利用闪回数据库（flashback）修复 Failover 后的 DG 环境

姓名：小麦苗

时间：2017.11.06

QQ 群：230161599

微信公众号：xiaomaimiaolhr
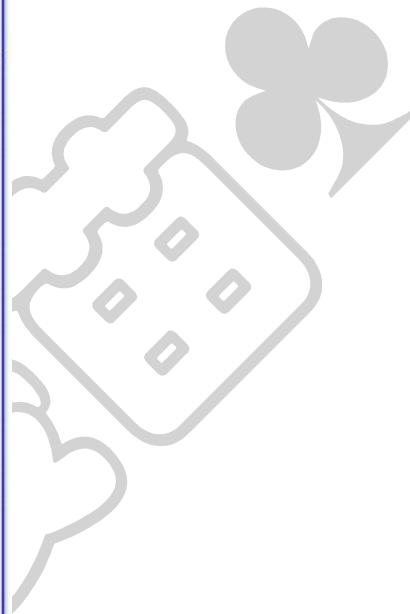
博客地址：http://blog.itpub.net/26736162/abstract/1/

利用闪回数据库（**flashback**）修复 **Failover** 后的 **DG** 环境

1.1 **BLOG** 文档结构图

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 Failover 后 DG 环境的恢复方法（重点）

② DG 的基本维护操作

③ GC 客户端软件的安装

④ 利用 GC 快速搭建一套 DG 环境

⑤ Failover 和 Switchover 的区别

⑥ 其它维护操作

Tips:

① 本文在 itpub（http://blog.itpub.net/26736162）、博客园（http://www.cnblogs.com/lhrbest）和微信公众号（xiaomaimiaolhr）上有同步更新。

② 文章中用到的所有代码、相关软件、相关资料及本文的 pdf 版本都请前往小麦苗的云盘下载，小麦苗的云盘地址见：http://blog.itpub.net/26736162/viewspace-1624453/。

③ 若网页文章代码格式有错乱，请下载 pdf 格式的文档来阅读。

④ 在本篇 BLOG 中，代码输出部分一般放在一行一列的表格中。

⑤ 本文适合于初中级人员阅读，数据库大师请略过本文。

⑥ 不喜勿喷。

本文若有错误或不完善的地方请大家多多指正，您的批评指正是我写作的最大动力。

1.3 本文简介

10 月 23 和 24 日考完了 OCM，感觉过关的法则就是"真题+多练"，练习过 10 来遍，基本就可以考过了。OCM 的考试内容除了 GC 这块小麦苗没有接触过，其它内容基本都算熟。基本命令熟记于心，不熟的命令可以立马找到官方文档，善用 OEM 和 SQL Developer 工具。所以，想快速通过 OCM 考试的朋友可以私下联系小麦苗，小麦苗会把自己的经验全都教给大家。

好了，废话不多说了。最近小麦苗的 DBA 宝典微信群里，有朋会友问到了 Failover 操作后，如何恢复到最初的 DG 环境。这个问题，小麦苗大概知道利用闪回可以实现，只是没有做过实验，或者曾经做过实验，只是没有记录文档，反正就是年纪大了，想不起来了。好吧，最近就抽个时间把这个实验做一遍。有不对的地方，依然请大家指出。

1.4 相关知识点扫盲

① 物理 DG 的 Switchover 切换：http://blog.itpub.net/26736162/viewspace-1753111/

② 物理 DG 的 Failover 切换：http://blog.itpub.net/26736162/viewspace-1753130/

③ 利 用 闪 回 数 据 库 （ flashback ） 修 复 Failover 后 的 DG 环 境 ：http://blog.itpub.net/26736162/viewspace-2146883/

④ Switchover 和 Failover 的区别：http://blog.itpub.net/26736162/viewspace-2141207/

1.1.1.1 Switchover 和 Failover 的区别

一个 DG 环境中只有两种角色：Primary 和 Standby。所谓角色转换就是让数据库在这两种角色中切换，切换也分两种：Switchover 和 Failover，关于角色切换需要注意以下几点：

① Switchover 是指主库转换成备库，然后将原备库转换成新主库；而 Failover 是指将备库转换成主库。

② 使用场合不同：Switchover 用于有准备的、计划之中的切换，通常是系统升级、数据迁移等常态任务；Failover 用于意料之外的突发情况，例如异常断电、自然灾难等等。

③ 数据丢失程度不同：Switchover 不会丢失数据，Failover 通常意味着有部分数据丢失。

④ 善后处理的不同：Switchover 之后 DG 环境不会被破坏，仍然有 Primary、Standby 两种角色的系统存在，但是 Failover 之后，DG 环境就会被破坏，一般情况下需要重建。但是，若主库或备库开启了闪回功能，则都可以通过闪回数据库功能恢复 DG 环境。例如，PROD1 为主库，SBDB1 为备库；若 PROD1 意外宕机，则 SBDB1 执行 Failover 操作变为主库；此时若想恢复 DG 环境，则有 3 种处理办法：

a. 将 PROD1 利用闪回数据库功能闪回到 SBDB1 变为主库的 SCN 时间点，然后将 PROD1 转换为备库，最后利用 switchover 转换为最初的环境。在这种情况下，PROD1 需要开启闪回。

b. 将 SBDB1 利用闪回数据库功能闪回到 SBDB1 变为主库的 SCN 时间点，此时 SBDB1 仍然是主库的角色，然后将 SBDB1 转换为备库。在这种情况下，SBDB1 需要开启闪回，而且会丢失部分数据。

c. 利用 RMAN 重新搭建 DG 环境。

Switchover 切换的主要 SQL 语句为：

```
--在主库操作
alter database commit to switchover to physical standby with session shutdown;
startup mount;
--在备库操作
select name, LOG_MODE, OPEN_MODE, database_role, SWITCHOVER_STATUS, db_unique_name, flashback_on from v$database;
alter database commit to switchover to primary with session shutdown;
alter database open;
```

Failover 切换的主要 SQL 语句为：

```
--在备库操作
alter database recover managed standby database finish force;
alter database commit to switchover to primary with session shutdown;
alter database open;
```

执行闪回数据库后，切换主库为备库的 SQL 语句为：

```
alter database convert to physical standby;
```

📖 说明：

有关具体的 Switchover 和 Failover 切换的过程可以参考我的 BLOG：

① 物理 DG 的 Switchover 切换：http://blog.itpub.net/26736162/viewspace-1753111/

② 物理 DG 的 Failover 切换：http://blog.itpub.net/26736162/viewspace-1753130/

③ 利用闪回数据库（flashback）修复 Failover 后的 DG 环境：http://blog.itpub.net/26736162/viewspace-2146883/

④ Switchover 和 Failover 的区别：http://blog.itpub.net/26736162/viewspace-2141207/

第 2 章　实验准备

2.1 实验环境介绍

实验环境为练习 OCM 的虚拟机环境：

项目	Source DB	Target DB

DB 类型	单机	单机
DB VERSION	11.2.0.3.0	11.2.0.3.0
DB 存储	FS	FS
OS 版本及 kernel 版本	OEL linux 5.4 32	OEL linux 5.4 32
DB_NAME	PROD1	PROD1
ORACLE_SID	PROD1	SBDB1
ORACLE_HOME	/u01/app/oracle/product/11.2.0/dbhome_1	/u01/app/oracle/product/11.2.0/db_1
hosts 文件	10.190.104.111 edsir4p1.us.oracle.com edsir4p1 10.190.104.28 edsir1p8.us.oracle.com edsir1p8	

