5 14:48 15 -> /dev/zero
lrwx----- 1 oracle oinstall 64 May  5 14:48 16 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/hc_oratest.dat
lrwx----- 1 oracle oinstall 64 May  5 14:48 17 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/lkORATEST
lr-x----- 1 oracle oinstall 64 May  5 14:48 18 -> /u02/app/oracle/product/11.2.0/dbhome_1/rdbms/mesg/oraus.msb
l-wx----- 1 oracle oinstall 64 May  5 14:53 19 -> /u02/app/oracle/diag/rdbms/oratest/oratest/trace/oratest_lgwr_31863.trc
l-wx----- 1 oracle oinstall 64 May  5 14:48 2 -> /dev/null
l-wx----- 1 oracle oinstall 64 May  5 14:53 20 -> /u02/app/oracle/diag/rdbms/oratest/oratest/trace/oratest_lgwr_31863.trm
lrwx----- 1 oracle oinstall 64 May  5 14:48 256 -> /u02/app/oracle/oradata/oratest/control01.ctl (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 257 -> /u02/app/oracle/flash_recovery_area/oratest/control02.ctl (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 258 -> /u02/app/oracle/oradata/oratest/redo01.log (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 259 -> /u02/app/oracle/oradata/oratest/redo02.log (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 260 -> /u02/app/oracle/oradata/oratest/redo03.log (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 261 -> /u02/app/oracle/oradata/oratest/system01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 262 -> /u02/app/oracle/oradata/oratest/sysaux01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 263 -> /u02/app/oracle/oradata/oratest/undotbs01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 264 -> /u02/app/oracle/oradata/oratest/users01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 265 -> /u02/app/oracle/oradata/oratest/example01.dbf (deleted)
lrwx----- 1 oracle oinstall 64 May  5 14:48 266 -> /u02/app/oracle/oradata/oratest/temp01.dbf (deleted)
lr-x----- 1 oracle oinstall 64 May  5 14:48 3 -> /dev/null
lr-x----- 1 oracle oinstall 64 May  5 14:48 4 -> /dev/null
lrwx----- 1 oracle oinstall 64 May  5 14:48 5 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/hc_oratest.dat
lr-x----- 1 oracle oinstall 64 May  5 14:48 6 -> /dev/null
lr-x----- 1 oracle oinstall 64 May  5 14:48 7 -> /dev/null
lr-x----- 1 oracle oinstall 64 May  5 14:48 8 -> /dev/null
lr-x----- 1 oracle oinstall 64 May  5 14:48 9 -> /dev/null
[root@orcltest fd]#
```

此时，不用管了，只要我们保证所有的文件以及 copy 到制定位置就可以了，下边关闭数据库即可。

1.3.3 如果数据库还没有关掉则关闭数据库

```
[oracle@orcltest fd]$ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.3.0 Production on Tue May 5 15:01:54 2015

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Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 - 64bit Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options

SQL> archive log list;
ORA-03113: end-of-file on communication channel
SQL> exit
Disconnected from Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 - 64bit Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options
[oracle@orcltest fd]$ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.3.0 Production on Tue May 5 15:03:40 2015

Copyright (c) 1982, 2011, Oracle. All rights reserved.

Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 - 64bit Production
With the Partitioning, 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
-----
oratest        orcltest   11.2.0.3.0       2015-05-05 15:03:11  OPEN   NORMAL   PRIMARY_INSTANCE  ACTIVE

SQL> select sysdate from dual;

SYSDATE
-----
2015-05-05 15:06:48

SQL>
SQL> ! ps -ef|grep ora_lgwr_
oracle  32173      1  0 15:03 ?          00:00:00 ora_lgwr_oratest
oracle  32285 32274  0 15:09 pts/4      00:00:00 /bin/bash -c ps -ef|grep ora_lgwr_
oracle  32287 32285  0 15:09 pts/4      00:00:00 grep ora_lgwr_

SQL> select count(1) from aa;

