How to use HATR Feature

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1. Introduction

DBMaster supports HATR (Heterogeneous Asynchronous Table Replication) feature, but DBMaster server must be located on a computer running Windows. Because DBMaster uses the ODBC Driver Manager to perform HATR. So DBMaster 5.0.1 provide a new feature: HATR can work in Linux. And HATR have not the limitation that is only working on windows, for HATR in windows, please refer to DBA manual. The guide helps user friendly using the feature.

2. How to Configure HATR

DBMaster also uses the ODBC Driver Manager to perform HATR in Linux, so uses DSN to access Slave database. No matter Master and Slave database is deployed on same or different computer, user firstly must make sure that DSN on Master site can successfully access Slave database, and then create schedule and Heterogeneous Asynchronous Table Replication, now HATR have normally worked.

We will introduce detailed steps by a sample, Master site is AS4 with DBMaster5.0.1, and slave site is Solaris10 with Oracle 10g:

Master site:

OS: Red Hat Enterprise Linux AS release 4 (Nahant) Kernel 2.6.9-5.EL on an i686

DB: DBMaster5.0.1

Slave site:

OS: SunOS Solaris10 5.10 Generic i86pc i386 i86pc

DB: Oracle10.2.0.2.0

2.1 Preparing Environment

PC	Software	Description	Source Site
PC1(AS4)	DBMaster5.0.1	Home dir is /home/dbmaster/5.0.	
	Oracle Instant Client 10.2.0.3	Home dir should be /home/oracle/instantclient_10_2. But we do not download it, so install oracle10g server to replace. Home dir is /home/oracle/10.2.0/db_1	http://www.oracle.com
	unixODBC-2.2.9-1	This is default unixODBC of the system. $ isql --version It can check whether unixODBC has been installed. If not, user should manually install.	http://www.unixodbc.org

PC2(AS4)	Oracle10g	Home dir is /home/oracle/10.2.0/db_1	http://www.oracle.com

NOTE: User must set the following global variable on PC1 (Master site):

ORACLE_HOME
LD_LIBRARY_PATH
TWO_TASK

2.2 Requirement Settings on Master side

After preparing environment, we will introduce detailed testing steps and configuration by a sample.

2.2.1 SETTING ENVIRONMENT VARIABLE

```
/etc/profile:
    export LD_LIBRARY_PATH=/home/oracle/10.2.0/db_1/lib
    export TWO_TASK=dbmr1918
    export ORACLE_HOME=/home/oracle/10.2.0/db_1
```

2.2.2 DMCONFIG.INI SETTING OF DBMASTER

```
/home/dbmaster/5.0/dmconfig.ini

   [DBSAMPLE5]

   DB_DBDIR = /home/dbmaster/5.0/samples/DATABASE

   DB_PtNum = 2453

   DB_SvAdr = 127.0.0.1

   DB_SPDIR = /home/dbmaster/5.0/samples/DATABASE

   DB_LBDIR = /home/dbmaster/5.0/samples/DATABASE

   DB_FODIR = /home/dbmaster/5.0/samples/DATABASE/fo

   DB_ATRMD = 1

   DD_DDBMD = 1
```

2.2.3 TNASNAMES.ORA SETTING ON ORACLE CLIENT TNASNAMES.ORA

```
/home/oracle/10.2.0/db_1/network/admin/tnsnames.ora:

    dbmr1918 =

      (DESCRIPTION =

        (ADDRESS = (PROTOCOL = TCP)(HOST = 192.168.0.196)(PORT = 1521))

        (CONNECT_DATA =

          (SID = dbmr1918)

          (SERVER = DEDICATED)

          (SERVICE_NAME = dbmr1918)
```

)

)

2.2.4 CONFIGURE DSN OF DBMASTER IN UNIXODBC

/etc/odbc.ini:

[dbsample5]

Description   = Database for DBMaker 5.0

Driver   = DBMaster5.0

Database   = 192.168.0.8

Port   = 2453

User   = SYSADM

Password   =

/etc/odbcinst.ini:

[DBMaster5.0]

Description   = ODBC for DBMaster 5.0

Driver   = /home/dbmaster/5.0/lib/so/libdmapic.so

FileUsage   = 0

2.2.5 CONFIGURE DSN OF ORACLE IN UNIXODBC

/etc/odbc.ini:

[dbmr1918]

Description   = Oracle ODBC driver for Oracle 10g

Driver   = Oracle 10g ODBC driver

DB   = dbmr1918

UserID   = scott

PASSWORD   = scott

TNS_ADMIN   = /home/oracle/10.2.0/db_1/network/admin/tnsnames.ora

server = dbmr1918

ServerType   = Oracle

Port   = 1521

SID = dbmr1918

/etc/odbcinst.ini:

```
[Oracle 10g ODBC driver]

Description             = Oracle ODBC driver for Oracle 10g

Driver      = /home/oracle/10.2.0/db_1/lib/libsqora.so.10.1

Setup       = /usr/lib/liboraodbcS.so.1

FileUsage         =

CPTimeout           =

CPReuse         =
```

p.s please make sure Oracle database character set and DBMaster database db lcode (db_lcode) is in the same encoding area.