2.2 实验目标

备库执行 FAILOVER 后，通过闪回数据库技术重新恢复 DG 环境，而不用重新搭建 DG。

2.3 实验过程

2.4 利用 GC 快速搭建 DG 环境

小麦苗手头的 DG 环境是在一个主机上，测试多有不便，刚好，最近练习 OCM 的环境还在，就用练习 OCM 的环境来做这个实验吧。若已经有 DG 环境的朋友可以略过该小节内容。
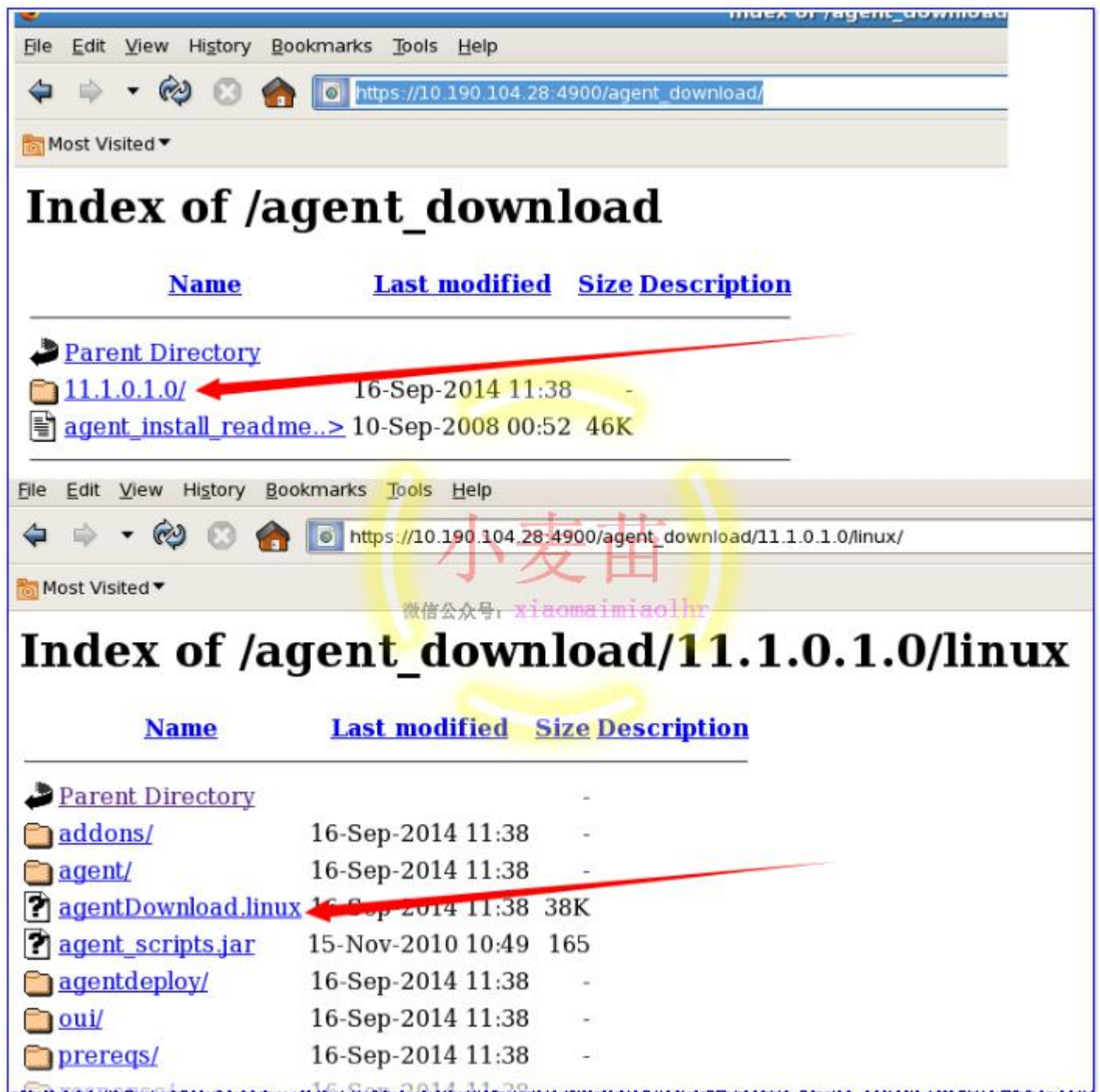
2.4.1　安装 GC 客户端软件

1、起动 GC 服务器，首先确保 EMREP 数据库处于 OPEN 状态，监听也已经启动，GC 服务器启动日志为：
/u01/app/gc_inst/em/EMGC_OMS1/sysman/log/emctl.log
    cd /u01/app/oracle/Middleware/oms11g/bin

./emctl start oms

```
[oracle@edsir1p8- ~]$ ps -ef|grep pmon
oracle    4763    1  0 00:53 ?        00:00:00 ora_pmon_EMREP
oracle  11802 11633  0 01:39 pts/2    00:00:00 grep pmon
[oracle@edsir1p8- ~]$ cd /u01/app/
gc_inst/    Middleware/  oracle/      oraInventory/
[oracle@edsir1p8- ~]$ cd /u01/app/Middleware/oms11g/bin
[oracle@edsir1p8- bin]$ ./emctl start oms
Oracle Enterprise Manager 11g Release 1 Grid Control
Copyright (c) 1996, 2010 Oracle Corporation.  All rights reserved.
Starting WebTier...
WebTier Successfully Started
Starting Oracle Management Server...
Oracle Management Server Successfully Started
AdminServer Could Not Be Started
Oracle Management Server is Up
[oracle@edsir1p8- bin]$ more /etc/hosts
# Do not remove the following line, or various programs
# that require network functionality will fail.
127.0.0.1       localhost.localdomain   localhost
10.190.104.28   edsir1p8.us.oracle.com  edsir1p8
10.190.104.111 edsir4p1.us.oracle.com edsir4p1
[oracle@edsir1p8- bin]$ ./emctl status oms -details
Oracle Enterprise Manager 11g Release 1 Grid Control
Copyright (c) 1996, 2010 Oracle Corporation.  All rights reserved.
Enter Enterprise Manager Root (SYSMAN) Password :
Console Server Host : edsir1p8.us.oracle.com
HTTP Console Port   : 7788
HTTPS Console Port  : 7799
HTTP Upload Port    : 4889
HTTPS Upload Port   : 4900
OMS is not configured with SLB or virtual hostname
Agent Upload is locked.
OMS Console is locked.
Active CA ID: 1
```

2、安装 agent

https://10.190.104.28:4900/agent_download/ 从这里下载

Index of /agent_download/11.1.0.1.0/linux

Name	**Last modified**	**Size**	**Description**
Parent Directory		-	
addons/	16-Oct-2014 13:54	-	
agent/	16-Oct-2014 13:54	-	
agentDownload.linux	16-Oct-2014 13:54	38K	
agent_	0 10:49	165	
agentd	4 13:54	-	
oui/	4 13:54	-	
prereq	4 13:54	-	
respon	4 13:54		

Open Link in New Window
Open Link in New Tab

Bookmark This Link
Save Link As...
Send Link...
Copy Link Location

Properties

微信公众号：xiaomaimiaolhr

Index of /agent_download/11.1.0.1.0/linux

Name	**Last modified**	**Size**	**Description**
Parent Directory		-	
addons/	16-Oct-2014 13:54	-	
agent/	16-Oct-2014 13:54	-	
agentDownload.linux	16-Oct-2014 13:54	38K	
agent_scripts.jar	15-Nov-2010 10:49	165	
agentdeploy/	16-Oct-2014 13:54	-	
oui/	16-Oct-2014 13:54	-	
prereqs/	16-Oct-2014 13:54	-	
response/	16-Oct-2014 13:54	-	

Enter name of file to save to...

