

## **Using Oracle GoldenGate (OGG) 11gR2 for Conflict Detection and Resolution (CDR) based on balance and timestamp in a bidirectional active-active configuration**

In the article you will have a look at an example for CDR implementation based on a balance and timestamp column in a bidirectional active-active OGG setup. I will build an active-active bidirectional OGG replication between two sites (RACD, RACDB) each having identical tables (test5.account, test5.seat\_assignment). I will emphasize on the requirements for CDR implementation and will outline CDR concepts and illustrate a step-by step CDR implementation, testing and troubleshooting. I will cover two cases

- Use delta method for account balance CDR - An initial balance of 1000 will be simultaneously credited 200 on site B and debited 100 on site A. The result will be 1100 on both site A and site B.
- Use USEMIN timestamp method for seat booking CDR - a seat '2A' will be booked 1<sup>st</sup> by John Smith on site A and at about the same time will be booked by Pier Cardin on site B. The result will be the first user on both site A and site B.

Starting with OGG 11gR2 there are build in options in the MAP replicat parameter, such as COMPARECOLS, RESOLVECONFLICT, and in the TABLE extract parameter, such as GETBEFORECOLS, allowing easy, automatic and OGG driven CDR compared to the methods involving SQL or PLSQL code invoked from SQLEXEC used for CDR in versions of OGG prior to 11gR2.

In active-active bidirectional configuration we have

- OGG configured for replication from site A to site B and from site B to site A
- Application that can access both site A and site B

In the article Site A is RACD ad site b is RACDB.

Due to the asynchronous nature of OGG conflicts can occur if both sites update the same record at or near the same time. For CDR there are different methods in use such as

- Latest time stamp - a timestamp column is added to the table and in case of two contending operations against the same record issued each on a different site, the record corresponding to an operation with the latest timestamp win the contest and persist in the database
- Earliest timestamp - a timestamp column is added to the table and in case of two contending operations against the same record issued each on a different site, the record corresponding to an operation with the earliest timestamp win the contest and persist in the database.
- Balance - in case of two contending operations against the same record issued each on a different site, the record that persist in the database is a summation from the difference(before-after) from the source + current column value from a record on the target for the

column where balance is used. That is, adds the difference between the before and after values in the trail record from site A to the current value of the column in the target database on site B.

- Site priority
- Etc...
- Any combination of the above methods.

OGG 11gR2 introduced facilities for automatic handling of

- Latest timestamp - using USEMAX option in RESOLVECONFLICT
- Earliest timestamp - using USEMIN option in RESOLVECONFLICT
- Balance - using BALANCE option in RESOLVECONFLICT

In OGG versions prior to 11gR2 a custom code using SQLEXEC was required in order to implement the CDR functionality.

For CDR to operate the before image of the changed record is required in addition to the before image of the table key. Force Oracle to log in the tranlog the before image of a changed non key column by issuing ADD TRANDATA <tablename>, COLS(<changed columns>)

The extract capture for CDR should include the following

1. Force extract to capture the before image using GETBEFORECOLS in the TABLE parameter.
2. Use NOCOMPRESSDELETES and NOCOMPRESSUPDATES in the extract parameter file so that to have extract write a full record in a trail instead of the changed columns only.

For CDR replicat will be configured with mapping for:

- A base table part of the replication configuration
- An exception table corresponding to each replicated table to store the records details only in case of a conflict resolution or an error ( Similar to the way OGG REPERROR maps errors using exception map statement into an exception table)

The CDR is handled first and the REPERROR is handled second. Thus, the exception table is populated in case of a CDR.

A replicat configured for CDR performs the following tasks in addition to the usual tasks of applying the records from the trail.

1. Compare the before values of the record from the trail using the MAP option COMPARECOLS with the before values on the target for each update or delete or both update and delete
2. Use the before images from the trail to calculate a value on the target in case of conflict if DELTA is used
3. Use the after images from the trail to calculate a value on the target in case of conflict if DELTA, USEMIN or USEMAX is used

4. In case of conflict populates the table specified in the exception map for future reference (optional if you use an exception mapping)

The configuration is as follows.

	Site A	Site B
Database	RACD	RACDB
Tables in the replication configuration are identical	<pre> create table test5.seat_assignment (   id     number(10) primary   key,   passenger_name     varchar2(50),   latest_timestamp     timestamp,   flight_no     number(10),   seat_no     varchar2(19),   flight_time     date);  create table test5.account (   account_id     number(10) primary   key,   account_name     varchar2(50),   account_tel     varchar2(12),   account_address     varchar2(200),   balance     number(10)); </pre>	<pre> create table test5.seat_assignment (   id     number(10) primary   key,   passenger_name     varchar2(50),   latest_timestamp     timestamp,   flight_no     number(10),   seat_no     varchar2(19),   flight_time     date);  create table test5.account (   account_id     number(10) primary   key,   account_name     varchar2(50),   account_tel     varchar2(12),   account_address     varchar2(200),   balance     number(10)); </pre>
Exception tables	<pre> create table test5.seat_assignment_ex (   id_pk     number(10) primary   key,   res_date     date,   optype     varchar2(100),   dberrnum     varchar2(100),   dberrmsg     varchar2(400),   tablename     varchar2(20),   id_curr     number(10) , </pre>	<pre> create table test5.seat_assignment_ex (   id_pk     number(10) primary   key,   res_date     date,   optype     varchar2(100),   dberrnum     varchar2(100),   dberrmsg     varchar2(400),   tablename     varchar2(20),   id_curr     number(10) , </pre>

	<pre> passenger_name_curr     varchar2(50), latest_timestamp_curr     timestamp, flight_no_curr     number(10), seat_no_curr     varchar2(19), flight_time_curr     date, id_before     number(10) , passenger_name_before     varchar2(50), latest_timestamp_before     timestamp, flight_no_before     number(10), seat_no_before     varchar2(19), flight_time_before     date, id_after     number(10) , passenger_name_after     varchar2(50), latest_timestamp_after     timestamp, flight_no_after     number(10), seat_no_after     varchar2(19), flight_time_after     date );  create table test5.account_ex ( id_pk     number(10) primary key, res_date     date, optype     varchar2(100), dberrnum     varchar2(100), dberrmsg     varchar2(400), tablename     varchar2(20), account_id_curr     number(10) , account_name_curr     varchar2(50), account_tel_curr </pre>	<pre> passenger_name_curr     varchar2(50), latest_timestamp_curr     timestamp, flight_no_curr     number(10), seat_no_curr     varchar2(19), flight_time_curr     date, id_before     number(10) , passenger_name_before     varchar2(50), latest_timestamp_before     timestamp, flight_no_before     number(10), seat_no_before     varchar2(19), flight_time_before     date, id_after     number(10) , passenger_name_after     varchar2(50), latest_timestamp_after     timestamp, flight_no_after     number(10), seat_no_after     varchar2(19), flight_time_after     date );  create table test5.account_ex ( id_pk     number(10) primary key, res_date     date, optype     varchar2(100), dberrnum     varchar2(100), dberrmsg     varchar2(400), tablename     varchar2(20), account_id_curr     number(10) , account_name_curr     varchar2(50), account_tel_curr </pre>
--	--	--

