

## 【BBED】 sys.bootstrap\$ 对象的恢复

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### 1.2 前言部分

#### 1.2.1 导读和注意事项

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 sys.bootstrap\$的知识

② sys.bootstrap\$块损坏的修复过程

③ BBED copy 命令的使用

**Tips：**

① 若文章代码格式有错乱，推荐使用 QQ、搜狗或 360 浏览器，也可以下载 pdf 格式的文档来查看，pdf 文

档下载地址：<http://yunpan.cn/cdEQedhCs2kFz>（提取码：ed9b）

② 本篇 BLOG 中命令的输出部分需要特别关注的地方我都用灰色背景和粉红色字体来表示，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；而命令一般使

用黄色背景和红色字体标注；对代码或代码输出部分的注释一般采用蓝色字体表示。

```
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

[ZFXADB1:root]:/>ls -l
T_XDESK_APP1_vg
rootvg
[ZFXADB1:root]:/>
00:27:22 SQL> alter tablespace idxtbs read write;

====> 2097152*512/1024/1024/1024=1G
```

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 相关参考文章链接

【推荐】 【BBED】编译及基本命令(1)：<http://blog.itpub.net/26736162/viewspace-2075216/>

【推荐】 【BBED】丢失归档文件情况下的恢复：<http://blog.itpub.net/26736162/viewspace-2079337/>

### 1.2.3 本文简介

本文的实验过程主要是为了学习 BBED。

### 1.3 相关知识点扫盲(摘自网络)

在 alter database open 过程中，当读取到 bootstrap\$ 之后，会立即进行上下文切换，将控制权转移到 bootstrap\$ 过程，进行数据库的初始化工作。

```
SQL> select distinct dbms_rowid.rowid_relative_fno(rowid) file#,
2>                  dbms_rowid.rowid_block_number(rowid) block#
3>   from bootstrap$;
```

| FILE# | BLOCK# |
|-------|--------|
| 1     | 378    |
| 1     | 379    |
| 1     | 380    |

可以看到，bootstrap\$ 对象的数据位于 378、379、380 号块上，加上段头块 377，共 4 个数据块，若这 4 个数据块出现故障损坏。那么可以从测试环境或其他环境中同一个大版本的数据库中拷贝对应的数据块进行覆盖即可。

下面对数据库中 bootstrap\$ 对象损坏的情况进行模拟，并描述如何在此种情况下进行数据库恢复工作，使得数据库可以正常 open。

11g 下变成了 521、522、523 这 3 个块。

由于 bootstrap\$ 对象只存储于 File 1 中，在数据库其他文件中都不会存储该对象，故此本次故障我们无法从本数据库的其他文件获取数据。而在每个大版本的 Oracle 数据库中，bootstrap\$ 格式都是相同的，内容也基本相同。故此，在遇到这类问题时，可以尝试从其他同版本数据库中的 system 表空间 1 号文件中拷贝对应的数据块，具体步骤如下：

其他相关知识：<http://www.cnblogs.com/springside-example/archive/2011/10/31/2529621.html>

## 第 2 章 实验部分

### 2.1 实验环境介绍

| 项目                | db             |
|-------------------|----------------|
| db 类型             | 单实例            |
| db version        | 11.2.0.4.0     |
| db 存储             | FS             |
| 主机 IP 地址/hosts 配置 | 192.168.59.129 |
| OS 版本及 kernel 版本  | AIX 7.1 64 位   |
| 归档模式              | Archive Mode   |
| ORACLE_SID        | oralhr         |

### 2.2 实验目标

破坏 sys.bootstrap\$对象占用的 4 个块，然后利用 BBED 的 copy 从其他相同版本的文件中 copy 这 4 个块来恢复该对象。

### 2.3 实验过程

#### 2.3.1 冷备 system 文件

```
[ZFXDESKDB2:oracle]:/oracle>sqlplus / as sysdba
```

```
SQL*Plus: Release 11.2.0.4.0 Production on Thu Apr 14 16:10:07 2016
```

```
Copyright (c) 1982, 2013, Oracle. All rights reserved.
```

```
Connected to:
```

```
Oracle Database 11g Enterprise Edition Release 11.2.0.4.0 - 64bit Production  
With the Partitioning, Real Application Clusters, OLAP, Data Mining
```

and Real Application Testing options

```
SYS@oralhr> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.
SYS@oralhr> exit
Disconnected from Oracle Database 11g Enterprise Edition Release 11.2.0.4.0 - 64bit Production
With the Partitioning, Real Application Clusters, OLAP, Data Mining
and Real Application Testing options
```

```
[ZFXDESKDB2:oracle]:/oracle>cp /oracle/app/oracle/datafile/oralhr/system01.dbf
/oracle/app/oracle/datafile/oralhr/system01.dbf_bk
[ZFXDESKDB2:oracle]:/oracle>
[ZFXDESKDB2:oracle]:/oracle>sqlplus / as sysdba
```

SQL\*Plus: Release 11.2.0.4.0 Production on Thu Apr 14 16:34:04 2016

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Connected to an idle instance.

```
SYS@oralhr> startup
ORACLE instance started.
```

```
Total System Global Area 3089920000 bytes
Fixed Size                2250360 bytes
Variable Size             721422728 bytes
Database Buffers          2348810240 bytes
Redo Buffers              17436672 bytes
```

Database mounted.