Name: agentDownload.linux

Save in folder: Desktop

▷ Browse for other folders

✗ Cancel   💾 Save
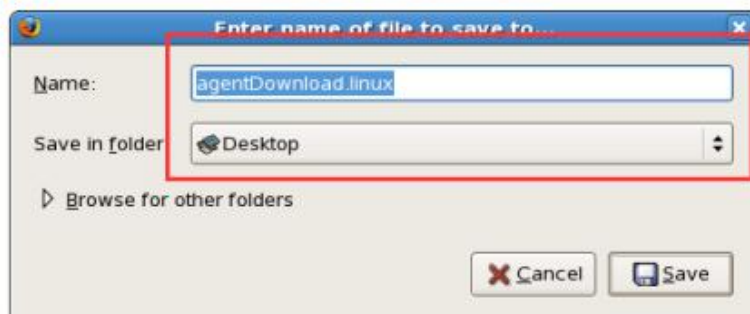
右键保存到桌面。

a、在需要安装 **agent** 的机器上 **mkdir /u01/app/agentbase** 创建目录，并将 **agentDownload.linux** 文件 **cp** 到**/u01/app/agentbase** 目录下，并且赋予可执行权限。

b、在服务端 **OMS** 启动的情况下，在客户端执行：

./agentDownload.linux -b /u01/app/agentbase -m edsir1p8.us.oracle.com -r 7799 -y

安装过程中要输入偶数机上 **OMS** 的密码

c、安装完成要用 **root** 执行：

[root@edsir4p1 ~]# sudo /u01/app/agentbase/agent11g/root.sh

没有 **root** 密码要使用 **sudo** 执行，注意：一定要执行该脚本，它会设置一些文件的权限（该脚本会把 **$AGENT_HOME/bin/nm*** 的几个文件的所有者修改为 **root**。）。如果不执行，那么搭建 **DG** 可能会报错："**ERROR: NMO not setuid-root (Unix-only)**"

d、进入**/u01/app/agentbase/agent11g/bin**

./emctl status agent 检查同步状态

./emctl upload agent 上传同步

./emctl secure agent 重新注册 **agent**，用于安装时密码输错

过程如下所示：

```
[oracle@edsir4p1-PROD2 ~]$ mkdir -p /u01/app/agentbase
[oracle@edsir4p1-PROD2 ~]$ cd /u01/app/agentbase
[oracle@edsir4p1-PROD2 agentbase]$ cp /home/oracle/Desktop/agentDownload.linux .
[oracle@edsir4p1-PROD2 agentbase]$ chmod +x agentDownload.linux
[oracle@edsir4p1-PROD2 agentbase]$ ll
total 40
-rwxr-xr-x 1 oracle oinstall 38525 Nov  6 01:46 agentDownload.linux
[oracle@edsir4p1-PROD2 agentbase]$ ./agentDownload.linux
agentDownload.linux invoked on Mon Nov  6 01:46:55 UTC 2017 with Arguments ""
agentDownload.linux: Invalid Invocation
Usage: agentDownload.linux -b[cdhimnoprtuvxyNR]
   b - Base installation location for Agent Oracle home
   d - Do NOT initiate automatic target discovery
   h - Usage (this message)
   i - Inventory pointer location file
   l - To specify as local host (pass -local to runInstaller)
   m - Management Service host name for downloading the Management Agent software
   n - Cluster name
   o - Old Oracle Home location during Upgrade
   p - Static port list file
   r - Port for connecting to the Management Service host
   t - Do NOT start the Agent
   u - Upgrade
   v - Inventory directory location
   x - Debug output
   c - CLUSTER_NODES
   N - Do NOT prompt for Agent Registration Password
   R - To use virtual hostname(ORACLE_HOSTNAME) for this installation. If this is being used along with more
than one cluster nodes through -c option, then -l option also needs to be passed.
   y - Decline Security Updates.
[oracle@edsir4p1-PROD2 agentbase]$ ./agentDownload.linux -b /u01/app/agentbase -m edsir1p8.us.oracle.com
-r 7799 -y
agentDownload.linux invoked on Mon Nov  6 01:49:01 UTC 2017 with Arguments "-b /u01/app/agentbase -m
edsir1p8.us.oracle.com -r 7799 -y"
Platform=Linux.i686, OS=linux
GetPlatform:returned=0, and os is set to: linux, platform=Linux.i686
Creating /u01/app/agentbase/agentDownload11.1.0.1.0Oui ...
LogFile for this Download can be found at:
"/u01/app/agentbase/agentDownload11.1.0.1.0Oui/agentDownload.linux110617014901.log"
Running on Selected Platform: Linux.i686
Installer location: /u01/app/agentbase/agentDownload11.1.0.1.0Oui
Downloading Agent install response file ...
Downloading Agent install response file ...
Executing wget_get_file
。。。。。。。。。。省略部分。。。。。。
Finished Downloading agent_download.rsp with Status=0
Response file check Complete - Success
Checking the writable permission for baseDir - passed

Provide the Agent Registration password so that the Management Agent can communicate with Secure Management
Service.
Note: You may proceed with the installation without supplying the password; however, Management Agent can
be secured manually after the installation.
If Oracle Management Service is not secured, agent will not be secured, so continue by pressing Enter Key.

Enter Agent Registration Password:      <<<<=输入密码
Downloading Oracle Installer ...
Executing wget_get_file
https://edsir1p8.us.oracle.com:7799/agent_download/11.1.0.1.0/linux/oui/oui_linux.jar
using the url https://edsir1p8.us.oracle.com:7799/agent_download/11.1.0.1.0/ to access OMS
。。。。。。。。。。省略部分。。。。。。
```

```
Configuration assistant "Agent Configuration Assistant" Succeeded

AgentPlugIn:agent configuration finished with status = true

Running Configuration assistant "Agent Add-on Plug-in"

Configuration assistant "Agent Add-on Plug-in" Succeeded

Querying Agent status: Agent is running
Removing the copied stuff.....
Removed: /u01/app/agentbase/agentDownload11.1.0.1.0Oui/oui linux.jar
Removed: /u01/app/agentbase/agentDownload11.1.0.1.0Oui/agent download.rsp
Removed:/u01/app/agentbase/agentDownload11.1.0.1.0Oui/Disk1
Log name of installation can be found at: "/u01/app/agentbase/agentDownload.linux110617014901.log"
/u01/app/agentbase/agent11g/root.sh needs to be executed by root to complete this installation.
[oracle@edsir4p1-PROD2 agentbase]$ sudo /u01/app/agentbase/agent11g/root.sh
[oracle@edsir4p1-PROD2 agentbase]$ ll
total 80
drwxr-xr-x 40 oracle oinstall  4096 Nov  6 01:53 agent11g
drwxr-xr-x  2 oracle oinstall  4096 Nov  6 01:53 agentDownload11.1.0.1.0Oui
-rwxr-xr-x  1 oracle oinstall 38525 Nov  6 01:46 agentDownload.linux
-rw-r--r--  1 oracle oinstall    78 Nov  6 01:46 agentDownload.linux110617014655.log
-rw-r--r--  1 oracle oinstall 24908 Nov  6 01:53 agentDownload.linux110617014901.log
[oracle@edsir4p1-PROD2 agentbase]$ cd agent11g/bin/
[oracle@edsir4p1-PROD2 bin]$ ./emctl status agent
Oracle Enterprise Manager 11g Release 1 Grid Control 11.1.0.1.0
Copyright (c) 1996, 2010 Oracle Corporation.  All rights reserved.
---------------------------------------------------------------
Agent Version     : 11.1.0.1.0
OMS Version       : 11.1.0.1.0
Protocol Version  : 11.1.0.0.0
Agent Home        : /u01/app/agentbase/agent11g
Agent binaries    : /u01/app/agentbase/agent11g
Agent Process ID  : 26954
Parent Process ID : 26914
Agent URL         : https://edsir4p1.us.oracle.com:3872/emd/main/
Repository URL    : https://edsir1p8.us.oracle.com:4900/em/upload
Started at        : 2017-11-06 01:53:15
Started by user   : oracle
Last Reload       : 2017-11-06 01:53:15
Last successful upload                : 2017-11-06 01:55:13
Total Megabytes of XML files uploaded so far :    17.86
Number of XML files pending upload        :        0
Size of XML files pending upload(MB)       :     0.00
Available disk space on upload filesystem   :    83.54%
Last successful heartbeat to OMS           : 2017-11-06 01:57:20
---------------------------------------------------------------
Agent is Running and Ready
[oracle@edsir4p1-PROD2 bin]$
```