	<pre> varchar2(12), account_address_curr varchar2(200), balance_curr number(10), account_id_before number(10) , account_name_before varchar2(50), account_tel_before varchar2(12), account_address_before varchar2(200), balance_before number(10), account_id number(10) , account_name varchar2(50), account_tel varchar2(12), account_address varchar2(200), balance number(10) ); </pre>	<pre> varchar2(12), account_address_curr varchar2(200), balance_curr number(10), account_id_before number(10) , account_name_before varchar2(50), account_tel_before varchar2(12), account_address_before varchar2(200), balance_before number(10), account_id number(10) , account_name varchar2(50), account_tel varchar2(12), account_address varchar2(200), balance number(10) ); </pre>
Table accessed by an application	test5.seat_assignment test5.account	test5.seat_assignment test5.account
Extracts	Extbil	Extbi2
Replicats	Repbi2	Repbil
Trail files	./dirdat/3y	./dirdat/3z
Oracle sequence object to generate key values in the exception table map. See the replicat parameter file.	<pre> CREATE SEQUENCE test4.exception START WITH      1 INCREMENT BY    2 CACHE 30000 ; </pre>	<pre> CREATE SEQUENCE test4.exception START WITH      2 INCREMENT BY    2 CACHE 30000 ; </pre>

The dataflow is as follows

	Source database	extract	trail	replicat	Target database
From A to B	RACD	Extbil	./dirdat/3z	Repbil	RACDB
From B to A	RACDB	Extbi2	./dirdat/3y	Repbi2	RACD

The column test5.seat\_assignment.latest\_timestamp is instrumental for the USEMIN mode CDR. If there are no conflicts the data from the trail is applied as usual. In case of a conflict the after image from the trail file for this column is compared to the current value on the target. The earliest timestamp wins and the change record with the earliest after image of test5.seat\_assignment.latest\_timestam is written to the target. Note that as DEFAULT is used the resolution applies to all columns.

The column test5.account.balance is instrumental for the DELTA mode CDR. If there are no conflicts the data from the trail is applied as usual. In case of a conflict, the difference between the before and after values of test5.account.balance column from the trail record is added to the current value of the test5.account.balance column on the target database. The remaining columns are overwritten.

Implementing bidirectional active-active OGG replication with CDR includes the following steps performed in order.

1. Prepare the Oracle to log into the redo log before and after images for all columns, not only keys and changed data, for tables in the replication (test5.seat\_assignment,test5.account)
2. Configuring replication from RACD to RACDB
3. Configuring replication from RACDB to RACD
4. Testing USEMIN and BALANCE CDR

## Prepare Oracle to log data for all table columns

For each site perform the following

```
dblogin userid ogg_extract@[RACD-RACDB], password ogg_extrac

add trandata test5.seat_assignment, cols (passenger_name, latest_timestamp, flight_no,
seat_no, flight_time)

add trandata test5.account, cols(account_name,account_tel,account_address,balance)
```

Use **info trandata** to verify the output. Take a note that the default used in DDLOPTIONS ADDTRANDATA and without columns specifications do not add all columns.

```
GGSCI (raclinux1.gj.com) 15> dblogin userid ogg_extract@racd, password ogg_extract
Successfully logged into database.

GGSCI (raclinux1.gj.com) 16> info trandata TEST5.ACCOUNT

Logging of supplemental redo log data is enabled for table TEST5.ACCOUNT.

Columns supplementally logged for table TEST5.ACCOUNT: ACCOUNT_ID, ACCOUNT_NAME,
ACCOUNT_TEL, ACCOUNT_ADDRESS, BALANCE.

GGSCI (raclinux1.gj.com) 17> info trandata test5.seat_assignment

Logging of supplemental redo log data is enabled for table TEST5.SEAT_ASSIGNMENT.

Columns supplementally logged for table TEST5.SEAT_ASSIGNMENT: ID, PASSENGER_NAME,
LATEST_TIMESTAMP, FLIGHT_NO, SEAT_NO, FLIGHT_TIME.

GGSCI (raclinux1.gj.com) 18>
```

Failure to add logging to all columns will result in

```
2012-11-07 15:41:30 ERROR OGG-01920 Missing COMPARECOLS column ACCOUNT_NAME in before
image, while mapping to target table TEST5.ACCOUNT. Add the column to GETBEFORECOLS.
```

## Configure replication from RACD to RACDB

Create an extract, trail and replicat

```
GGSCI (raclinux1.gj.com) 126> add extract extbil, tranlog, begin now, threads 2
EXTRACT added.
GGSCI (raclinux1.gj.com) 127>
GGSCI (raclinux1.gj.com) 130> add rmttrail ./dirdat/3z, extract extbil, megabytes 30
RMTTRAIL added.
GGSCI (raclinux1.gj.com) 131>
GGSCI (raclinux1.gj.com) 133> add replicat repbil, extrail ./dirdat/3z
REPLICAT added.
```