2.2.6   TEST DSN IN UNIXODBC

Because DBMaster HATR should transfer data from DBMaster to Oracle via UnixODBC; we should test DSN via UnixODBC isql to check the channel is ok or not. If cannot connect to remote Oracle database via UnixODBC isql, please check odbc.ini and odbcinst.ini settings in UnixODBC.

```
$ isql -v dbmr1918
+---------------------------------------+
| Connected!                            |
|                                       |
| sql-statement                         |
| help [tablename]                      |
| quit                                  |
|                                       |
+---------------------------------------+
SQL>
```

2.3 Test HATR from DBMaster to Oracle

1. Start master side database of DBMaster
   Start DBMaster database, and create Source table
   ```
   $ ./dmserver dbsample5
   dmSQL> create table source(a int primary key,b int);
   ```
2. Start slave side database of Oracle
   Start Oracle database, and create destination table
   ```
   $ ./lsnrctl start
   $ ./sqlplus /nolog
   SQL> connect sys/support as sysdba;
   Connected to an idle instance.
   ```

```
SQL> startup
ORACLE instance started.
SQL> create table scott.dest(a int primary key,b int);
```

3. Create HATR syntax in master of DBMaster database

Create schedule and Create replication SQL syntax

```
dmSQL> create schedule for replication to dbmr1918(ORACLE) begin at 2008/12/17 09:05:00 every
01:00:00 with no check identified by scott scott;


dmSQL> CREATE ASYNC REPLICATION rp1 WITH PRIMARY AS source REPLICATE TO
dbmr1918:scott.dest;
```

4. Insert data into master side DBMaster database

DBMaster side:

```
dmSQL> insert into source values(99,99);
1 rows inserted


dmSQL> SYNC REPLICATION TO dbmr1918 NO WAIT;
```

5. Check slave side data status of Oracle database

Oracle side:

```
SQL> select * from scott.dest;


A          B
---------- ----------
99         99
```

3. Result of Current Testing

We have tested HATR on this version (DBMaster 5.0.1 (#18147, 20081228)), the chapter will list testing result and limitation on the version.

OK means data replicate ok

Failed means HATR to Oracle is failed in this version

- **Map Table of Column Type**

All data had replicated from DBMaster to Oracle successfully, the type map table is listed in below.

The map table of column type in DBMaster and Oracle				
Column type			Column Type	Result
DBMaster		→	Oracle	
Serial	→		number(12)	OK
integer	→		number(12)	OK
smallint	→		number(7)	OK
float	→		number	OK
double	→		number	OK
char(50)	→		char(50)	OK
varchar(50)	→		varchar(50)	OK
binary(50)	→		raw(50)	OK
date	→		date	OK
time	→		date	OK
timestamp	→		timestamp	OK
long varchar	→		clob	OK
long varbinary	→		blob	OK
file	→		blob	OK
xmltype	→		blob	OK
xmlfiletype	→		blob	OK
nchar(60)	→		nchar(60)	OK
nvarchar(60)	→		nvarchar2(60)	OK
nclob	→		nclob	OK

- **Failed Situation**

Column type		Column Type	Result
DBMaster	→	Oracle	
oid	→	raw(8)	Failed

● **Other**

Column type		Column Type	Result	Error Message
DBMaster	→	Oracle		
xmltype	→	xmltype	Failed	ORA-00932
xmlfiletype	→	xmltype	Failed	ORA-00932
xmlfile	→	bfile	Failed	no error message
xmlfiletype	→	bfile	Failed	no error message

ORA-00932: inconsistent datatype: expected - got BINARY

4. Testing Report of DBMaster 5.1 UTF8 to Oracle AL32UTF8

4.1 Environment

DBMaster	DBMaster 5.1.0 (#18169, 20090122)	Testing platform	Linux rh4as 2.6.9-78.ELsmp #1
Oracle	Oracle Database 10g Enterprise Edition Release 10.2.0.1.0	unixODBC	unixODBC 2.2.11