Database opened.

```
SYS@oralhr> SELECT dbms_rowid.rowid_relative_fno(rowid) rel_fno,
2         dbms_rowid.rowid_block_number(rowid) blockno,
3         count(1)
4 FROM sys.bootstrap$ d
5 group by dbms_rowid.rowid_relative_fno(rowid) ,
6         dbms_rowid.rowid_block_number(rowid) ;
```

| REL_FNO | BLOCKNO | COUNT(1) |
|---------|---------|----------|
| 1       | 523     | 12       |
| 1       | 521     | 26       |
| 1       | 522     | 22       |

====》 11g 块号有所变化

```
SYS@oralhr>
SYS@oralhr> set line 9999 pagesize 9999
SYS@oralhr> col name format a80
SYS@oralhr> select file#||' '||name||' '||bytes name from v$datafile;
```

NAME

```
-----
1 /oracle/app/oracle/datafile/oralhr/system01.dbf 786432000
2 /oracle/app/oracle/datafile/oralhr/sysaux01.dbf 576716800
3 /oracle/app/oracle/datafile/oralhr/undotbs01.dbf 78643200
4 /oracle/app/oracle/datafile/oralhr/users01.dbf 310640640
```

```
SYS@oralhr>
```

## 2.3.2 模拟故障

```
[ZFXDESKDB2:oracle]:/home/oracle>l
total 208
-rwxrwxrwx 1 oracle dba 57 Apr 05 17:01 bbed.par
-rwxrwxrwx 1 oracle dba 52224 Apr 14 15:55 bifile.bbd
```

```
-rwxrwxrwx 1 oracle asmadmin 5715 Apr 06 15:34 ctl.sql
-rwxrwxrwx 1 oracle dba 302 Apr 14 10:32 file.txt
drwxrwxrwx 8 oracle dba 4096 Apr 13 17:16 gdul
-rwxrwxrwx 1 oracle dba 21008 Apr 14 16:35 log.bbd
drwxrwxrwx 4 oracle dba 256 Apr 12 15:52 oracle_bk
drwxrwxrwx 4 oracle dba 256 Apr 05 16:54 rman_bak
-rwxrwxrwx 1 oracle dba 757 Apr 11 10:02 rman_bk_db_archive_lhr.sh
-rwxrwxrwx 1 oracle dba 1023 Apr 08 11:25 rman_bk_db_lhr.sh
```

```
[ZFXDESKDB2:oracle]:/home/oracle>cat file.txt
```

```
1 /oracle/app/oracle/datafile/oralhr/system01.dbf 786432000
2 /oracle/app/oracle/datafile/oralhr/sysaux01.dbf 566231040
3 /oracle/app/oracle/datafile/oralhr/undotbs01.dbf 78643200
4 /oracle/app/oracle/datafile/oralhr/users01.dbf 310640640
5 /oracle/app/oracle/datafile/oralhr/system01.dbf_bk 786432000
```

```
[ZFXDESKDB2:oracle]:/home/oracle>bbed PASSWORD=blockedit mode=edit blocksize=8192
listfile=/home/oracle/file.txt
```

```
BBED: Release 2.0.0.0.0 - Limited Production on Thu Apr 14 16:36:00 2016
```

```
Copyright (c) 1982, 2011, Oracle and/or its affiliates. All rights reserved.
```

```
***** !!! For Oracle Internal Use only !!! *****
```

```
BBED> info
```

| File# | Name   | Size(blks) |
|-------|--|------------|
| 1     | /oracle/app/oracle/datafile/oralhr/system01.dbf    | 96000      |
| 2     | /oracle/app/oracle/datafile/oralhr/sysaux01.dbf    | 69120      |
| 3     | /oracle/app/oracle/datafile/oralhr/undotbs01.dbf   | 9600       |
| 4     | /oracle/app/oracle/datafile/oralhr/users01.dbf     | 37920      |
| 5     | /oracle/app/oracle/datafile/oralhr/system01.dbf_bk | 96000      |

```
BBED> set count 128
```

```
COUNT 128
```

```
BBED> copy file 1 block 111 to file 1 block 377
```

```
Warning: contents of previous BIFILE will be lost. Proceed? (Y/N) Y
```

```
File: /oracle/app/oracle/datafile/oralhr/system01.dbf (1)
```

```
Block: 377 Offsets: 0 to 127 Dbai:0x00400179
```

```
1ea20000 0040006f 000000e2 00000104 fa4c0000 00000001 03450080 00000000
00000000 0000f800 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

