【OGG】OGG 简单配置双向复制(三)

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 OGG 的双向实时复制功能

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

项目	source db	target db
db 类型	单实例	单实例
db version	11.2.0.3	11.2.0.3
db 存储	FS type	FS type
ORACLE_SID	ogg1	ogg2
db_name	ogg1	ogg2
主机 IP 地址：	192.168.59.129	192.168.59.130
OS 版本及 kernel 版本	RHEL6.5 64 位， 2.6.32-504.16.2.el6.x86_64	RHEL6.5 64 位， 2.6.32-504.16.2.el6.x86_64
OGG 版本	11.2.1.0.1 64 位	11.2.1.0.1 64 位
OS hostname	orcltest	rhel6_lhr

1.2.3 相关参考文章链接

【OGG】OGG 的下载和安装篇：http://blog.itpub.net/26736162/viewspace-1693241/

【OGG】OGG 的单向 DML 复制配置(一):http://blog.itpub.net/26736162/viewspace-1696020/

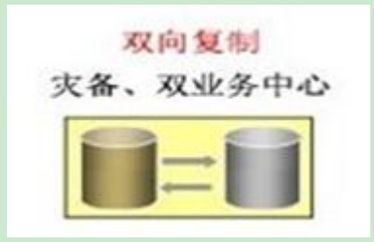
【OGG】OGG 的单向复制配置-支持 DDL(二)：http://blog.itpub.net/26736162/viewspace-1696031/

1.2.4 本文简介

本文基于 OGG 的双向复制功能，主要参考网址为：http://ylw6006.blog.51cto.com/all/470441/16 ，非常感谢斩月大师。

在完成 ogg 的单向复制配置后，自然会想着向前推进一层，实现双向复制；在实际应用中，双向复制面临着许多问题，主要有如下几点：

1. 如果两个库同时更新同一条记录 如何处理？
2. 如果网络出现失败如何处理？
3. 如果数据不同步后如何修复？



本文介绍如何在前文的基础上简单实现 ogg 的双向复制！双向复制一般用于双业务中心环境下，目前笔者的生产环境中未使用到 ogg，ogg 系列的文章只是从技术上提前做一个准备，因而许多问题的细节未能理清，后续将继续学习研究！在开始之前，请先配置好 db1-db2 的单向复制(include ddl replicat)!

1.3 实验部分

1.3.1 实验目标

实现 OGG1 和 OGG2 的双向复制功能。

1.3.2 配置 OGG1，添加 checkpoint 表

注意：本文 OGG1 和 OGG2 互为 source 和 target，因而直接采用 OGG1 和 OGG2 来标识两台数据库服务器

```
[oracle@orcltest gg11]$ ggsci

Oracle GoldenGate Command Interpreter for Oracle
Version 11.2.1.0.1 OGGCORE_11.2.1.0.1_PLATFORMS_120423.0230_FBO
Linux, x64, 64bit (optimized), Oracle 11g on Apr 23 2012 08:32:14

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GGSCI (orcltest) 1> view params ./GLOBALS

GGSCHEMA ggusr


GGSCI (orcltest) 2> edit params ./GLOBALS
GGSCHEMA ggusr
checkpointtable ggusr.rep_demo_ckpt
~
~
。。。。。。。。。。。。。。。。
~
~
~
~
~
"./GLOBALS" 2L, 51C written


GGSCI (orcltest) 3> view params ./GLOBALS

GGSCHEMA ggusr
checkpointtable ggusr.rep_demo_ckpt


GGSCI (orcltest) 4>

GGSCI (orcltest) 4>  dblogin userid ggusr@ogg1,password lhr
Successfully logged into database.

GGSCI (orcltest) 5> add checkpointtable  ggusr.rep_demo_ckpt

Successfully created checkpoint table ggusr.rep_demo_ckpt.

GGSCI (orcltest) 6> add checkpointtable  ggusr.rep_demo_ckpt
ERROR: OCI Error ORA-00955: name is already used by an existing object (status = 955). Creating checkpoint table ggusr.rep_demo_ckpt, SQL <CREATE TABLE ggusr.rep_demo_ckpt (  group_name VARCHAR2(8) NOT NULL,  group_key
NUMBER(19) NOT NULL,  seqno NUMBER(10),  rba NUMBER(19) NOT NULL,  audit_ts VARCHAR2(29),  create_ts DATE NOT NULL,  last_update_ts DATE NOT NULL,  current_dir VARCHAR2(255) NOT NULL,  log_csn VARCHAR2(129),  log_xid
VARCHAR2(129),  log_cmplt_csn VARCHAR2(129),  log_cmplt_xids VARCHAR2(2000),  version NUMBER(3),  PRIMARY KEY (group_name, group_key))>.

GGSCI (orcltest) 7>
```