DBMaster 5.1 UTF-8 DB_LCODE to Oracle characterset is AL32UTF8

4.2 UnixOdbc Settings

4.2.1 ODBCINST.INI

Set Driver /etc/odbcinst.ini:

```
[DBMaster 5.1 Driver]
Description              = ODBC for DBMaster 5.1
Driver          = /home/dbmaster/5.1/lib/so/libdmapic.so
FileUsage           = 1

[Oracle 10g Driver]
Description              = ODBC for Oracle 10g
Driver          = /oracle/product/10.2.0/lib/libsqora.so.10.1
```

4.2.2 ODBC.INI

Set DSN /etc/odbc.ini

```
[SA1]
Description       = Database for SA1
Driver            = DBMaster 5.1 Driver
Database          = SA1
Host              = localhost
```

```
Port            = 5566
User             = SYSADM


[dmorclu8]
Description     = Oracle database
Driver          = Oracle 10g Driver
DSN              = dmorclu8
UserID           = system
```

4.3 Environment variable setting

Set user profile .bash_profile

```
# User specific environment and startup programs
export ORACLE_BASE=/oracle
export ORACLE_HOME=$ORACLE_BASE/product/10.2.0
export ORA_CRS_HOME=$ORACLE_HOME/crs
export ORACLE_PATH=$ORACLE_BASE/common/oracle/sql:.:$ORACLE_HOME/rdbms/admin
export ORACLE_SID=dmorclu8

export
PATH=$ORACLE_HOME/bin:$ORA_CRS_HOME/bin:$HOME/bin:/home/dbmaster/5.1/bin
export PATH=${PATH}:/usr/bin:/bin:/usr/bin/X11:/usr/local/bin
export PATH=${PATH}:$ORACLE_BASE/common/oracle/bin
export ORACLE_TERM=xterm
export TNS_ADMIN=$ORACLE_HOME/network/admin
export ORA_NLS10=$ORACLE_HOME/nls/data
export LD_LIBRARY_PATH=${LD_LIBRARY_PATH}:/lib:/usr/lib:/usr/local/lib:$ORACLE_
HOME/oracm/lib:$ORACLE_HOME/lib
export LIBPATH=$LIBPATH:$ORA_CRS_HOME/lib:$ORACLE_HOME/lib
export
CLASSPATH=${CLASSPATH}:$ORACLE_HOME/rdbms/jlib:$ORACLE_HOME/jlib:$ORACLE
alias sysdba="sqlplus " / as sysdba""
export PATH=./:$HOME/bin:${PATH}
```

4.4 DBMaster dmconfig.ini setting

Set dmconfig.ini :

```
[SA1]
DB_DBDIR = /home/hook/release/workspace
DB_FODIR = /home/hook/release/workspace/fo
DB_PtNum =5566
DB_SvAdr =127.0.0.1
DB_UsrID =SYSADM
DB_LCODE = 10
DD_DDBMD = 1
```

DB_ATRMD = 1

DB_UsrFo = 1

RP_LGDIR = "/home/hook/release/workspace/lgdir"

4.5 OS default LANG environment variable

[oracle@rh4as ~]$ echo $LANG

zh_TW.UTF-8

OS Lang environment variable will effect DBMaster error code and client code, if customer doesn't set any configuration keyword in dmconfig.ini, DBMaster take OS LANG as client code and error code.

4.6 Testing Result

al32utf8 means export NLS_LANG="TRADITIONAL CHINESE_TAIWAN.al32utf8"
(Japanese is export NLS_LANG="JAPANESE_JAPAN.AL32UTF8")

zht16big5 means export NLS_LANG="TRADITIONAL CHINESE_TAIWAN.zht16big5"
(Japanese is export NLS_LANG="JAPANESE_JAPAN.JA16SJIS")

Testing Data type :char, varchar, long varchar

	DBMaster dmsqlc – client code	Oracle client NLS_LANG setting	Destination Oracle sqlplus NLS_LANG setting	Result
1	SET CLIENT_CHAR_SET 'BIG5';	al32utf8	zht16big5	OK
2	SET CLIENT_CHAR_SET 'BIG5';	al32utf8	al32utf8	Garbage character
3	NO SET (default utf-8)	al32utf8	zht16big5	Garbage character
4	NO SET (default utf-8)	al32utf8	al32utf8	OK
5	SET CLIENT_CHAR_SET 'BIG5';	zht16big5	zht16big5	Garbage character
6	SET CLIENT_CHAR_SET 'BIG5';	zht16big5	al32utf8	Garbage character
7	NO SET (default utf-8)	zht16big5	zht16big5	OK
8	NO SET (default utf-8)	zht16big5	al32utf8	Garbage character

4.7 Testing Result of Data Type

The result is from 4.6 testing case 1 setting

source (dbmaster & unixodbc)   destination (dmorclu8)