### Pay attention to the parameter files

```
GGSCI (raclinux1.gj.com) 3> view params extbil

extract extbil
SETENV (ORACLE_SID = "RACDB1")
tranlogoptions asmuser sys@ASM, asmpassword sys1

userid ogg_extract1@racd, password ogg_extract1
report at 10:00
reportcount every 10 minutes, rate
reportrollover on friday

nocompressupdates -- Include the full record
nocompressdeletes -- Include the full record
tranlogoptions excludeuser ogg_replicat -- Exclude the replicat user
rmthost raclinux1, mgrport 7809
rmttrail ./dirdat/3z
table test5.seat_booking;
table test5.seat_assignment, getbeforecols(on update all, on delete all);
table test5.account, getbeforecols(on update all, on delete all);

GGSCI (raclinux1.gj.com) 4>

GGSCI (raclinux1.gj.com) 4> view params repbil

replicat repbil
--maxtransops 1
--TRANSACTIONTIMEOUT 5 S
repererror(default,exception) -- For exeption mapping
repererror(default2,discard) -- For test5.seat_booking as is withot exeption map
SETENV (ORACLE_SID = "RACDB1")
userid ogg_replicat@racdb, password ogg_replicat
assumetargetdefs
report at 10:00
reportcount every 10 minutes, rate
reportrollover on friday
discardfile ./dirrpt/repbil.dsc, purge

map test5.seat_booking, target test5.seat_booking;
map test5.seat_assignment, target test5.seat_assignment,
comparecols( on update all, on delete all),
RESOLVECONFLICT (UPDATEROWEXISTS, (DEFAULT, USEMIN (latest_timestamp))),
RESOLVECONFLICT (INSERTROWEXISTS, (DEFAULT, USEMIN (latest_timestamp))),
RESOLVECONFLICT (DELETEROWEXISTS, (DEFAULT, OVERWRITE)),
RESOLVECONFLICT (UPDATEROWMISSING, (DEFAULT, OVERWRITE)),
RESOLVECONFLICT (DELETEROWMISSING, (DEFAULT, DISCARD));

map test5.seat_assignment, target test5.seat_assignment_ex,
exceptiononly,
insertallrecords,
sqlexec(id seq1, query " select test4.exception.nextval from dual ", NOPARAMS),
```

```

sqlexec(id query_val1, query " select ID, PASSENGER_NAME, LATEST_TIMESTAMP, FLIGHT_NO,
SEAT_NO, FL
IGHT_TIME from test5.seat_assignment where id = :var_id ", PARAMS(var_id=id)),
colmap (
usedefaults,
id_pk = seq1.test4.exception.nextval,
res_date = @DATENOW(),
-- captures and maps the DML operation type.
optype = @GETENV("LASTERR", "OPTYPE"),
-- captures and maps the database error number that was returned.
dberrnum = @GETENV("LASTERR", "DBERRNUM"),
-- captures and maps the database error that was returned.
dberrmsg = @GETENV("LASTERR", "DBERRMSG"),
-- captures and maps the name of the target table
tablename = @GETENV("GGHEADER", "TABLENAME"),

id_curr = @GETVAL(query_val1.id),
passenger_name_curr = @GETVAL(query_val1.passenger_name),
latest_timestamp_curr = @GETVAL(query_val1.latest_timestamp),
flight_no_curr = @GETVAL(query_val1.flight_no),
seat_no_curr = @GETVAL(query_val1.seat_no),
flight_time_curr = @GETVAL(query_val1.flight_time),

id_before = before.id,
passenger_name_before = before.passenger_name,
latest_timestamp_before = before.latest_timestamp,
flight_no_before = before.flight_no,
seat_no_before = before.seat_no,
flight_time_before = before.flight_time,

id_after = id,
passenger_name_after = passenger_name,
latest_timestamp_after = latest_timestamp,
flight_no_after = flight_no,
seat_no_after = seat_no,
flight_time_after = flight_time);

map test5.account, target test5.account,
comparecols( on update all, on delete all),
RESOLVECONFLICT (UPDATEROWEXISTS, (delta_calc, USEDELTA,
cols(balance)), (DEFAULT,OVERWRITE)),
RESOLVECONFLICT (DELETEROWEXISTS, (DEFAULT, OVERWRITE)),
RESOLVECONFLICT (UPDATEROWMISSING, (DEFAULT, OVERWRITE)),
RESOLVECONFLICT (DELETEROWMISSING, (DEFAULT, DISCARD));

map test5.account, target test5.account_ex,
exceptionsonly,
insertallrecords,
sqlexec(id seq2, query " select test4.exception.nextval from dual ", NOPARAMS),
sqlexec(id current_val2, query " select ACCOUNT_ID, ACCOUNT_NAME, ACCOUNT_TEL,
ACCOUNT_ADDRESS, BA
LANCE from test5.account where account_id = :var_id ", PARAMS(var_id=account_id)),
colmap (
usedefaults,
id_pk = seq2.test4.exception.nextval,
res_date = @DATENOW(),
-- captures and maps the DML operation type.
optype = @GETENV("LASTERR", "OPTYPE"),
-- captures and maps the database error number that was returned.
dberrnum = @GETENV("LASTERR", "DBERRNUM"),
-- captures and maps the database error that was returned.
dberrmsg = @GETENV("LASTERR", "DBERRMSG"),
-- captures and maps the name of the target table
tablename = @GETENV("GGHEADER", "TABLENAME"),

account_id_curr = current_val2.account_id,
account_name_curr = current_val2.account_name,
account_tel_curr = current_val2.account_tel,
account_address_curr = current_val2.account_address,
balance_curr = current_val2.balance,

```



```

account_id_before = before.account_id,
account_name_before = before.account_name,
account_tel_before = before.account_tel,
account_address_before = before.account_address,
balance_before = before.balance

--account_id = account_id
--account_name = account_name
--account_tel = account_tel
--account_address = account_address
--balance = balance
);

GGSCI (raclinux1.gj.com) 5>

```

## Configure replication from RACDB to RACD

Create an extract, trail and replicat

```

GGSCI (raclinux1.gj.com) 16>

GGSCI (raclinux1.gj.com) 18> add extract extbi2, tranlog, begin now, threads 2

EXTRACT added.

GGSCI (raclinux1.gj.com) 19> add rmttrail ./dirdat/3y extract extbi2,megabytes 30

RMTTRAIL added.

GGSCI (raclinux1.gj.com) 20>

GGSCI (raclinux1.gj.com) 21> add replicat repbi2, exttrail ./dirdat/3y

REPLICAT added.

GGSCI (raclinux1.gj.com) 22>

```

### Pay attention to the parameter files

```

GGSCI (raclinux1.gj.com) 5> view params extbi2

extract extbi2
SETENV (ORACLE_SID = "RACDB1")
tranlogoptions asmuser sys@ASM, asmpassword sys1

userid ogg_extract1@racdb, password ogg_extract1
report at 10:00
reportcount every 10 minutes, rate
reportrollover on friday

nocompressupdates -- Include the full record
nocompressdeletes -- Include the full record
tranlogoptions excludeuser ogg_replicat -- Exclude the replicat user
rmthost raclinux1, mgrport 7809
rmttrail ./dirdat/3y
table test5.seat_booking;
table test5.seat_assignment, getbeforecols(on update all, on delete all);
table test5.account, getbeforecols(on update all, on delete all);

GGSCI (raclinux1.gj.com) 6>

GGSCI (raclinux1.gj.com) 6> view params repbi2