```
<32 bytes per line>
```

```
BBED> copy file 1 block 111 to file 1 block 378
```

```
File: /oracle/app/oracle/datafile/oralhr/system01.dbf (1)
```

```
Block: 378 Offsets: 0 to 127 Dbai:0x0040017a
```

```
1ea20000 0040006f 000000e2 00000104 fa4c0000 00000001 03450080 00000000
00000000 0000f800 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

```
<32 bytes per line>
```

```
BBED> copy file 1 block 111 to file 1 block 379
```

```
File: /oracle/app/oracle/datafile/oralhr/system01.dbf (1)
```

```
Block: 379 Offsets: 0 to 127 Dbai:0x0040017b
```

```
1ea20000 0040006f 000000e2 00000104 fa4c0000 00000001 03450080 00000000
00000000 0000f800 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

```
<32 bytes per line>
```

```
BBED> copy file 1 block 111 to file 1 block 380
```

```
File: /oracle/app/oracle/datafile/oralhr/system01.dbf (1)
```

```
Block: 380           Offsets: 0 to 127           Db:0x0040017c
-----
1ea20000 0040006f 000000e2 00000104 fa4c0000 00000001 03450080 00000000
00000000 0000f800 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000

<32 bytes per line>

BBED> sum apply
Check value for File 1, Block 380:
current = 0xfa4c, required = 0xfa4c

BBED>
BBED>
```

重启数据库：

```
SYS@oralhr> startup force
ORACLE instance started.

Total System Global Area 3089920000 bytes
Fixed Size                2250360 bytes
Variable Size             721422728 bytes
Database Buffers          2348810240 bytes
Redo Buffers              17436672 bytes
Database mounted.
ORA-01092: ORACLE instance terminated. Disconnection forced
ORA-00704: bootstrap process failure
ORA-00704: bootstrap process failure
ORA-00604: error occurred at recursive SQL level 1
ORA-01578: ORACLE data block corrupted (file # 1, block # 377)
ORA-01110: data file 1: '/oracle/app/oracle/datafile/oralhr/system01.dbf'
Process ID: 32243962
Session ID: 34 Serial number: 3

SYS@oralhr>
```

10g 不会提示，但告警日志里有提示，11g 直接有提示，告警日志：

```
Errors in file /oracle/app/oracle/diag/rdbms/oralhr/oralhr/trace/oralhr_ora_32243962.trc:
ORA-00704: bootstrap process failure
ORA-00704: bootstrap process failure
ORA-00604: error occurred at recursive SQL level 1
ORA-01578: ORACLE data block corrupted (file # 1, block # 377)
ORA-01110: data file 1: '/oracle/app/oracle/datafile/oralhr/system01.dbf'
Error 704 happened during db open, shutting down database
USER (ospid: 32243962): terminating the instance due to error 704
Instance terminated by USER, pid = 32243962
ORA-1092 signalled during: ALTER DATABASE OPEN...
opiodr aborting process unknown ospid (32243962) as a result of ORA-1092
Thu Apr 14 16:40:03 2016
ORA-1092 : opitsk aborting process
```

### 2.3.3 故障恢复

从其他的相同版本的库 copy 1 号文件，我们有冷备份，直接添加进 BBED 来恢复。

```
[ZFXDESKDB2:oracle]:/home/oracle> bbed PASSWORD=blockedit mode=edit blocksize=8192
listfile=/home/oracle/file.txt
```

BBED: Release 2.0.0.0.0 - Limited Production on Thu Apr 14 16:42:59 2016

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\*\*\*\*\* !!! For Oracle Internal Use only !!! \*\*\*\*\*

BBED> info

| File# | Name   | Size(blks) |
|-------|--|------------|
| 1     | /oracle/app/oracle/datafile/oralhr/system01.dbf    | 96000      |
| 2     | /oracle/app/oracle/datafile/oralhr/sysaux01.dbf    | 69120      |
| 3     | /oracle/app/oracle/datafile/oralhr/undotbs01.dbf   | 9600       |
| 4     | /oracle/app/oracle/datafile/oralhr/users01.dbf     | 37920      |
| 5     | /oracle/app/oracle/datafile/oralhr/system01.dbf_bk | 96000      |

BBED> set count 128

COUNT 128

BBED>

BBED>

BBED> copy file 5 block 377 to file 1 block 377

Warning: contents of previous BIFILE will be lost. Proceed? (Y/N) Y

File: /oracle/app/oracle/datafile/oralhr/system01.dbf (1)

Block: 377 Offsets: 0 to 127 Dbai:0x00400179