1.3.3 配置 OGG2,运行相关的脚本，支持 DDL 的复制

```
[oracle@rhel6_lhr gg11]$ ggsci

Oracle GoldenGate Command Interpreter for Oracle
Version 11.2.1.0.1 OGGCORE_11.2.1.0.1_PLATFORMS_120423.0230_FBO
Linux, x64, 64bit (optimized), Oracle 11g on Apr 23 2012 08:32:14

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GGSCI (rhel6_lhr) 1>  view params ./GLOBALS

checkpointtable ggusr.rep_demo_ckpt


GGSCI (rhel6_lhr) 2> edit  params ./GLOBALS



GGSCI (rhel6_lhr) 3>  view params ./GLOBALS

GGSCHEMA ggusr
checkpointtable ggusr.rep_demo_ckpt


GGSCI (rhel6_lhr) 4>
```

```
[oracle@orcltest ~]$ cd $OGG_HOME
[oracle@orcltest gg11]$ sqlplus sys/lhr@ogg2 as  sysdba

SQL*Plus: Release 11.2.0.3.0 Production on Wed Jun 10 17:10:45 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> select name,SUPPLEMENTAL_LOG_DATA_MIN, FORCE_LOGGING from v$database;

NAME      SUPPLEME FOR
--------- -------- ---
OGG2      NO       NO

SQL> alter database add supplemental log data ;

Database altered.

SQL> archive log list;
Database log mode              Archive Mode
Automatic archival             Enabled
Archive destination            USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence     7
Next log sequence to archive   9
Current log sequence           9
```

```
SQL>

SQL> grant execute on utl_file to ggusr;

Grant succeeded.

SQL> @marker_setup.sql

Marker setup script

You will be prompted for the name of a schema for the Oracle GoldenGate database objects.
NOTE: The schema must be created prior to running this script.
NOTE: Stop all DDL replication before starting this installation.

Enter Oracle GoldenGate schema name:ggusr


Marker setup table script complete, running verification script...
Please enter the name of a schema for the GoldenGate database objects:
Setting schema name to GGUSR

MARKER TABLE
-------------------------------
OK

MARKER SEQUENCE
-------------------------------
OK

Script complete.
SQL> @ddl_setup.sql

Oracle GoldenGate DDL Replication setup script

Verifying that current user has privileges to install DDL Replication...

You will be prompted for the name of a schema for the Oracle GoldenGate database objects.
NOTE: For an Oracle 10g source, the system recycle bin must be disabled. For Oracle 11g and later, it can be enabled.
NOTE: The schema must be created prior to running this script.
NOTE: Stop all DDL replication before starting this installation.

Enter Oracle GoldenGate schema name:ggusr

Working, please wait ...
Spooling to file ddl_setup_spool.txt

Checking for sessions that are holding locks on Oracle Golden Gate metadata tables ...

Check complete.









Using GGUSR as a Oracle GoldenGate schema name.

Working, please wait ...

DDL replication setup script complete, running verification script...
Please enter the name of a schema for the GoldenGate database objects:
Setting schema name to GGUSR

CLEAR_TRACE STATUS:

Line/pos            Error
```

```
-------------------- --------------------------------------------------------------------------------
No errors            No errors

CREATE_TRACE STATUS:

Line/pos             Error
-------------------- --------------------------------------------------------------------------------
No errors            No errors

TRACE_PUT_LINE STATUS:

Line/pos             Error
-------------------- --------------------------------------------------------------------------------
No errors            No errors

INITIAL_SETUP STATUS:

Line/pos             Error
-------------------- --------------------------------------------------------------------------------
No errors            No errors

DDLVERSIONSPECIFIC PACKAGE STATUS:

Line/pos             Error
-------------------- --------------------------------------------------------------------------------
No errors            No errors

DDLREPLICATION PACKAGE STATUS:

Line/pos             Error
-------------------- --------------------------------------------------------------------------------
No errors            No errors