```

```

replicat repbi2
--maxtransops 1
--TRANSACTIONTIMEOUT 5 S
reperror(default,exception) -- For exeption mapping
reperror(default2,discard) -- For test5.seat_booking as is withot exeption map
SETENV (ORACLE_SID = "RACDB1")
userid ogg_replicat@racd, password ogg_replicat
assumetargetdefs
report at 10:00
reportcount every 10 minutes, rate
reportrollover on friday
discardfile ./dirrpt/repdwn.dsc, purge

map test5.seat_booking, target test5.seat_booking;
map test5.seat_assignment, target test5.seat_assignment,
comparecols( on update all, on delete all),
RESOLVECONFLICT (UPDATEROWEXISTS, (DEFAULT, USEMIN (latest_timestamp))),
RESOLVECONFLICT (INSERTROWEXISTS, (DEFAULT, USEMIN (latest_timestamp))),
RESOLVECONFLICT (DELETEROWEXISTS, (DEFAULT, OVERWRITE)),
RESOLVECONFLICT (UPDATEROWMISSING, (DEFAULT, OVERWRITE)),
RESOLVECONFLICT (DELETEROWMISSING, (DEFAULT, DISCARD));

map test5.seat_assignment, target test5.seat_assignment_ex,
exceptionsonly,
insertallrecords,
sqlexec(id seq1, query " select test4.exception.nextval from dual ", NOPARAMS),
sqlexec(id query_vall, query " select ID, PASSENGER_NAME, LATEST_TIMESTAMP, FLIGHT_NO,
SEAT_NO, FL
IGHT_TIME from test5.seat_assignment where id = :var_id ", PARAMS(var_id=id)),
colmap (
usedefaults,
id_pk = seq1.test4.exception.nextval,
res_date = @DATENOW(),
-- captures and maps the DML operation type.
optype = @GETENV("LASTERR", "OPTYPE"),
-- captures and maps the database error number that was returned.
dberrnum = @GETENV("LASTERR", "DBERRNUM"),
-- captures and maps the database error that was returned.
dberrmsg = @GETENV("LASTERR", "DBERRMSG"),
-- captures and maps the name of the target table
tablename = @GETENV("GGHEADER", "TABLENAME"),

id_curr = @GETVAL(query_vall.id),
passenger_name_curr = @GETVAL(query_vall.passenger_name),
latest_timestamp_curr = @GETVAL(query_vall.latest_timestamp),
flight_no_curr = @GETVAL(query_vall.flight_no),
seat_no_curr = @GETVAL(query_vall.seat_no),
flight_time_curr = @GETVAL(query_vall.flight_time),

id_before = before.id,
passenger_name_before = before.passenger_name,
latest_timestamp_before = before.latest_timestamp,
flight_no_before = before.flight_no,
seat_no_before = before.seat_no,
flight_time_before = before.flight_time,

id_after = id,
passenger_name_after = passenger_name,
latest_timestamp_after = latest_timestamp,
flight_no_after = flight_no,
seat_no_after = seat_no,
flight_time_after = flight_time);

map test5.account, target test5.account,
comparecols( on update all, on delete all),
RESOLVECONFLICT (UPDATEROWEXISTS, (delta_calc, USEDELTA,
cols(balance)), (DEFAULT, OVERWRITE)),
RESOLVECONFLICT (DELETEROWEXISTS, (DEFAULT, OVERWRITE)),
RESOLVECONFLICT (UPDATEROWMISSING, (DEFAULT, OVERWRITE)),
RESOLVECONFLICT (DELETEROWMISSING, (DEFAULT, DISCARD));

```

```

map test5.account, target test5.account_ex,
exceptiononly,
insertallrecords,
sqlexec(id seq2, query " select test4.exception.nextval from dual ", NOPARAMS),
sqlexec(id current_val2, query " select ACCOUNT_ID, ACCOUNT_NAME, ACCOUNT_TEL,
ACCOUNT_ADDRESS, BA
LANCE from test5.account where account_id = :var_id ", PARAMS(var_id=account_id)),
colmap (
usedefaults,
id_pk = seq2.test4.exception.nextval,
res_date = @DATENOW(),
-- captures and maps the DML operation type.
optype = @GETENV("LASTERR", "OPTYPE"),
-- captures and maps the database error number that was returned.
dberrnum = @GETENV("LASTERR", "DBERRNUM"),
-- captures and maps the database error that was returned.
dberrmsg = @GETENV("LASTERR", "DBERRMSG"),
-- captures and maps the name of the target table
tablename = @GETENV("GGHEADER", "TABLENAME"),

account_id_curr = current_val2.account_id,
account_name_curr = current_val2.account_name,
account_tel_curr = current_val2.account_tel,
account_address_curr = current_val2.account_address,
balance_curr = current_val2.balance,

account_id_before = before.account_id,
account_name_before = before.account_name,
account_tel_before = before.account_tel,
account_address_before = before.account_address,
balance_before = before.balance

--account_id = account_id
--account_name = account_name
--account_tel = account_tel
--account_address = account_address
--balance = balance
);

GGSCI (raclinux1.gj.com) 7>

```

## Testing CDR

Make sure that extract and the replicates are running.

### Testing BALANCE

The test will include series of SQL performed in the following order on RACD and RACDB.

	RACD	RACDB
1	<pre> 16:27:04 SQL&gt; insert into test5.account values (1, 'Smith', '555- 555-5555', '1234 Some street name', 1000); commit; 1 row created.  Elapsed: 00:00:00.01 16:27:10 SQL&gt; </pre>	

	<pre> Commit complete.  Elapsed: 00:00:00.02 16:27:12 SQL&gt; select * from account;  ACCOUNT_ID ACCOUNT_NAME ACCOUNT_TEL ACCOUNT_AD BALANCE ----- -----           1 Smith          555- 555-5555 1234 Some          1000  street nam  e  Elapsed: 00:00:00.00 16:27:21 SQL&gt; </pre>	
2		<pre> 16:27:08 SQL&gt; select * from account;  ACCOUNT_ID ACCOUNT_NAME ACCOUNT_TEL ACCOUNT_AD BALANCE ----- -----           1 Smith 555-555-5555 1234 Some          1000  street nam  e  Elapsed: 00:00:00.00 16:27:27 SQL&gt;  16:28:20 SQL&gt; insert into test5.account values(2,'Jones','666-666- 6666','5678 Some street name',2000); commit;  1 row created.  Elapsed: 00:00:00.00 16:28:20 SQL&gt; Commit complete.  Elapsed: 00:00:00.01 16:28:20 SQL&gt; 16:28:21 SQL&gt; select * from account; </pre>

		<pre> ACCOUNT_ID ACCOUNT_NAME ACCOUNT_TEL ACCOUNT_AD BALANCE ----- 1 Smith 555-555-5555 1234 Some 1000  street nam e  2 Jones 666-666-6666 5678 Some 2000  street nam e  Elapsed: 00:00:00.00 16:28:27 SQL&gt; </pre>
3	<pre> 16:28:58 SQL&gt; select * from account;  ACCOUNT_ID ACCOUNT_NAME ACCOUNT_TEL ACCOUNT_AD BALANCE ----- 1 Smith 555-5555 1234 Some 1000  street nam e  2 Jones 666-6666 5678 Some 2000  street nam e  Elapsed: 00:00:00.01 16:29:00 SQL&gt; </pre>	
4	<pre> 16:29:00 SQL&gt; update test5.account set balance=1200 where account_id=1;  1 row updated.  Elapsed: 00:00:00.00 16:29:36 SQL&gt; commit;  Commit complete.  Elapsed: 00:00:00.00 16:30:04 SQL&gt; select * from account; </pre>	<pre> 16:28:27 SQL&gt; update test5.account set balance=900 where account_id=1;  1 row updated.  Elapsed: 00:00:00.00 16:29:51 SQL&gt; commit;  Commit complete.  Elapsed: 00:00:00.00 16:30:03 SQL&gt; select * from account; </pre>

<pre> ACCOUNT_ID ACCOUNT_NAME ACCOUNT_TEL ACCOUNT_AD BALANCE ----- 1 Smith 555- 555-5555 1234 Some 1100 street nam e 2 Jones 666- 666-6666 5678 Some 2000 street nam e Elapsed: 00:00:00.00 16:30:10 SQL&gt; </pre>	<pre> ACCOUNT_ID ACCOUNT_NAME ACCOUNT_TEL ACCOUNT_AD BALANCE ----- 1 Smith 555-555-5555 1234 Some 1100 street nam e 2 Jones 666- 666-666-6666 5678 Some 2000 street nam e Elapsed: 00:00:00.01 16:30:14 SQL&gt; 16:30:48 SQL&gt; </pre>
---	---

Starting from an initial balance of 1000 and decreasing the balance by 100 to 900 on RACDB and increasing by 200 to 1200 on RACD results in balance of 1100. This is correct as  $1100=1000+200-100$ .