2.4.2　使用 GC 快速搭建物理备库

从浏览器打开 **https://10.190.104.28:7799/em/**，使用 **sysman** 用户进行登录。

使用 sys 用户登录 PROD1 数据库。

ORACLE Enterprise Manager
Grid Control 11g

Hosts | Databases | Middleware | Web Applications | Services | Systems | Groups | Virtual Servers | **All Targets**

Backup Type   Backup Options   Database Location

Add Standby Database: Backup Type

Data Guard uses Oracle Recovery Manager (RMAN) to create the standby database from a new or existing backup of the primary database. Select the type of backup to use for the standby database creation.

- ⊙ Online Backup
  - ⊙ Use Recovery Manager (RMAN) to copy database files
    Staging areas not required. RMAN will copy files directly to destination locations.
  - ○ Copy database files via staging areas
    Requires staging areas on both primary and standby hosts.
- ○ Existing Backup
  - ⊙ RMAN Backup
    A whole database backup performed typically as part of a regular backup strategy.
  - ○ Backup from a previous standby database creation
    A backup performed by the Add Standby Database wizard.

ORACLE Enterprise Manager
Grid Control 11g

微信公众号：xiaomaimiaolhr   Home

Hosts | Databases | Middleware | Web Applications | Services | Systems | Groups | Virtual Servers | **All Targets**

Backup Type   **Backup Options**   Database Location   File Locatio

Add Standby Database: Backup Options

Primary Database   **PROD1**
Primary Host   **edsir4p1.us.oracle.com**

The primary database files will be copied directly to the standby database Oracle Home. No staging areas are required.

Degree of Parallelism   `2`
The number of parallel channels used by Recovery Manager (RMAN) to copy the database fi bandwidth is available.

Primary Host Credentials
Enter the credentials of the user who owns the primary database Oracle server installation.

* Username   `oracle`   操作系统的用户名密码，此处为 oracle
* Password   `••••••`
   ☑ Save as Preferred Credential

Primary Database Standby Redo Log Files
Several Data Guard features require standby redo log files. They will be added to the primary database.

☑ Use Oracle-managed files (OMF) for standby redo log files

Hosts | Databases | Middleware | Web Applications | Services | Systems | Groups | Virtual Servers | **All Targets**

Backup Type — Backup Options — **Database Location** — File Locations — Configuration — Review

Add Standby Database: Database Location

Primary Database **PROD1**
Primary Host **edsir4p1.us.oracle.com**

Standby Database Attributes

* Instance Name **SBDB1**

The instance name (also referred to as the SID) must be unique on the standby host.

Database Storage **File System**

Standby Database Location

Specify the host and Oracle Home where the standby database will be created. The host should be a discovered Enterprise Manager target and match the operating system of specified host and match the version of the primary database.

* Host **edsir1p8.us.oracle.com**

* Oracle Home **/u01/app/oracle/product/11.2.0/db_1**

Standby Host Credentials

Enter the credentials of the user who owns the Oracle Home selected above.

* Username **oracle**

* Password ••••••

☑ Save as Preferred Credential

Add Standby Database: File Locations

Primary Database **PROD1**
Primary Host **edsir4p1.us.oracle.com**
Standby Host **edsir1p8.us.oracle.com**

Standby Database File Locations

Total Disk Space Required **2140 MB**

◉ Use Oracle Optimal Flexible Architecture-compliant directory structure (OFA)

○ Keep file names and locations the same as the primary database

Listener Configuration

○ Use Default Grid Infrastructure Listener

The destination host contains a Grid Infrastructure installation. Choose this option to use the default listener running from the Grid Infrastructure home.

◉ Use Destination Database Home Listener

Configuration File Location **/u01/app/oracle/product/11.2.0/db_1/network/admin**

* Listener Name **LISTENER**

Click the flashlight to show the list of existing listeners.