```
06a20000 00400179 000d00f0 00000104 75380000 02000001 00000029 000d00f0
00000000 00010200 00000000 0004000d 0000040d 00c072f0 009e0200 80000000
000d00e9 01008001 00000001 0009002e 1f291efb 0040017a 00080000 1f780000
1f701f68 1f5f1f56 1f4d1f44 1f3b1f32 1f291eb2 1ea71ec8 1ed31e2e 1e231e9c
```

<32 bytes per line>

BBED> copy file 5 block 378 to file 1 block 378

File: /oracle/app/oracle/datafile/oralhr/system01.dbf (1)

Block: 378 Offsets: 0 to 127 Dbai:0x0040017a

```
06a20000 0040017a 00033b45 00000104 5e150000 02000000 00000029 00033b45
0000af58 00020200 00000000 0003001f 0000000e 00c003f0 00070100 e0000000
00033742 00000000 00000000 00000000 00000000 00000000 00008001
00000001 023f04a2 04a80006 00000000 0040017b 00000000 06000000 1f600000
```

<32 bytes per line>

BBED> copy file 5 block 379 to file 1 block 379

File: /oracle/app/oracle/datafile/oralhr/system01.dbf (1)

Block: 379 Offsets: 0 to 127 Dbai:0x0040017b

```
06a20000 0040017b 0002fee2 00000106 4c290000 02000000 00000029 0002fed6
00000000 00020200 00000000 00080002 00000048 00c01bb9 00120100 c0000000
0001bf0a 0004001f 000000ff 00c00592 00341200 2002001c 0002fee2 00008001
00000002 02390496 04a10023 00000002 0040017c 0040017a 06000000 1f600000
```

<32 bytes per line>

BBED> copy file 5 block 380 to file 1 block 380

File: /oracle/app/oracle/datafile/oralhr/system01.dbf (1)

Block: 380 Offsets: 0 to 127 Dbai:0x0040017c

```
06a20000 0040017c 0008ac20 00000106 55390000 02020003 00000029 0008ab88
00000000 1f020200 00000000 000a000d 0000015e 00c0714e 00330100 60010000
0008ab8a 000a0018 00000151 00c0714d 00330900 20420000 0008ac20 00018001
00000002 021f0462 04670005 00000000 0040017d 0040017b 06000000 1f600000
```

<32 bytes per line>

BBED> sum apply

Check value for File 1, Block 380:



```
current = 0x5539, required = 0x5539
```

```
BBED>
```

```
BBED>
```

尝试启动数据库：

```
SYS@oralhr> alter database open;
```

```
ERROR:
```

```
ORA-03114: not connected to ORACLE
```

```
SYS@oralhr> exit
```

```
Disconnected from Oracle Database 11g Enterprise Edition Release 11.2.0.4.0 - 64bit Production
```

```
With the Partitioning, Real Application Clusters, OLAP, Data Mining
```

```
and Real Application Testing options
```

```
[ZFXDESKDB2:oracle]:/oracle> sqlplus / as sysdba
```

```
SQL*Plus: Release 11.2.0.4.0 Production on Thu Apr 14 16:44:02 2016
```

```
Copyright (c) 1982, 2013, Oracle. All rights reserved.
```

```
Connected to an idle instance.
```

```
SYS@oralhr> startup
```

```
ORACLE instance started.
```

```
Total System Global Area 3089920000 bytes
```

```
Fixed Size 2250360 bytes
```

```
Variable Size 721422728 bytes
```

```
Database Buffers 2348810240 bytes
```

```
Redo Buffers 17436672 bytes
```

```
Database mounted.
```

```
Database opened.
```

```
SYS@oralhr>
```

**自此：数据库正常启动，且后台告警日志未出现任何类似 ORA-600、7445 等内部错误，恢复完成！**

## 2.4 实验总结

11g 下 sys.bootstrap\$对象所占用的块变成了 520、521、522、523 这 4 个块，10g 下为 377、378、379、380 这 4 个块，

但是 11g 测试的时候破坏 520、521、522、523 或 378、379、380 都可以完成这个实验，其中破坏 520 的时候报错：

```
ORA-01092: ORACLE instance terminated. Disconnection forced
```

```
ORA-00704: bootstrap process failure
```

```
ORA-01578: ORACLE data block corrupted (file # 1, block # 520)
```

```
ORA-01110: data file 1: '/oracle/app/oracle/datafile/oralhr/system01.dbf'
```

```
Process ID: 34078884
```

```
Session ID: 34 Serial number: 3
```

## About Me

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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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