DDLREPLICATION PACKAGE BODY STATUS:

Line/pos             Error
-------------------- --------------------------------------------------------------------------------
No errors            No errors

DDL IGNORE TABLE
-----------------------------------
OK

DDL IGNORE LOG TABLE
-----------------------------------
OK

DDLAUX  PACKAGE STATUS:

Line/pos             Error
-------------------- --------------------------------------------------------------------------------
No errors            No errors

DDLAUX PACKAGE BODY STATUS:

Line/pos             Error
-------------------- --------------------------------------------------------------------------------
No errors            No errors

SYS.DDLCTXINFO  PACKAGE STATUS:

Line/pos             Error
-------------------- --------------------------------------------------------------------------------
No errors            No errors

SYS.DDLCTXINFO  PACKAGE BODY STATUS:
```

```
Line/pos             Error
-------------------- -----------------------------------------------------------------
No errors            No errors

DDL HISTORY TABLE
-----------------------------------
OK

DDL HISTORY TABLE(1)
-----------------------------------
OK

DDL DUMP TABLES
-----------------------------------
OK

DDL DUMP COLUMNS
-----------------------------------
OK

DDL DUMP LOG GROUPS
-----------------------------------
OK

DDL DUMP PARTITIONS
-----------------------------------
OK

DDL DUMP PRIMARY KEYS
-----------------------------------
OK

DDL SEQUENCE
-----------------------------------
OK

GGS_TEMP_COLS
-----------------------------------
OK

GGS_TEMP_UK
-----------------------------------
OK

DDL TRIGGER CODE STATUS:

Line/pos             Error
-------------------- -----------------------------------------------------------------
No errors            No errors

DDL TRIGGER INSTALL STATUS
-----------------------------------
OK

DDL TRIGGER RUNNING STATUS
-----------------------------------------------------------------
ENABLED

STAYMETADATA IN TRIGGER
-----------------------------------------------------------------
OFF

DDL TRIGGER SQL TRACING
-----------------------------------------------------------------
0

DDL TRIGGER TRACE LEVEL
```

```
------------------------------------------------------------------------
0

LOCATION OF DDL TRACE FILE
------------------------------------------------------------------------------------------------------------------------
/u01/app/oracle/diag/rdbms/ogg2/ogg2/trace/ggs_ddl_trace.log

Analyzing installation status...


STATUS OF DDL REPLICATION
------------------------------------------------------------------------------------------------------------------------
SUCCESSFUL installation of DDL Replication software components

Script complete.
SQL> @role_setup.sql

GGS Role setup script

This script will drop and recreate the role GGS_GGSUSER_ROLE
To use a different role name, quit this script and then edit the params.sql script to change the gg_role parameter to the preferred name. (Do not run the script.)

You will be prompted for the name of a schema for the GoldenGate database objects.
NOTE: The schema must be created prior to running this script.
NOTE: Stop all DDL replication before starting this installation.

Enter GoldenGate schema name:ggusr
Wrote file role_setup_set.txt

PL/SQL procedure successfully completed.


Role setup script complete

Grant this role to each user assigned to the Extract, GGSCI, and Manager processes, by using the following SQL command:

GRANT GGS_GGSUSER_ROLE TO <loggedUser>

where <loggedUser> is the user assigned to the GoldenGate processes.
SQL>
SQL> GRANT GGS_GGSUSER_ROLE TO ggusr;

Grant succeeded.

SQL> @ddl_enable.sql

Trigger altered.

SQL> @?/rdbms/admin/dbmspool.sql

Package created.


Grant succeeded.


SQL> @ddl_pin.sql ggusr

PL/SQL procedure successfully completed.


PL/SQL procedure successfully completed.


PL/SQL procedure successfully completed.

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 gg11]$
```