You can use GGSCI **stats** to monitor what have happened. See the Appendix for a detail output but a snip will look like

*Replicating from TEST5.ACCOUNT to TEST5.ACCOUNT:*

```

*** Total statistics since 2012-11-07 16:28:24 ***
Total inserts 1.00
Total updates 1.00
Total deletes 0.00
Total discards 0.00
Total operations 2.00
Total CDR conflicts 1.00
CDR resolutions succeeded 1.00
CDR UPDATEROWEXISTS conflicts 1.00

```

The exception table gets populated as well. On RACD I have

16:56:43 SQL> select \* from account\_ex;

```

ID_PK RES_DATE OPTYPE DBERRNUM DBERRMSG TABLENAME
ACCOUNT_ID_CURR ACCOUNT_NAME_CURR ACCOUNT_TEL_ ACCOUNT_AD BALANCE_CURR
ACCOUNT_ID_BEFORE ACCOUNT_NAME_BEFORE ACCOUNT_TEL_ ACCOUNT_AD BALANCE_BEFORE ACCOUNT_ID
ACCOUNT_NAME ACCOUNT_TEL ACCOUNT_AD BALANCE
-----
-----
180007 07-NOV-12 SQL COMPUPDA 1403 TEST5.ACCOUNT
1 Smith 555-555-5555 1234 Some 1100 1 Smith
555-555-5555 1234 Some 1000 1
900
TE
street nam street nam

```

e

e

Elapsed: 00:00:00.01  
16:57:08 SQL>

On RACDB I have

16:57:59 SQL> select \* from account\_ex;

```

          ID PK RES DATE  OPTYPE          DBERRNUM      DBERRMSG     TABLENAME
ACCOUNT_ID_CURR ACCOUNT_NAME_CURR  ACCOUNT_TEL_ ACCOUNT_AD BALANCE_CURR
ACCOUNT_ID_BEFORE ACCOUNT_NAME_BEFORE  ACCOUNT_TEL_ ACCOUNT_AD BALANCE_BEFORE ACCOUNT_ID
ACCOUNT_NAME          ACCOUNT_TEL  ACCOUNT_AD    BALANCE
-----
180001 07-NOV-12 SQL COMPUPDA 1403          TEST5.ACCOUNT
1 Smith          555-555-5555 1234 Some          1000          1          1100          1 Smith
555-555-5555 1234 Some          1000          1
1200
          TE
street nam          street nam
e

```

Elapsed: 00:00:00.01  
16:58:11 SQL>

**Testing USEMIN**

The test will include series of SQL performed in the following order on RACD and RACDB.

	RACD	RACDB
1	<pre> 16:37:25 SQL&gt; 16:39:05 SQL&gt; insert into test5.seat_assignment values(1,'',current_timestamp,120,'1 A',sysdate); insert into test5.seat_assignment values(2,'',current_timestamp,120,'1 B',sysdate); insert into test5.seat_assignment values(3,'',current_timestamp,120,'1 C',sysdate); insert into test5.seat_assignment values(4,'',current_timestamp,120,'1 D',sysdate); insert into test5.seat_assignment values(5,'',current_timestamp,120,'1 E',sysdate); insert into test5.seat_assignment values(6,'',current_timestamp,120,'1 F',sysdate); commit;  1 row created. </pre>	

	<pre> Elapsed: 00:00:00.02 16:39:13 SQL&gt; 1 row created.  Elapsed: 00:00:00.01 16:39:13 SQL&gt; 1 row created.  Elapsed: 00:00:00.00 16:39:13 SQL&gt; 1 row created.  Elapsed: 00:00:00.01 16:39:13 SQL&gt; 1 row created.  Elapsed: 00:00:00.00 16:39:13 SQL&gt; 1 row created.  Elapsed: 00:00:00.01 16:39:13 SQL&gt; Commit complete.  Elapsed: 00:00:00.00 16:39:13 SQL&gt; 16:39:19 SQL&gt; select count(*) from seat_assignment;    COUNT(*) -----           6  Elapsed: 00:00:00.01 16:39:34 SQL&gt; </pre>	
2		<pre> 16:40:11 SQL&gt; select count(*) from seat_assignment;    COUNT(*) -----           6  Elapsed: 00:00:00.04 16:40:13 SQL&gt; insert into test5.seat_assignment values(7,'',current_timestamp,120,'2A ',sysdate); insert into test5.seat_assignment values(8,'',current_timestamp,120,'2B ',sysdate); insert into test5.seat_assignment values(9,'',current_timestamp,120,'2C ',sysdate); insert into test5.seat_assignment values(10,'',current_timestamp,120,'2 </pre>



		<pre> D',sysdate); insert into test5.seat_assignment values(11,'',current_timestamp,120,'2 E',sysdate); insert into test5.seat_assignment values(12,'',current_timestamp,120,'2 F',sysdate); commit; 1 row created.  Elapsed: 00:00:00.00 16:40:25 SQL&gt; 1 row created.  Elapsed: 00:00:00.00 16:40:25 SQL&gt; 1 row created.  Elapsed: 00:00:00.02 16:40:25 SQL&gt; 1 row created.  Elapsed: 00:00:00.00 16:40:25 SQL&gt; 1 row created.  Elapsed: 00:00:00.01 16:40:25 SQL&gt; 1 row created.  Elapsed: 00:00:00.02 16:40:25 SQL&gt;  Commit complete.  Elapsed: 00:00:00.00 16:40:26 SQL&gt; 16:40:27 SQL&gt; select count(*) from seat_assignment 16:40:32  2  ;        COUNT(*)       -----               12  Elapsed: 00:00:00.01 16:40:34 SQL&gt; </pre>
3	<pre> 16:39:34 SQL&gt; select count(*) from seat_assignment;        COUNT(*)       -----               12  Elapsed: 00:00:00.00 16:41:14 SQL&gt; </pre>	