COUNT(1)
-----
150406

SQL>
```

数据库自动重启了，而且数据也没有丢失，如果没有重启，我们可以手动重启一下，我们再次查看 fd 目录。


```
[root@orcltest ~]# cd /proc/32173/fd
[root@orcltest fd]# ll
total 0
lr-x----- 1 root root 64 May  5 15:10 0 -> /dev/null
l-wx----- 1 root root 64 May  5 15:10 1 -> /dev/null
lr-x----- 1 root root 64 May  5 15:10 10 -> /dev/null
lrwx----- 1 root root 64 May  5 15:10 11 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/hc_oratest.dat
lr-x----- 1 root root 64 May  5 15:10 12 -> /dev/null
lr-x----- 1 root root 64 May  5 15:10 13 -> /dev/null
lr-x----- 1 root root 64 May  5 15:10 14 -> /dev/null
lr-x----- 1 root root 64 May  5 15:10 15 -> /dev/null
lr-x----- 1 root root 64 May  5 15:10 16 -> /dev/zero
lr-x----- 1 root root 64 May  5 15:10 17 -> /u01/app/11.2.0/grid/dbs/hc_+ASM.dat
l-wx----- 1 root root 64 May  5 15:10 18 -> /u01/app/11.2.0/grid/log/orcltest/alertorcltest.log
lr-x----- 1 root root 64 May  5 15:10 19 -> /dev/zero
l-wx----- 1 root root 64 May  5 15:10 2 -> /dev/null
lrwx----- 1 root root 64 May  5 15:10 20 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/hc_oratest.dat
lr-x----- 1 root root 64 May  5 15:10 21 -> /u02/app/oracle/product/11.2.0/dbhome_1/rdbms/mesg/oraus.msb
lr-x----- 1 root root 64 May  5 15:10 22 -> /proc/32173/fd
lr-x----- 1 root root 64 May  5 15:10 23 -> /dev/zero
lrwx----- 1 root root 64 May  5 15:10 24 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/hc_oratest.dat
lrwx----- 1 root root 64 May  5 15:10 25 -> /u02/app/oracle/product/11.2.0/dbhome_1/dbs/lkORATEST
lrwx----- 1 root root 64 May  5 15:10 256 -> /u02/app/oracle/oradata/oratest/control01.ctl
lrwx----- 1 root root 64 May  5 15:10 257 -> /u02/app/oracle/flash_recovery_area/oratest/control02.ctl
lrwx----- 1 root root 64 May  5 15:10 258 -> /u02/app/oracle/oradata/oratest/redo01.log
lrwx----- 1 root root 64 May  5 15:10 259 -> /u02/app/oracle/oradata/oratest/redo02.log
lr-x----- 1 root root 64 May  5 15:10 26 -> /u02/app/oracle/product/11.2.0/dbhome_1/rdbms/mesg/oraus.msb
lrwx----- 1 root root 64 May  5 15:10 260 -> /u02/app/oracle/oradata/oratest/redo03.log
lrwx----- 1 root root 64 May  5 15:10 261 -> /u02/app/oracle/oradata/oratest/system01.dbf
lrwx----- 1 root root 64 May  5 15:10 262 -> /u02/app/oracle/oradata/oratest/sysaux01.dbf
lrwx----- 1 root root 64 May  5 15:10 263 -> /u02/app/oracle/oradata/oratest/undotbs01.dbf
lrwx----- 1 root root 64 May  5 15:10 264 -> /u02/app/oracle/oradata/oratest/users01.dbf