1.3.4 OGG2 上配置 extract 和 pump 进程

```
[oracle@rhel6_lhr gg11]$ ggsci

Oracle GoldenGate Command Interpreter for Oracle
Version 11.2.1.0.1 OGGCORE_11.2.1.0.1_PLATFORMS_120423.0230_FBO
Linux, x64, 64bit (optimized), Oracle 11g on Apr 23 2012 08:32:14

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GGSCI (rhel6_lhr) 1> dblogin userid ggusr@ogg2,password lhr
Successfully logged into database.

GGSCI (rhel6_lhr) 2> add trandata hr.*

Logging of supplemental redo data enabled for table HR.COUNTRIES.

Logging of supplemental redo data enabled for table HR.DEPARTMENTS.

Logging of supplemental redo data enabled for table HR.EMPLOYEES.

Logging of supplemental redo data enabled for table HR.JOBS.

Logging of supplemental redo data enabled for table HR.JOB_HISTORY.

Logging of supplemental redo data enabled for table HR.LOCATIONS.

Logging of supplemental redo data enabled for table HR.REGIONS.

Logging of supplemental redo data enabled for table HR.T1.

Logging of supplemental redo data enabled for table HR.T2.

2015-06-10 03:11:40  WARNING OGG-00869  No unique key is defined for table 'T3'. All viable columns will be used to represent the key, but may not guarantee uniqueness.  KEYCOLS may be used to define the key.

Logging of supplemental redo data enabled for table HR.T3.

GGSCI (rhel6_lhr) 3> edit params eora_hr2



GGSCI (rhel6_lhr) 4> view params eora_hr2

extract eora_hr2
setenv (ORACLE_SID=ogg2)
setenv (ORACLE_HOME=/u01/app/oracle/product/11.2.0/dbhome_1)
setenv (NLS_LANG=AMERICAN_AMERICA.ZHS16GBK)
ddl include all
userid ggusr,password lhr
tranlogoptions excludeuser ggusr   //避免出现死循环复制，db1 上的 extract 进程也需要进行此项设置
exttrail ./dirdat/ab
table hr.*;

GGSCI (rhel6_lhr) 4> add extract eora_hr2,tranlog,begin now
EXTRACT added.
```

```
GGSCI (rhel6_lhr) 5> add exttrail ./dirdat/ab,extract eora_hr2,megabytes 100
EXTTRAIL added.


GGSCI (rhel6_lhr) 6> start extract eora_hr2

Sending START request to MANAGER ...
EXTRACT EORA_HR2 starting


GGSCI (rhel6_lhr) 7> edit params pora_hr2



GGSCI (rhel6_lhr) 8> view params pora_hr2

extract pora_hr2
setenv (ORACLE_SID=ogg2)
setenv (ORACLE_HOME=/u01/app/oracle/product/11.2.0/dbhome_1)
setenv (NLS_LANG=AMERICAN_AMERICA.ZHS16GBK)
passthru
rmthost 192.168.59.129,mgrport 7809
rmttrail ./dirdat/pb
table hr.*;


GGSCI (rhel6_lhr) 9> add extract pora_hr2,exttrailsource ./dirdat/ab
EXTRACT added.


GGSCI (rhel6_lhr) 10> add rmttrail ./dirdat/pb extract pora_hr2,megabytes 100
RMTTRAIL added.


GGSCI (rhel6_lhr) 11> start extract pora_hr2

Sending START request to MANAGER ...
EXTRACT PORA_HR2 starting


GGSCI (rhel6_lhr) 12> info all

Program     Status      Group       Lag at Chkpt  Time Since Chkpt

MANAGER     RUNNING
EXTRACT     RUNNING     EORA_HR2    00:00:00      00:04:16
EXTRACT     RUNNING     PORA_HR2    00:00:00      00:00:00
REPLICAT    RUNNING     RORA_HR     00:00:00      00:00:01


GGSCI (rhel6_lhr) 13>
```