<pre> 4 16:51:57 SQL&gt; select * from     seat_assignment where seat_no='2A';            ID PASSENGER_NAME LATEST_TIMESTAMP FLIGHT_NO SEAT_NO FLIGHT_TI ----- ----- ----- ----- ----- 7 07-NOV-12 04.40.25.481803 PM 120 2A          07-NOV-12  Elapsed: 00:00:00.00 16:51:59 SQL&gt; update test5.seat_assignment set PASSENGER_NAME='John Smith', LATEST_TIMESTAMP=current_timestamp where seat_no='2A' and FLIGHT_NO=120;  1 row updated.  Elapsed: 00:00:00.00 <b>16:52:31 SQL&gt; commit;</b>  <b><u>Commit complete.</u></b>  <b><u>Elapsed: 00:00:00.03</u></b> <b>16:53:00 SQL&gt;</b> select * from     seat_assignment where seat_no='2A';            ID PASSENGER_NAME LATEST_TIMESTAMP FLIGHT_NO SEAT_NO FLIGHT_TI ----- ----- ----- ----- ----- 7 John Smith 07-NOV-12 04.52.31.618956 PM 120 2A          07-NOV-12  Elapsed: 00:00:00.00 16:53:12 SQL&gt; </pre>	<pre> 16:52:09 SQL&gt; select * from     seat_assignment where seat_no='2A';            ID PASSENGER_NAME LATEST_TIMESTAMP FLIGHT_NO SEAT_NO FLIGHT_TI ----- ----- ----- ----- ----- 7 07-NOV-12 04.40.25.481803 PM 120 2A          07-NOV-12  Elapsed: 00:00:00.01 16:52:12 SQL&gt; update test5.seat_assignment set PASSENGER_NAME='Pier Cardin', LATEST_TIMESTAMP=current_timestamp where seat_no='2A' and FLIGHT_NO=120;  1 row updated.  Elapsed: 00:00:00.01 <b>16:52:46 SQL&gt; commit;</b>  <b><u>Commit complete.</u></b>  <b><u>Elapsed: 00:00:00.05</u></b> <b>16:53:03 SQL&gt;</b> select * from     seat_assignment where seat_no='2A';            ID PASSENGER_NAME LATEST_TIMESTAMP FLIGHT_NO SEAT_NO FLIGHT_TI ----- ----- ----- ----- ----- 7 John Smith 07-NOV-12 04.52.31.618956 PM 120 2A          07-NOV-12  Elapsed: 00:00:00.01 16:53:16 SQL&gt; </pre>
---	--

Here 1<sup>st</sup> committed change is for 'John Smith' that wins against the change for 'Pier Cardin'. Therefore, the 1<sup>st</sup> record persists across both sites and 'John Smith' change is visible on both sites.

You can use GGSCI **stats** to monitor what have happened. See the Appendix for a detail output but a snip will look like

Replicating from TEST5.SEAT\_ASSIGNMENT to TEST5.SEAT\_ASSIGNMENT:

\*\*\* Total statistics since 2012-11-07 16:27:17 \*\*\*

```

Total inserts                6.00
Total updates                1.00
Total deletes                0.00
Total discards              0.00
Total operations            7.00
Total CDR conflicts         1.00
CDR resolutions succeeded    1.00
CDR UPDATEROWEXISTS conflicts 1.00

```

Replicating from TEST5.SEAT\_ASSIGNMENT to TEST5.SEAT\_ASSIGNMENT\_EX:

\*\*\* Total statistics since 2012-11-07 16:27:17 \*\*\*

```

Total inserts                0.00
Total updates                1.00
Total deletes                0.00
Total discards              0.00
Total operations            1.00

```

The exception table gets populated as well. On RACD I have

16:56:25 SQL> select \* from seat\_assignment\_ex;

```

      ID PK RES DATE  OPTYPE      DBERRNUM  DBERRMSG  TABLENAME
ID_CURR PASSENGER_NAME_CURR  LATEST_TIMESTAMP_CURR
FLIGHT_NO CURR SEAT_NO CURR      FLIGHT_TI  ID BEFORE PASSENGER_NAME BEFOR
LATEST_TIMESTAMP_BEF FLIGHT_NO_BEFORE SEAT_NO_BEFORE  FLIGHT_TI  ID AFTER
PASSENGER_NAME AFTER                                LATEST_TIMESTAMP_AFTER
FLIGHT_NO_AFTER SEAT_NO_AFTER      FLIGHT_TI
-----
180009 07-NOV-12 SQL COMPUPDA 1403          OCI Error OR TEST5.SEAT_ASSIGNMEN
7 John Smith          07-NOV-12 04.52.31.618956 PM
120 2A                07-NOV-12          7          07-NOV-12 04.40.25.4
120 2A                07-NOV-12          7 Pier Cardin
07-NOV-12 04.52.46.481506 PM
TE
81803 PM

```

```

data found,
SQL <UPDATE
"TEST5"."SEAT_ASSIGNMENT
" SET "PASSENGER_NAME" =
:a1,"LATEST_TIMESTAMP"
=:a2 WHERE

```

```

      ID PK RES DATE  OPTYPE      DBERRNUM  DBERRMSG  TABLENAME
ID_CURR PASSENGER_NAME_CURR  LATEST_TIMESTAMP_CURR
FLIGHT_NO CURR SEAT_NO CURR      FLIGHT_TI  ID BEFORE PASSENGER_NAME BEFOR
LATEST_TIMESTAMP_BEF FLIGHT_NO_BEFORE SEAT_NO_BEFORE  FLIGHT_TI  ID AFTER
PASSENGER NAME AFTER                                LATEST_TIMESTAMP_AFTER
FLIGHT_NO_AFTER SEAT_NO_AFTER      FLIGHT_TI
-----

```



OGG replicat report files also provide CDR related information that looks like.

```
From Table TEST5.SEAT_ASSIGNMENT to TEST5.SEAT_ASSIGNMENT:
#           inserts:      29
#           updates:      2
#           deletes:      23
#           discards:      0
# CDR conflicts           : 1
# CDR resolutions succeeded : 1
# CDR UPDATEROWEXISTS conflicts : 1
From Table TEST5.SEAT_ASSIGNMENT to TEST5.SEAT_ASSIGNMENT_EX:
#           inserts:      0
#           updates:      1
#           deletes:      0
#           discards:      0

Stored procedure seq1:
  attempts:      1
  successful:    1

Stored procedure query_val1:
  attempts:      1
  successful:    1

From Table TEST5.ACCOUNT to TEST5.ACCOUNT:
#           inserts:      1
#           updates:      3
#           deletes:      0
#           discards:      0
# CDR conflicts           : 2
# CDR resolutions succeeded : 2
# CDR UPDATEROWEXISTS conflicts : 2
From Table TEST5.ACCOUNT to TEST5.ACCOUNT_EX:
#           inserts:      0
#           updates:      2
#           deletes:      0
#           discards:      0

Stored procedure seq2:
  attempts:      2
  successful:    2

Stored procedure current_val2:
  attempts:      2
  successful:    2
```

## Summary

In the article you had a look at a way to setup a bidirectional active-active OGG replication implementing CDR using a timestamp USEMIN and DELTA methods.