lrwx----- 1 root root 64 May  5 15:10 265 -> /u02/app/oracle/oradata/oratest/example01.dbf
lrwx----- 1 root root 64 May  5 15:10 266 -> /u02/app/oracle/oradata/oratest/temp01.dbf
lrwx----- 1 root root 64 May  5 15:10 3 -> /u01/app/11.2.0/grid/log/orcltest/agent/ohasd/oraagent_grid/oraagent_gridOUT.log
l-wx----- 1 root root 64 May  5 15:10 4 -> /u01/app/11.2.0/grid/log/orcltest/agent/ohasd/oraagent_grid/oraagent_grid.log
lr-x----- 1 root root 64 May  5 15:10 5 -> /dev/null
lrwx----- 1 root root 64 May  5 15:10 6 -> socket:[25060]
lrwx----- 1 root root 64 May  5 15:10 7 -> socket:[25061]
lrwx----- 1 root root 64 May  5 15:10 8 -> socket:[25062]
lrwx----- 1 root root 64 May  5 15:10 9 -> socket:[25063]
[root@orcltest fd]#
[root@orcltest ~]# cd /proc/31863/fd
-bash: cd: /proc/31863/fd: No such file or directory
```

此时数据文件都已经正常了，每次启动数据库实例后，进程都会再/proc 下生成一个相应的以进程号命名的目录，存放操作中涉及到的文件句柄，此时 lgwr 进程对应的目录已经变为 32173，而原来的 31863 目录已经不存在了

1.4 总结：

当我们进行 Linux 操作系统命令 rm 的时候，切忌不可随意加-rf 参数，就算一定要用，也要确定再三后才能执行，否则对于数据库而言，可以说是灾难性的。这里只是测试了一下删除/u01/app/oracle/oradata/下的全部文件，试想一下，如果你当初执行的是 rm -rf /u01 呢？可能情况就要更加复杂一点了，恢复需要的步骤也就更多了。

由于是在数据库 open 状态下直接进行了破坏性操作，对于 redo buffer 还来不及写入 online redo logfile 的那部分操作，肯定是会丢失的，因为我们通过文件句柄号恢复出来的日

志文件中，并不一定包含数据库的最新变更，即便如此，对于 `rm -rf` 误操作的恢复，还是有一定意义的，至少可以在你没有任何备份的情况下，多提供了一根救命稻草来拯救你的数据库，再次强调一下，`rm -rf` 后，千万不要着急地关闭数据库重启！！！否则就等着哭吧！！！！

1.5 其他相关文章链接

RMAN 相关链接：

- 【RMAN】利用备份片还原数据库(上)：<http://blog.itpub.net/26736162/viewspace-1621581/>
- 【RMAN】利用备份片还原数据库(中)：<http://blog.itpub.net/26736162/viewspace-1621661/>
- 【RMAN】利用备份片还原数据库(下)：<http://blog.itpub.net/26736162/viewspace-1621672/>
- 【RMAN】利用备份片还原数据库(中)-附加：<http://blog.itpub.net/26736162/viewspace-1621938/>

rman 跨版本恢复：

关于 10g 的跨小版本恢复参考：<http://blog.chinaunix.net/uid-26736162-id-4942816.html>

关于 11g 的跨小版本恢复参考：<http://blog.itpub.net/26736162/viewspace-1565655/>

关于在不同版本和平台之间进行还原或复制的常见问题：<http://blog.itpub.net/26736162/viewspace-1549041/>

RMAN 跨版本恢复(下)——大版本异机恢复：<http://blog.itpub.net/26736162/viewspace-1562583/>

undo 表空间的恢复：

undo 表空间文件丢失恢复（1）——有备份的情况下恢复：<http://blog.itpub.net/26736162/viewspace-1458654/>

undo 表空间文件丢失恢复（2）——无备份有 redo 的情况下恢复：<http://blog.itpub.net/26736162/viewspace-1458663/>

undo 表空间文件丢失恢复（3）——无备份无 redo 的情况下恢复：<http://blog.itpub.net/26736162/viewspace-1458750/>

undo 表空间文件丢失恢复（4）——无备份无 recover 的情况下恢复：<http://blog.itpub.net/26736162/viewspace-1458787/>

参考文档: <http://www.linuxidc.com/Linux/2014-08/105978.htm>

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