* Port **1521**

Primary Database Port **1521**

等待大约 10 分钟即可自动完成 DG 的搭建和配置工作。期间，可以查看主库和备库的告警日志以及数据文件夹的大小来预估搭建完成时间。

创建完成后：

2.4.3 启用实时应用

2.5 开启主备库闪回

主库：

```
SQL> select name, open_mode, database_role, flashback_on from v$database;

NAME      OPEN_MODE            DATABASE_ROLE    FLASHBACK_ON
--------- -------------------- ---------------- ------------------
PROD1     READ WRITE           PRIMARY          NO
SQL>  select INSTANCE_NAME,INSTANCE_ROLE from v$instance;

INSTANCE_NAME    INSTANCE_ROLE
---------------- -----------------
PROD1            PRIMARY_INSTANCE
```

备库：

```
SQL> select name, open_mode, database_role, flashback_on from v$database;

NAME      OPEN_MODE            DATABASE_ROLE    FLASHBACK_ON
--------- -------------------- ---------------- ------------------
PROD1     READ ONLY WITH APPLY PHYSICAL STANDBY NO
SQL> select INSTANCE_NAME,INSTANCE_ROLE from v$instance;
```

```
INSTANCE NAME    INSTANCE ROLE
---------------- ------------------
SBDB1           PRIMARY_INSTANCE
```

主库开启闪回：

```
SQL> alter database flashback on;

Database altered.

SQL>  select name, open_mode, database_role, flashback_on from v$database;

NAME      OPEN_MODE             DATABASE_ROLE    FLASHBACK_ON
--------- -------------------- ---------------- ------------------
PROD1     READ WRITE            PRIMARY          YES
SQL> select oldest_flashback_scn, to_char(oldest_flashback_time,'yyyy-mm-dd HH24:mi:ss')
oldest_flashback_time from v$flashback_database_log;

OLDEST_FLASHBACK_SCN OLDEST_FLASHBACK_TI
-------------------- -------------------
            867005 2017-11-06 02:55:59

SQL> show parameter flashback

NAME                                 TYPE        VALUE
------------------------------------ ----------- --------------------------------
db_flashback_retention_target        integer     1440

====>参数 db_flashback_retention_target 控制闪回时间范围，数字单位是分钟，默认为1天。这个数字决定了闪回的时间范围，如
果设置更长的时间，对应的闪回日志文件大小就会比较大一些。
```

告警日志：

```
Mon Nov 06 02:55:55 2017
alter database flashback on
Starting background process RVWR
Mon Nov 06 02:55:56 2017
RVWR started with pid=37, OS id=1096
Allocated 3981204 bytes in shared pool for flashback generation buffer
Flashback Database Enabled at SCN 867006
Completed: alter database flashback on
```

此时，备库并没有开启闪回，需要在备库上手动开启闪回：

```
SQL> alter database flashback on;
alter database flashback on
*
ERROR at line 1:
ORA-01153: an incompatible media recovery is active


SQL> recover managed standby database cancel;
Media recovery complete.
SQL>  alter database flashback on;

Database altered.
```

```
SQL> select name, open mode, database role, flashback on from v$database;

NAME      OPEN MODE              DATABASE ROLE    FLASHBACK ON
--------- -------------------- ---------------- ------------------
PROD1     READ ONLY            PHYSICAL STANDBY YES

SQL> alter database recover managed standby database using current logfile disconnect from session;

Database altered.
```

第 3 章　实验 1

实验 1、PROD1 意外宕机，SBDB1 执行 Failover 操作变为主库；然后将 PROD1 利用闪回数据库功能闪回到 SBDB1 变为主库的 SCN 时间点，然后将 PROD1 转换为备库，最后利用 switchover 转换为最初的环境。<===PROD1 需要开启闪回

3.1 **Failover** 操作

切换之前确保监听使用静态监听、fal_client、fal_server、log_archive_dest_1 和 log_archive_dest_2 参数已正确配置。

主库操作：

```
SYS@PROD1> select
dbid,name,current_scn,protection_mode,protection_level,database_role,force_logging,open_mode,switchover
_status from v$database;

     DBID NAME        CURRENT_SCN PROTECTION_MODE      PROTECTION_LEVEL      DATABASE_ROLE    FOR OPEN_MODE
SWITCHOVER_STATUS
---------- ---------- ----------- -------------------- -------------------- ---------------- ---
-------------------- --------------------
2177200393 PROD1           868787 MAXIMUM PERFORMANCE  MAXIMUM PERFORMANCE  PRIMARY          YES READ WRITE
TO STANDBY
SYS@PROD1> create table test_bylhr as select * from dba_objects;

Table created.

SYS@PROD1> insert into test_bylhr select * from test_bylhr;

72459 rows created.

SYS@PROD1> commit;

Commit complete.

SYS@PROD1> select count(1) from test_bylhr;

  COUNT(1)
----------
    144918

SYS@PROD1> shutdown abort
ORACLE instance shut down.
```

备库操作：

```
SYS@SBDB1> select count(1) from test bylhr;

  COUNT(1)
----------
    144918

SYS@SBDB1> alter database recover managed standby database cancel;

Database altered.

SYS@SBDB1> alter database recover managed standby database finish;

Database altered.

SYS@SBDB1> set line 9999
SYS@SBDB1> select name, LOG MODE, OPEN MODE, database role, SWITCHOVER STATUS, db unique name from
v$database;

NAME      LOG MODE    OPEN MODE            DATABASE ROLE    SWITCHOVER STATUS    DB UNIQUE NAME
--------- ----------- -------------------- ---------------- --------------------
------------------------------
PROD1     ARCHIVELOG  READ ONLY            PHYSICAL STANDBY SESSIONS ACTIVE      SBDB1

SYS@SBDB1>  alter database commit to switchover to primary with session shutdown;

Database altered.

SYS@SBDB1> select name, LOG MODE, OPEN MODE, database role, SWITCHOVER STATUS, db unique name from
v$database;

NAME      LOG MODE    OPEN MODE            DATABASE ROLE    SWITCHOVER STATUS    DB UNIQUE NAME
--------- ----------- -------------------- ---------------- --------------------
------------------------------
PROD1     ARCHIVELOG  MOUNTED              PRIMARY          NOT ALLOWED          SBDB1

SYS@SBDB1> alter database open;

Database altered.
```

3.2 **Primary** 重新加入

　　Failover 后的 Primary 数据库，实际上已经失去了和 DG 的关联，如果 Primary 故障严重，是难以保障对应的归档数据可以顺利传输的。如果希望 Primary 重新回到 DG 环境，关键就是恢复的时间点。要求 Primary 回到 Standby 切换角色的那个时间点，理论上就可以"延续"操作。

3.2.1　　查询原备库变为新主库的 SCN

　　在原备库端，查看 v$database 视图，可以看到这个库成为 primary 的具体时间。

```
SYS@SBDB1> select STANDBY_BECAME_PRIMARY_SCN from v$database;
```

```
STANDBY BECAME PRIMARY SCN
--------------------------
                 869428


SYS@SBDB1> create table test bylhr2 as select * from dba objects where rownum<=1000;

Table created.

SYS@SBDB1> alter system switch logfile;

System altered.
SYS@SBDB1> select count(1) from test bylhr2;

  COUNT(1)
----------
      1000

SYS@SBDB1> select dbms_flashback.get_system_change_number from dual;

GET_SYSTEM_CHANGE_NUMBER
-----------------------
                869833
```

3.2.2   原主库执行闪回操作

```
SYS@PROD1> startup mount
ORACLE instance started.

Total System Global Area  313860096 bytes
Fixed Size                  1336232 bytes
Variable Size             247467096 bytes
Database Buffers           58720256 bytes
Redo Buffers                6336512 bytes
Database mounted.
SYS@PROD1> flashback database to scn 869428;

Flashback complete.

SYS@PROD1> select
dbid,name,current_scn,protection_mode,protection_level,database_role,force_logging,open_mode,switchover
_status from v$database;

    DBID NAME       CURRENT_SCN PROTECTION_MODE     PROTECTION_LEVEL     DATABASE_ROLE    FOR OPEN_MODE
SWITCHOVER_STATUS
---------- ---------- ----------- -------------------- -------------------- ---------------- ---
-------------------- --------------------
2177200393 PROD1                0 MAXIMUM PERFORMANCE  UNPROTECTED          PRIMARY          YES MOUNTED
NOT ALLOWED
```