## Appendix

### After DELTA test

```
GGSCI (raclinux1.gj.com) 52> stats extbil reportcdr

Sending STATS request to EXTRACT EXTBI1 ...

Start of Statistics at 2012-11-07 16:31:30.
```

Output to ./dirdat/3z:

Extracting from TEST5.ACCOUNT to TEST5.ACCOUNT:

```
*** Total statistics since 2012-11-07 16:27:16 ***
    Total inserts                1.00
    Total updates                1.00
    Total befores                1.00
    Total deletes                0.00
    Total discards               0.00
    Total operations              3.00

*** Daily statistics since 2012-11-07 16:27:16 ***
    Total inserts                1.00
    Total updates                1.00
    Total befores                1.00
    Total deletes                0.00
    Total discards               0.00
    Total operations              3.00

*** Hourly statistics since 2012-11-07 16:27:16 ***
    Total inserts                1.00
    Total updates                1.00
    Total befores                1.00
    Total deletes                0.00
    Total discards               0.00
    Total operations              3.00

*** Latest statistics since 2012-11-07 16:27:16 ***
    Total inserts                1.00
    Total updates                1.00
    Total befores                1.00
    Total deletes                0.00
    Total discards               0.00
    Total operations              3.00
```

End of Statistics.

GGSCI (raclinux1.gj.com) 53>

GGSCI (raclinux1.gj.com) 75> stats repbil reportcdr

Sending STATS request to REPLICAT REPBI1 ...

Start of Statistics at 2012-11-07 16:32:36.

Replicating from TEST5.ACCOUNT to TEST5.ACCOUNT:

```
*** Total statistics since 2012-11-07 16:27:17 ***
    Total inserts                1.00
    Total updates                1.00
    Total deletes                0.00
    Total discards               0.00
    Total operations              2.00
    Total CDR conflicts          1.00
    CDR resolutions succeeded     1.00
    CDR UPDATEROWEXISTS conflicts 1.00

*** Daily statistics since 2012-11-07 16:27:17 ***
    Total inserts                1.00
    Total updates                1.00
    Total deletes                0.00
    Total discards               0.00
    Total operations              2.00
    Total CDR conflicts          1.00
    CDR resolutions succeeded     1.00
    CDR UPDATEROWEXISTS conflicts 1.00

*** Hourly statistics since 2012-11-07 16:27:17 ***
    Total inserts                1.00
```

Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	2.00
Total CDR conflicts	1.00
CDR resolutions succeeded	1.00
CDR UPDATEROWEXISTS conflicts	1.00

\*\*\* Latest statistics since 2012-11-07 16:27:17 \*\*\*

Total inserts	1.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	2.00
Total CDR conflicts	1.00
CDR resolutions succeeded	1.00
CDR UPDATEROWEXISTS conflicts	1.00

Replicating from TEST5.ACCOUNT to TEST5.ACCOUNT\_EX:

\*\*\* Total statistics since 2012-11-07 16:27:17 \*\*\*

Total inserts	0.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	1.00

\*\*\* Daily statistics since 2012-11-07 16:27:17 \*\*\*

Total inserts	0.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	1.00

\*\*\* Hourly statistics since 2012-11-07 16:27:17 \*\*\*

Total inserts	0.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	1.00

\*\*\* Latest statistics since 2012-11-07 16:27:17 \*\*\*

Total inserts	0.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	1.00

End of Statistics.

GGSCI (raclinux1.gj.com) 76>

GGSCI (raclinux1.gj.com) 76> stats extbi2 reportcdr

Sending STATS request to EXTRACT EXTBI2 ...

Start of Statistics at 2012-11-07 16:33:27.

Output to ./dirdat/3y:

Extracting from TEST5.ACCOUNT to TEST5.ACCOUNT:

\*\*\* Total statistics since 2012-11-07 16:28:24 \*\*\*

Total inserts	1.00
Total updates	1.00
Total befores	1.00
Total deletes	0.00
Total discards	0.00
Total operations	3.00

```

*** Daily statistics since 2012-11-07 16:28:24 ***
    Total inserts          1.00
    Total updates          1.00
    Total befores          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       3.00

```

```

*** Hourly statistics since 2012-11-07 16:28:24 ***
    Total inserts          1.00
    Total updates          1.00
    Total befores          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       3.00

```

```

*** Latest statistics since 2012-11-07 16:28:24 ***
    Total inserts          1.00
    Total updates          1.00
    Total befores          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       3.00

```

End of Statistics.

GGSCI (raclinux1.gj.com) 77>

GGSCI (raclinux1.gj.com) 53> stats repbi2 reportcdr

Sending STATS request to REPLICAT REPBI2 ...

Start of Statistics at 2012-11-07 16:34:05.

Replicating from TEST5.ACCOUNT to TEST5.ACCOUNT:

```

*** Total statistics since 2012-11-07 16:28:24 ***
    Total inserts          1.00
    Total updates          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       2.00
    Total CDR conflicts    1.00
    CDR resolutions succeeded 1.00
    CDR UPDATEROWEXISTS conflicts 1.00

```

```

*** Daily statistics since 2012-11-07 16:28:24 ***
    Total inserts          1.00
    Total updates          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       2.00
    Total CDR conflicts    1.00
    CDR resolutions succeeded 1.00
    CDR UPDATEROWEXISTS conflicts 1.00

```

```

*** Hourly statistics since 2012-11-07 16:28:24 ***
    Total inserts          1.00
    Total updates          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       2.00
    Total CDR conflicts    1.00
    CDR resolutions succeeded 1.00
    CDR UPDATEROWEXISTS conflicts 1.00

```

```

*** Latest statistics since 2012-11-07 16:28:24 ***
    Total inserts          1.00
    Total updates          1.00
    Total deletes          0.00

```



Total discards	0.00
Total operations	2.00
Total CDR conflicts	1.00
CDR resolutions succeeded	1.00
CDR UPDATEROWEXISTS conflicts	1.00

Replicating from TEST5.ACCOUNT to TEST5.ACCOUNT\_EX:

```

*** Total statistics since 2012-11-07 16:28:24 ***
    Total inserts          0.00
    Total updates         1.00
    Total deletes         0.00
    Total discards        0.00
    Total operations      1.00

*** Daily statistics since 2012-11-07 16:28:24 ***
    Total inserts          0.00
    Total updates         1.00
    Total deletes         0.00
    Total discards        0.00
    Total operations      1.00

*** Hourly statistics since 2012-11-07 16:28:24 ***
    Total inserts          0.00
    Total updates         1.00
    Total deletes         0.00
    Total discards        0.00
    Total operations      1.00

*** Latest statistics since 2012-11-07 16:28:24 ***
    Total inserts          0.00
    Total updates         1.00
    Total deletes         0.00
    Total discards        0.00
    Total operations      1.00

```

End of Statistics.

GGSCI (raclinux1.gj.com) 54>

### After USEMIN test

GGSCI (raclinux1.gj.com) 57> stats extbil reportcdr

Sending STATS request to EXTRACT EXTBI1 ...

Start of Statistics at 2012-11-07 16:59:53.