OGG1 上设置抽取进程参数，添加 tranlogoptions excludeuser ggusr：

```
GGSCI (orcltest) 15> view params EORA_HR

extract eora_hr
setenv (ORACLE_SID=ogg1)
setenv (ORACLE_HOME=/u02/app/oracle/product/11.2.0/dbhome_1)
setenv (NLS_LANG=AMERICAN_AMERICA.ZHS16GBK)
ddl include all
tranlogoptions excludeuser ggusr
```

```
userid ggusr,password lhr
exttrail ./dirdat/hr
table hr.*;


GGSCI (orcltest) 16>
```

1.3.5 OGG1 上配置 replicat 进程

```
[oracle@orcltest gg11]$ ggsci

Oracle GoldenGate Command Interpreter for Oracle
Version 11.2.1.0.1 OGGCORE_11.2.1.0.1_PLATFORMS_120423.0230_FBO
Linux, x64, 64bit (optimized), Oracle 11g on Apr 23 2012 08:32:14

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GGSCI (orcltest) 1> info all

Program     Status      Group       Lag at Chkpt  Time Since Chkpt

MANAGER     RUNNING
EXTRACT     RUNNING     EORA_HR     00:00:00      00:00:10
EXTRACT     RUNNING     PORA_HR     00:00:00      00:00:05



GGSCI (orcltest) 2> view params rora_hr2
ERROR: PARAMS file RORA_HR2 does not exist.


GGSCI (orcltest) 3> edit params rora_hr2
replicat rora_hr2
setenv (ORACLE_SID=ogg1)
setenv (ORACLE_HOME=/u02/app/oracle/product/11.2.0/dbhome_1)
setenv (NLS_LANG=AMERICAN_AMERICA.ZHS16GBK)
ddl include all
ddlerror default ignore retryop maxretries 3 retrydelay 5
userid ggusr,password lhr
handlecollisions
assumetargetdefs
discardfile ./dirrpt/rora_hr2.dsc,purge
map hr.* ,target hr.*;
~
~
~
~

。。。。。。。。。。。。。。。
~
~
~
~
~
"dirprm/rora_hr2.prm" [New] 11L, 345C written


GGSCI (orcltest) 4> view params rora_hr2
```

```
replicat rora_hr2
setenv (ORACLE_SID=ogg1)
setenv (ORACLE_HOME=/u02/app/oracle/product/11.2.0/dbhome_1)
setenv (NLS_LANG=AMERICAN_AMERICA.ZHS16GBK)
ddl include all
ddlerror default ignore retryop maxretries 3 retrydelay 5
DDLOPTIONS REPORT
userid ggusr,password lhr
handlecollisions
assumetargetdefs
discardfile ./dirrpt/rora_hr2.dsc,purge
map hr.* ,target hr.*;


GGSCI (orcltest) 5> add replicat rora_hr2,exttrail ./dirdat/pb
REPLICAT added.


GGSCI (orcltest) 6> start replicat rora_hr2

Sending START request to MANAGER ...
REPLICAT RORA_HR2 starting


GGSCI (orcltest) 7> info all

Program     Status      Group       Lag at Chkpt  Time Since Chkpt

MANAGER     RUNNING
EXTRACT     RUNNING     EORA_HR     00:00:00      00:00:00
EXTRACT     RUNNING     PORA_HR     00:00:00      00:00:09
REPLICAT    RUNNING     RORA_HR2    00:00:00      00:00:04

GGSCI (orcltest) 8>
```

1.3.6 测试

1.3.6.1 ddl 测试

```
[oracle@orcltest gg11]$ sqlplus hr/hr@ogg1

SQL*Plus: Release 11.2.0.3.0 Production on Wed Jun 10 18:07:48 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>  create table t5 as select * from dual;

Table created.

SQL> conn hr/hr@ogg2
Connected.
SQL> select count(1) from t5;

  COUNT(1)
```

```
----------
         1

SQL> alter table t5 add name varchar2(255);

Table altered.

SQL> conn hr/hr@ogg1
Connected.
SQL> desc t5
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 DUMMY                                              VARCHAR2(1)
 NAME                                               VARCHAR2(255)
```

DDL 测试注意查看 ddl 日志：

OGG2 上的日志（/u01/app/oracle/diag/rdbms/ogg2/ogg2/trace/ggs_ddl_trace.log）：

```
SESS 470002-2015-06-10 18:11:50 : DDL : ************************ Start of log for DDL sequence [1508], v[ $Id: ddl_setup.sql /st_oggcore_11.2.1/8 2012/04/02 11:11:33 smijatov Exp $ ] trace level [0], owner schema of DDL package [GGUSR], objtype [TABLE] name [HR.T5]
SESS 470002-2015-06-10 18:11:50 : DDLTRACE1 : Before Trigger: point in execution = [1.0], objtype [TABLE] name [HR.T5]
SESS 470002-2015-06-10 18:11:50 : DDL : DDL operation [ create table t5 as select * from dual ], sequence [1508], DDL type [CREATE] TABLE, real object type [TABLE], validity [], object ID [], object [HR.T5], real object [HR.T5], base object schema [], base object name [], logged as [HR]
SESS 470002-2015-06-10 18:11:50 : DDL : Start SCN found [1112052]
SESS 470002-2015-06-10 18:11:50 : DDL : ------------------------ End of log for DDL sequence [1508]
SESS 450003-2015-06-10 18:12:38 : DDL : ************************ Start of log for DDL sequence [1509], v[ $Id: ddl_setup.sql /st_oggcore_11.2.1/8 2012/04/02 11:11:33 smijatov Exp $ ] trace level [0], owner schema of DDL package [GGUSR], objtype [TABLE] name [HR.T5]
SESS 450003-2015-06-10 18:12:38 : DDLTRACE1 : Before Trigger: point in execution = [1.0], objtype [TABLE] name [HR.T5]
SESS 450003-2015-06-10 18:12:38 : DDL : DDL operation [alter table hr."T5" add name varchar2(255)  /* GOLDENGATE_DDL_REPLICATION */ ], sequence [1509], DDL type [ALTER] TABLE, real object type [TABLE], validity [VALID], object ID [76900], object [HR.T5], real object [HR.T5], base object schema [], base object name [], logged as [GGUSR]
SESS 450003-2015-06-10 18:12:38 : DDL : Start SCN found [1112101]
SESS 450003-2015-06-10 18:12:40 : DDL : ------------------------ End of log for DDL sequence [1509]
```