SET CLIENT_CHAR_SET 'BIG5';　　　　zht16big5
al32utf8

DBMaster data type	Oracle data type	Result	Description (input data)	Oracle result	Comment
serial	number(12)	ok	1, 2, 3	1, 2, 3	
integer	number(12)	ok	123, 2147483647, -2147483648	123, 2147483647, -2.147E+09	
smallint	number(7)	ok	123, 32766, -32767	123, 32766, -32767	
float	number	ok	123, 3.402823466E38,	123, 3.4028E+38,	
double	number	ok	123, 3.402823466E38, 12345678.99	123, 3.4028E+38 12345679	Data 12345678.99 show 12345679 in ORALCE, select with column format , then it will show detail SQL>column c5 format 99999999.99 =>12345678.99
decimal(10,2)	number	ok	12345678.99	12345679 column c5 format 99999999.99 =>12345678.99	Data 12345678.99 show 12345679 in ORALCE, select with column format , then it will show detail SQL>column c5 format 99999999.99 =>12345678.99
char(50)	char(150)	ok	'c6char　中文字加空白' 'オバマ米大統領'	'c6char　　中文字加空白' 'オバマ米大統領'	show as input ,Oracle site need to enlarge column size, else get error ORA-12899(data size problem)
varchar(50)	varchar(50)	ok	'c7varchar　中文字加空白' 'オバマ米大統領'	'c7varchar　中文字加空白' 'オバマ米大統領'	show as input
binary(50)	raw(50)	ok	Data1: 'c8binary 中文字加空白', Data2:'12345678'x,	Data1 :633862696E61727920E38080E4B8ADE69687E5AD97E58AA0E7A9BAE799BD000000000000000000000000000000000000 (COLUMN c1 FORMAT A20 WRAP), Data 2: 1234567800000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000	
date	date	ok	'2000/11/23' '2008/11/23'	23-11 月-00, 23-11 月-08	
time	date	ok	'22:04:05'	01-1 月 -70	SELECT to_char(c2, 'Dy DD-Mon-YYYY HH24:MI:SS') AS b FROM st; 星期四 01-1 月 -1970 22:04:05

timestamp	timestamp	ok	'2000/11/24 11:43:59'	24-11 月-00 11.43.59.000000 上午	SELECT to_char(c3, 'Dy DD-Mon-YYYY HH24:MI:SS') AS b FROM st; 星期五 24-11 月-2000 11:43:59
long varchar	CLOB	ok	'long varchar', insert host variable with file(English,Chinese, Japanese) ex: insert t1 values(?); &'3.txt'; end;	Show as input	
long varbinary	BLOB	ok	'long varbinary', insert host variable with file(English,Chinese, Japanese) ex: insert t1 values(?); &'3.txt'; end;	DBMaster save data as UTF-8. Select column cast as varchar, English character show well, but Chinese(japans) character show odd code, so does ORACLE.	If Oracle sqlplus export NLS_LANG="TRADITI ONAL CHINESE_TAIWAN.al3 2utf8", it will show well.

file	BLOB	ok	//user fo
			insert into t1 values('/home/hook/r elease/workspace/1.t xt');
			//sys fo
			insert host variable with file(English,Chinese, Japanese) ex: insert t1 values(?); &'3.txt'; end;
				The same as long varbinary.	

xmltype	blob	ok	insert host variable with xml file(English,Chinese) ex: insert t1 values(?); &order.xml; end;	The same as long varbinary.	
xmlfiletype	blob	ok	insert host variable with xml file(English,Chinese) ex: insert t1 values(?); &order.xml; '/home/hook/release/ workspace/PRODUC T.XML'; end;	The same as long varbinary.	
nchar(60)	NCHAR(60)	ok	N'any nchar literal', '2D4E87650030'u, '3100320033003400 35003600370038003 90030003100'u,,	any nchar literal, 中文, 12345678901	Show as input
nvarchar(60)	nvarchar2(6 0)	ok	N'any nvarchar literal', '2D4E87650030'u, '3100320033003400 35003600370038003 90030003100'u,	any nchar literal, 中文, 12345678901	Show as input
nclob	nclob	ok	N'any nclob literal', '2D4E87650030'u, '3100320033003400 35003600370038003 90030003100'u,	any nchar literal, 中文, 12345678901	Show as input

oid	raw(8)	failed	'1234'x	ERROR (12899), [unixODBC][Oracle][ODBC][Ora]ORA-12899:	
xmltype	xmltype	failed	Xml file	ORA-00932: inconsistent datatype : expected - got BINARY	
xmlfiletype	xmltype	failed	Xml file	ORA-00932: inconsistent datatype : expected - got BINARY	
xmltype	bfile	failed	Xml file	(no error message)	
xmlfiletype	bfile	failed	Xml file	(no error message)	