注意：重新加入的原 Primary 是不能恢复角色的，而是只能先成为 Standby 角色。应用后续的日志达到同步。

```
SYS@PROD1> alter database convert to physical standby;
```

```
Database altered.

SYS@PROD1> startup force;
ORACLE instance started.

Total System Global Area  313860096 bytes
Fixed Size                  1336232 bytes
Variable Size             247467096 bytes
Database Buffers           58720256 bytes
Redo Buffers                6336512 bytes
Database mounted.
Database opened.
SYS@PROD1> select
dbid,name,current scn,protection mode,protection level,database role,force logging,open mode,switchover
_status from v$database;

     DBID NAME        CURRENT_SCN PROTECTION_MODE      PROTECTION_LEVEL     DATABASE_ROLE    FOR OPEN_MODE
SWITCHOVER_STATUS
---------- ---------- ----------- -------------------- -------------------- ---------------- ---
-------------------- --------------------
2177200393 PROD1          869428 MAXIMUM PERFORMANCE  MAXIMUM PERFORMANCE  PHYSICAL STANDBY YES READ ONLY
TO PRIMARY
SYS@PROD1> alter database recover managed standby database using current logfile disconnect from session;

Database altered.
SYS@PROD1> select count(1) from test_bylhr2;

  COUNT(1)
----------
      1000
```

Oracle DG 在发生 Failover 之后，当主库解决问题，是不可以直接回到 DG 环境的。这个过程往往需要一些辅助组建的配合。如 RMAN、Flashback，都可以简化重回 DG 的过程时间。

注意：如果原主库查询不到 test_bylhr2 表的数据，则需要仔细检查监听使用静态监听、fal_client、fal_server、log_archive_dest_1 和 log_archive_dest_2 参数已正确配置。

3.3 执行 **switchover** 切换成初始环境

新主库：

```
SYS@SBDB1> select name, LOG_MODE, OPEN_MODE, database_role, SWITCHOVER_STATUS, db_unique_name from
v$database;

NAME      LOG_MODE     OPEN_MODE            DATABASE_ROLE    SWITCHOVER_STATUS    DB_UNIQUE_NAME
--------- ------------ -------------------- ---------------- --------------------
----------------------------
PROD1     ARCHIVELOG   READ WRITE           PRIMARY          TO STANDBY           SBDB1
SYS@SBDB1> alter database commit to switchover to physical standby with session shutdown;

Database altered.

SYS@SBDB1> shutdown immediate
ORA-01507: database not mounted
```

```
ORACLE instance shut down.
SYS@SBDB1> startup mount
ORACLE instance started.

Total System Global Area  313860096 bytes
Fixed Size                  1336232 bytes
Variable Size             239078488 bytes
Database Buffers           67108864 bytes
Redo Buffers                6336512 bytes
Database mounted.
SYS@SBDB1> select name, LOG MODE, OPEN MODE, database role, SWITCHOVER STATUS, db unique name from
v$database;

NAME      LOG MODE     OPEN MODE           DATABASE ROLE    SWITCHOVER STATUS    DB UNIQUE NAME
--------- ------------ ------------------- ---------------- --------------------
-----------------------------
PROD1     ARCHIVELOG   MOUNTED             PHYSICAL STANDBY TO PRIMARY          SBDB1
```

新备库执行：

```
SYS@PROD1> select name, LOG_MODE, OPEN_MODE, database_role, SWITCHOVER_STATUS, db_unique_name from
v$database;

NAME   LOG_MODE     OPEN_MODE           DATABASE_ROLE    SWITCHOVER_STATUS    DB_UNIQUE_NAME
------ ------------ ------------------- ---------------- --------------------
-----------------------------
PROD1  ARCHIVELOG   READ ONLY           PHYSICAL STANDBY TO PRIMARY          PROD1

SYS@PROD1> alter database commit to switchover to primary with session shutdown;

Database altered.

SYS@PROD1> select name, LOG_MODE, OPEN_MODE, database_role, SWITCHOVER_STATUS, db_unique_name from
v$database;

NAME   LOG_MODE     OPEN_MODE           DATABASE_ROLE    SWITCHOVER_STATUS    DB_UNIQUE_NAME
------ ------------ ------------------- ---------------- --------------------
-----------------------------
PROD1  ARCHIVELOG   MOUNTED             PRIMARY          NOT ALLOWED          PROD1

SYS@PROD1> alter database open;

Database altered.

SYS@PROD1>  select name, LOG_MODE, OPEN_MODE, database_role, SWITCHOVER_STATUS, db_unique_name from
v$database;

NAME   LOG_MODE     OPEN_MODE           DATABASE_ROLE    SWITCHOVER_STATUS    DB_UNIQUE_NAME
------ ------------ ------------------- ---------------- --------------------
-----------------------------
PROD1  ARCHIVELOG   READ WRITE          PRIMARY          RESOLVABLE GAP       PROD1
SYS@PROD1> create table test_bylhr3 as select * from dual;

Table created.
```

备库查询：

```
SYS@SBDB1> select * from test bylhr3;
select * from test bylhr3
                *
ERROR at line 1:
ORA-01219: database not open: queries allowed on fixed tables/views only


SYS@SBDB1> alter database open;

Database altered.

SYS@SBDB1> select * from test bylhr3;

D
-
X
```

至此，该实验完毕。即主备库执行 Failover 后，通过闪回重新恢复最初的 DG 环境。

第 4 章　实验 2

实验 2、PROD1 意外宕机，SBDB1 执行 Failover 操作变为主库；然后将 SBDB1 利用闪回数据库功能闪回到 SBDB1 变为主库的 SCN 时间点，此时 SBDB1 仍然是主库的角色，然后将 SBDB1 转换为备库。<===SBDB1 需要开启闪回，会丢失部分数据。

4.1 **Failover** 操作

主库操作：

```
SYS@PROD1>  select
dbid,name,current_scn,protection_mode,protection_level,database_role,force_logging,open_mode,switchover
_status from v$database;

    DBID NAME   CURRENT_SCN PROTECTION_MODE       PROTECTION_LEVEL    DATABASE_ROLE    FOR OPEN_MODE
SWITCHOVER_STATUS
---------- ------ ----------- -------------------- -------------------- ---------------- ---
------------------- --------------------
2177200393 PROD1      901700 MAXIMUM PERFORMANCE  MAXIMUM PERFORMANCE  PRIMARY          YES READ WRITE
TO STANDBY

SYS@PROD1> create table test_bylhr4 as select * from dual;

Table created.

SYS@PROD1> select * from test_bylhr4;

D
-
X

SYS@PROD1> shutdown abort
ORACLE instance shut down.
```