OGG1 上的日志（/u02/app/oracle/diag/rdbms/ogg1/ogg1/trace/ggs_ddl_trace.log）：

```
SESS 450045-2015-06-10 04:05:42 : DDL : ************************ Start of log for DDL sequence [43], v[ $Id: ddl_setup.sql /st_oggcore_11.2.1/8 2012/04/02 11:11:33 smijatov Exp $ ] trace level [0], owner schema of DDL package [GGUSR], objtype [TABLE] name [HR.T5]
SESS 450045-2015-06-10 04:05:42 : DDLTRACE1 : Before Trigger: point in execution = [1.0], objtype [TABLE] name [HR.T5]
SESS 450045-2015-06-10 04:05:42 : DDL : DDL operation [ create table hr."T5" as select * from dual  /* GOLDENGATE_DDL_REPLICATION */ ], sequence [43], DDL type [CREATE] TABLE, real object type [TABLE], validity [], object ID [], object [HR.T5], real object [HR.T5], base object schema [], base object name [], logged as [GGUSR]
SESS 450045-2015-06-10 04:05:42 : DDL : Start SCN found [1121651]
SESS 450045-2015-06-10 04:05:42 : DDL : ------------------------ End of log for DDL sequence [43]
SESS 470002-2015-06-10 04:06:19 : DDL : ************************ Start of log for DDL sequence [44], v[ $Id: ddl_setup.sql /st_oggcore_11.2.1/8 2012/04/02 11:11:33 smijatov Exp $ ] trace level [0], owner schema of DDL package [GGUSR], objtype [TABLE] name [HR.T5]
SESS 470002-2015-06-10 04:06:19 : DDLTRACE1 : Before Trigger: point in execution = [1.0], objtype [TABLE] name [HR.T5]
SESS 470002-2015-06-10 04:06:19 : DDL : DDL operation [alter table t5 add name varchar2(255) ], sequence [44], DDL type [ALTER] TABLE, real object type [TABLE], validity [VALID], object ID [76920], object [HR.T5], real object [HR.T5], base object schema [], base object name [], logged as [HR]
SESS 470002-2015-06-10 04:06:19 : DDL : Start SCN found [1121693]
SESS 470002-2015-06-10 04:06:20 : DDL : ------------------------ End of log for DDL sequence [44]
```

1.3.6.2 dml 测试

```
[oracle@orcltest gg11]$ sqlplus hr/hr@ogg1

SQL*Plus: Release 11.2.0.3.0 Production on Wed Jun 10 18:13:37 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>  create table t6 as select * from dual;

Table created.

SQL> insert into t6 select * from t6;

1 row created.

SQL> commit;

Commit complete.

SQL> select count(1) from t6;

  COUNT(1)
----------
         2

SQL> conn hr/hr@ogg2
Connected.
SQL>  select count(1) from t6;

  COUNT(1)
----------
         2

SQL> insert into t6 select * from t6;

2 rows created.

SQL> commit;

Commit complete.

SQL>  select count(1) from t6;

  COUNT(1)
----------
         4

SQL> conn hr/hr@ogg1
Connected.
SQL>  select count(1) from t6;

  COUNT(1)
----------
         4

SQL>
```

1.3.7 实验总结

OGG 的双向复制其实就是在每台机器上都进行相关的单向配置。

1.4 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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