备库操作：

```
SYS@SBDB1> select * from test bylhr4;

D
-
X

SYS@SBDB1> alter database recover managed standby database finish force;

Database altered.

SYS@SBDB1> select name, LOG MODE, OPEN MODE, database role, SWITCHOVER STATUS, db unique name from
v$database;

NAME     LOG MODE     OPEN MODE           DATABASE ROLE    SWITCHOVER STATUS    DB UNIQUE NAME
--------- ------------ -------------------- ---------------- --------------------
------------------------------
PROD1    ARCHIVELOG   MOUNTED             PHYSICAL STANDBY TO PRIMARY           SBDB1

SYS@SBDB1>  alter database commit to switchover to primary with session shutdown;

Database altered.

SYS@SBDB1> select name, LOG MODE, OPEN MODE, database role, SWITCHOVER STATUS, db unique name from
v$database;

NAME     LOG MODE     OPEN MODE           DATABASE ROLE    SWITCHOVER STATUS    DB UNIQUE NAME
--------- ------------ -------------------- ---------------- --------------------
------------------------------
PROD1    ARCHIVELOG   MOUNTED             PRIMARY          NOT ALLOWED          SBDB1

SYS@SBDB1>  select * from test bylhr4;
 select * from test bylhr4
              *
ERROR at line 1:
ORA-01219: database not open: queries allowed on fixed tables/views only


SYS@SBDB1> alter database open;

Database altered.

SYS@SBDB1> select * from test_bylhr4;

D
-
X

SYS@SBDB1>  create table test_bylhr5 as select * from dual;

Table created.

SYS@SBDB1>  select * from test_bylhr5;

D
-
X
```

4.2 新主库闪回

```
SYS@SBDB1> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.
SYS@SBDB1> startup mount
ORACLE instance started.

Total System Global Area  313860096 bytes
Fixed Size                  1336232 bytes
Variable Size             243272792 bytes
Database Buffers           62914560 bytes
Redo Buffers                6336512 bytes
Database mounted.
SYS@SBDB1>  select STANDBY_BECAME_PRIMARY_SCN from v$database;

STANDBY_BECAME_PRIMARY_SCN
--------------------------
                    901723

SYS@SBDB1>  flashback database to scn 901723;

Flashback complete.

SYS@SBDB1> select * from test_bylhr5;
select * from test_bylhr5
            *
ERROR at line 1:
ORA-01219: database not open: queries allowed on fixed tables/views only


SYS@SBDB1> select name, LOG_MODE, OPEN_MODE, database_role, SWITCHOVER_STATUS, db_unique_name from
v$database;

NAME      LOG_MODE     OPEN_MODE            DATABASE_ROLE    SWITCHOVER_STATUS    DB_UNIQUE_NAME
--------- ------------ -------------------- ---------------- -------------------- --------------------
----------------------------
PROD1     ARCHIVELOG   MOUNTED              PRIMARY          NOT ALLOWED          SBDB1

SYS@SBDB1>  alter database convert to physical standby;

Database altered.

SYS@SBDB1> shutdown immediate
ORA-01507: database not mounted


ORACLE instance shut down.
SYS@SBDB1> startup mount
ORACLE instance started.

Total System Global Area  313860096 bytes
Fixed Size                  1336232 bytes
Variable Size             243272792 bytes
Database Buffers           62914560 bytes
Redo Buffers                6336512 bytes
Database mounted.
SYS@SBDB1> select name, LOG_MODE, OPEN_MODE, database_role, SWITCHOVER_STATUS, db_unique_name from
v$database;
```

```
NAME      LOG MODE    OPEN MODE         DATABASE ROLE    SWITCHOVER STATUS   DB UNIQUE NAME
--------- ----------- ------------------ ---------------- --------------------
------------------------------
PROD1     ARCHIVELOG   MOUNTED           PHYSICAL STANDBY TO PRIMARY          SBDB1


SYS@SBDB1> alter database open;

                                      - 26 -

Database altered.

SYS@SBDB1> select name, LOG MODE, OPEN MODE, database role, SWITCHOVER STATUS, db unique name from
v$database;

NAME      LOG MODE    OPEN MODE         DATABASE ROLE    SWITCHOVER STATUS   DB UNIQUE NAME
--------- ----------- ------------------ ---------------- --------------------
------------------------------
PROD1     ARCHIVELOG   READ ONLY         PHYSICAL STANDBY TO PRIMARY          SBDB1


SYS@SBDB1>
SYS@SBDB1> alter database recover managed standby database using current logfile disconnect from session;

Database altered.

SYS@SBDB1>  select * from test_bylhr5;
 select * from test_bylhr5
              *
ERROR at line 1:
ORA-00942: table or view does not exist


SYS@SBDB1> select name, LOG_MODE, OPEN_MODE, database_role, SWITCHOVER_STATUS, db_unique_name from
v$database;

NAME      LOG_MODE    OPEN_MODE         DATABASE_ROLE    SWITCHOVER_STATUS   DB_UNIQUE_NAME
--------- ----------- ------------------ ---------------- --------------------
------------------------------
PROD1     ARCHIVELOG   READ ONLY WITH APPLY PHYSICAL STANDBY SESSIONS ACTIVE     SBDB1
```

4.3 原主库打开

```
SYS@PROD1> startup force
ORACLE instance started.

Total System Global Area  313860096 bytes
Fixed Size                  1336232 bytes
Variable Size             251661400 bytes
Database Buffers           54525952 bytes
Redo Buffers                6336512 bytes
Database mounted.
Database opened.
SYS@PROD1> create table test_bylhr6 as select * from dual;

Table created.

SYS@PROD1> select * from test_bylhr6;

D
-
X
```

备库查询：

```
SYS@SBDB1> select * from test_bylhr6;

D
-
X
```

DGMGRL 中查看配置：

```
DGMGRL> show  CONFIGURATION VERBOSE;

Configuration - PROD1.us.oracle.com

  Protection Mode: MaxPerformance
  Databases:
    PROD1 - Primary database
    SBDB1 - Physical standby database

Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS
```

说明直接在原备库上执行闪回操作也可以让 Failover 后的环境重新恢复最初的环境。不过这也意味着部分数据的丢失。

第 5 章   实验总结

1、主库在开启闪回数据库功能后，备库并不会开启闪回数据库的功能。

2、PROD1 为主库，SBDB1 为备库；若 PROD1 意外宕机，则 SBDB1 执行 Failover 操作变为主库；此时若想恢复 DG 环境，则有 3 种处理办法：

① 将 PROD1 利用闪回数据库功能闪回到 SBDB1 变为主库的 SCN 时间点，然后将 PROD1 转换为备库，最后利用 switchover 转换为最初的环境。<===PROD1 需要开启闪回

② 将 SBDB1 利用闪回数据库功能闪回到 SBDB1 变为主库的 SCN 时间点，此时 SBDB1 仍然是主库的角色，然后将 SBDB1 转换为备库。<===SBDB1 需要开启闪回，会丢失部分数据。

③ 利用 RMAN 重新搭建 DG 环境。详情请参考：
http://blog.itpub.net/26736162/viewspace-1753130/

第 6 章　参考文章

6.1 MOS 或官网

https://docs.oracle.com/cd/E11882_01/server.112/e41134/scenarios.htm#SBYDB4889
https://docs.oracle.com/cd/E11882_01/server.112/e41134/scenarios.htm#SBYDB00900

This chapter describes scenarios you might encounter while administering your Data Guard configuration. Each scenario can be adapted to your specific environment.聽 *Table 13-1* lists the scenarios presented in this chapter.

Table 13-1 Data Guard Scenarios

Reference	Scenario
Section 13.1	Configuring Logical Standby Databases After a Failover
Section 13.2	Converting a Failed Primary Into a Standby Database Using Flashback Database
Section 13.3	Using Flashback Database After Issuing an Open Resetlogs Statement
Section 13.4	Recovering After the NOLOGGING Clause Is Specified
Section 13.5	Creating a Standby Database That Uses OMF or Oracle ASM
Section 13.6	Recovering From Lost-Write Errors on a Primary Database
Section 13.7	Converting a Failed Primary into a Standby Database Using RMAN Backups
Section 13.8	Changing the Character Set of a Primary Without Re-Creating Physical Standbys

这 8 个实验，建议有兴趣的朋友都做一遍。
http://blog.itpub.net/24500180/viewspace-1068495/
http://blog.itpub.net/24500180/viewspace-1068141/
http://blog.itpub.net/24500180/viewspace-1069602/

After a failover occurs, the original primary database can no longer participate in the Data Guard configuration until it is repaired and established as a standby database in the new configuration. To do this, you can use the Flashback Database feature to recover the failed primary database to a point in time before the failover occurred, and then convert it into a physical or logical standby database in the new configuration. The following sections describe:

Flashing Back a Failed Primary Database into a Physical Standby Database

Flashing Back a Failed Primary Database into a Logical Standby Database

Note:
You must have already enabled Flashback Database on the original primary database before the failover. See Oracle Database Backup and Recovery User's Guide for more information.
Flashing Back a Logical Standby Database to a Specific Applied SCN

See Also:
Oracle Data Guard Broker for automatic reinstatement of the failed primary database as a new standby database (as an alternative to using Flashback Database)
13.2.1 Flashing Back a Failed Primary Database into a Physical Standby Database
The following steps assume that a failover has been performed to a physical standby database and that Flashback Database was enabled on the old primary database at the time of the failover. This procedure brings the old primary database back into the Data Guard configuration as a physical standby database.

Step 1   Determine the SCN at which the old standby database became the primary database.
On the new primary database, issue the following query to determine the SCN at which the old standby database became the new primary database:

SQL> SELECT TO_CHAR(STANDBY_BECAME_PRIMARY_SCN) FROM V$DATABASE;
Step 2   Flash back the failed primary database.
Shut down the old primary database (if necessary), mount it, and flash it back to the value for STANDBY_BECAME_PRIMARY_SCN that was determined in Step 1.

SQL> SHUTDOWN IMMEDIATE;
SQL> STARTUP MOUNT;
SQL> FLASHBACK DATABASE TO SCN standby_became_primary_scn;
Step 3   Convert the database to a physical standby database.
Perform the following steps on the old primary database:

Issue the following statement on the old primary database:

SQL> ALTER DATABASE CONVERT TO PHYSICAL STANDBY;
This statement will dismount the database after successfully converting the control file to a standby control file.

Shut down and restart the database:

```
SQL> SHUTDOWN IMMEDIATE;
SQL> STARTUP MOUNT;
```
Step 4 Start transporting redo to the new physical standby database.
Perform the following steps on the new primary database:

Issue the following query to see the current state of the archive destinations:

```
SQL> SELECT DEST_ID, DEST_NAME, STATUS, PROTECTION_MODE, DESTINATION, -
> ERROR,SRL FROM V$ARCHIVE_DEST_STATUS;
```
If necessary, enable the destination:

```
SQL> ALTER SYSTEM SET LOG_ARCHIVE_DEST_STATE_n=ENABLE;
```
Perform a log switch to ensure the standby database begins receiving redo data from the new primary database, and verify it was sent successfully. Issue the following SQL statements on the new primary database:

```
SQL> ALTER SYSTEM SWITCH LOGFILE;
SQL> SELECT DEST_ID, DEST_NAME, STATUS, PROTECTION_MODE, DESTINATION,-
> ERROR,SRL FROM V$ARCHIVE_DEST_STATUS;
```
On the new standby database, you may also need to change the LOG_ARCHIVE_DEST_n initialization parameters so that redo transport services do not transmit redo data to other databases.

Step 5 Start Redo Apply on the new physical standby database.
Issue the following SQL statement on the new physical standby database:

```
SQL> ALTER DATABASE RECOVER MANAGED STANDBY DATABASE -
> USING CURRENT LOGFILE DISCONNECT;
```
Redo Apply automatically stops each time it encounters a redo record that is generated as the result of a role transition, so Redo Apply will need to be restarted one or more times until it has applied beyond the SCN at which the new primary database became the primary database. Once the failed primary database is restored and is running in the standby role, you can optionally perform a switchover to transition the databases to their original (pre-failure) roles. See Section 8.2.1, "Performing a Switchover to a Physical Standby Database" for more information.

6.2 博客

Data Guard 高级玩法：通过闪回恢复 failover 备库：http://blog.itpub.net/23718752/viewspace-2124234/
使用 Flashback 让 Failover 数据库重新加入 DG 环境：http://blog.itpub.net/17203031/viewspace-1184082

http://blog.itpub.net/24500180/viewspace-1068495/
http://blog.itpub.net/24500180/viewspace-1068141/
http://blog.itpub.net/24500180/viewspace-1069602/

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

● 本文在 itpub（http://blog.itpub.net/26736162/abstract/1/）、博客园（http://www.cnblogs.com/lhrbest）和个人微信

● 本文 itpub 地址：http://blog.itpub.net/26736162/abstract/1/

● 本文博客园地址：http://www.cnblogs.com/lhrbest

● 本文 pdf 版、个人简介及小麦苗云盘地址：http://blog.itpub.net/26736162/viewspace-1624453/

● 数据库笔试面试题库及解答：http://blog.itpub.net/26736162/viewspace-2134706/

● DBA 宝典今日头条号地址：http://www.toutiao.com/c/user/6401772890/#mid=1564638659405826

....

● QQ 群号：**230161599**（满）、**618766405**

● 微信群：可加我微信，我拉大家进群，非诚勿扰

● 联系我请加 QQ 好友（646634621），注明添加缘由

● 于 2017-11-06 09:00 ~ 2017-11-06 22:00 在魔都完成

● 文章内容来源于小麦苗的学习笔记，部分整理自网络，若有侵权或不当之处还请谅解

● 版权所有，欢迎分享本文，转载请保留出处

....

● 小麦苗的微店：https://weidian.com/s/793741433?wfr=c&ifr=shopdetail

● 小麦苗出版的数据库类丛书：http://blog.itpub.net/26736162/viewspace-2142121/

....

使用**微信客户端**扫描下面的二维码来关注小麦苗的微信公众号（xiaomaimiaolhr）及 QQ 群（DBA 宝典），学习最实用的数据库技术。

小麦苗的微信公众号	DBA 宝典 QQ 群 2	《DBA 笔试面宝典》	小麦苗的微店

....