Output to ./dirdat/3z:

Extracting from TEST5.ACCOUNT to TEST5.ACCOUNT:

```

*** Total statistics since 2012-11-07 16:27:16 ***
    Total inserts          1.00
    Total updates         1.00
    Total befores         1.00
    Total deletes         0.00
    Total discards        0.00
    Total operations      3.00

*** Daily statistics since 2012-11-07 16:27:16 ***
    Total inserts          1.00
    Total updates         1.00
    Total befores         1.00
    Total deletes         0.00
    Total discards        0.00
    Total operations      3.00

```

```

*** Hourly statistics since 2012-11-07 16:27:16 ***
    Total inserts          1.00
    Total updates          1.00
    Total befores          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       3.00

```

```

*** Latest statistics since 2012-11-07 16:27:16 ***
    Total inserts          1.00
    Total updates          1.00
    Total befores          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       3.00

```

Extracting from TEST5.SEAT\_ASSIGNMENT to TEST5.SEAT\_ASSIGNMENT:

```

*** Total statistics since 2012-11-07 16:27:16 ***
    Total inserts          6.00
    Total updates          1.00
    Total befores          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       8.00

```

```

*** Daily statistics since 2012-11-07 16:27:16 ***
    Total inserts          6.00
    Total updates          1.00
    Total befores          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       8.00

```

```

*** Hourly statistics since 2012-11-07 16:27:16 ***
    Total inserts          6.00
    Total updates          1.00
    Total befores          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       8.00

```

```

*** Latest statistics since 2012-11-07 16:27:16 ***
    Total inserts          6.00
    Total updates          1.00
    Total befores          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       8.00

```

End of Statistics.

GGSCI (raclinux1.gj.com) 58>

GGSCI (raclinux1.gj.com) 80> stats repb11 reportcdr

Sending STATS request to REPLICAT REPBI1 ...

Start of Statistics at 2012-11-07 17:00:36.

Replicating from TEST5.ACCOUNT to TEST5.ACCOUNT:

```

*** Total statistics since 2012-11-07 16:27:17 ***
    Total inserts          1.00
    Total updates          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       2.00

```

Total CDR conflicts	1.00
CDR resolutions succeeded	1.00
CDR UPDATEROWEXISTS conflicts	1.00
*** Daily statistics since 2012-11-07 16:27:17 ***	
Total inserts	1.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	2.00
Total CDR conflicts	1.00
CDR resolutions succeeded	1.00
CDR UPDATEROWEXISTS conflicts	1.00
*** Hourly statistics since 2012-11-07 17:00:00 ***	
No database operations have been performed.	
*** Latest statistics since 2012-11-07 16:27:17 ***	
Total inserts	1.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	2.00
Total CDR conflicts	1.00
CDR resolutions succeeded	1.00
CDR UPDATEROWEXISTS conflicts	1.00
Replicating from TEST5.ACCOUNT to TEST5.ACCOUNT_EX:	
*** Total statistics since 2012-11-07 16:27:17 ***	
Total inserts	0.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	1.00
*** Daily statistics since 2012-11-07 16:27:17 ***	
Total inserts	0.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	1.00
*** Hourly statistics since 2012-11-07 17:00:00 ***	
No database operations have been performed.	
*** Latest statistics since 2012-11-07 16:27:17 ***	
Total inserts	0.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	1.00
Replicating from TEST5.SEAT_ASSIGNMENT to TEST5.SEAT_ASSIGNMENT:	
*** Total statistics since 2012-11-07 16:27:17 ***	
Total inserts	6.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	7.00
Total CDR conflicts	1.00
CDR resolutions succeeded	1.00
CDR UPDATEROWEXISTS conflicts	1.00
*** Daily statistics since 2012-11-07 16:27:17 ***	
Total inserts	6.00
Total updates	1.00
Total deletes	0.00

Total discards	0.00
Total operations	7.00
Total CDR conflicts	1.00
CDR resolutions succeeded	1.00
CDR UPDATEROWEXISTS conflicts	1.00

\*\*\* Hourly statistics since 2012-11-07 17:00:00 \*\*\*

No database operations have been performed.

\*\*\* Latest statistics since 2012-11-07 16:27:17 \*\*\*

Total inserts	6.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	7.00
Total CDR conflicts	1.00
CDR resolutions succeeded	1.00
CDR UPDATEROWEXISTS conflicts	1.00

Replicating from TEST5.SEAT\_ASSIGNMENT to TEST5.SEAT\_ASSIGNMENT\_EX:

\*\*\* Total statistics since 2012-11-07 16:27:17 \*\*\*

Total inserts	0.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	1.00

\*\*\* Daily statistics since 2012-11-07 16:27:17 \*\*\*

Total inserts	0.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	1.00

\*\*\* Hourly statistics since 2012-11-07 17:00:00 \*\*\*

No database operations have been performed.

\*\*\* Latest statistics since 2012-11-07 16:27:17 \*\*\*

Total inserts	0.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	1.00

End of Statistics.

GGSCI (raclinux1.gj.com) 81>

GGSCI (raclinux1.gj.com) 81> stats extbi2 reportcdr

Sending STATS request to EXTRACT EXTBI2 ...

Start of Statistics at 2012-11-07 17:01:26.

Output to ./dirdat/3y:

Extracting from TEST5.ACCOUNT to TEST5.ACCOUNT:

\*\*\* Total statistics since 2012-11-07 16:28:24 \*\*\*

Total inserts	1.00
Total updates	1.00
Total beforefs	1.00
Total deletes	0.00
Total discards	0.00
Total operations	3.00

```

*** Daily statistics since 2012-11-07 16:28:24 ***
    Total inserts          1.00
    Total updates          1.00
    Total befores          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       3.00

```

```

*** Hourly statistics since 2012-11-07 17:00:00 ***

    No database operations have been performed.

```

```

*** Latest statistics since 2012-11-07 16:28:24 ***
    Total inserts          1.00
    Total updates          1.00
    Total befores          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       3.00

```

Extracting from TEST5.SEAT\_ASSIGNMENT to TEST5.SEAT\_ASSIGNMENT:

```

*** Total statistics since 2012-11-07 16:28:24 ***
    Total inserts          6.00
    Total updates          1.00
    Total befores          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       8.00

```

```

*** Daily statistics since 2012-11-07 16:28:24 ***
    Total inserts          6.00
    Total updates          1.00
    Total befores          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       8.00

```

```

*** Hourly statistics since 2012-11-07 17:00:00 ***

    No database operations have been performed.

```

```

*** Latest statistics since 2012-11-07 16:28:24 ***
    Total inserts          6.00
    Total updates          1.00
    Total befores          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       8.00

```

End of Statistics.

GGSCI (raclinux1.gj.com) 82>

GGSCI (raclinux1.gj.com) 58> stats repbi2 reportcdr

Sending STATS request to REPLICAT REPBI2 ...

Start of Statistics at 2012-11-07 17:02:03.

Replicating from TEST5.ACCOUNT to TEST5.ACCOUNT:

```

*** Total statistics since 2012-11-07 16:28:24 ***
    Total inserts          1.00
    Total updates          1.00
    Total deletes          0.00
    Total discards         0.00
    Total operations       2.00
    Total CDR conflicts    1.00

```

CDR resolutions succeeded	1.00
CDR UPDATEROWEXISTS conflicts	1.00
*** Daily statistics since 2012-11-07 16:28:24 ***	
Total inserts	1.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	2.00
Total CDR conflicts	1.00
CDR resolutions succeeded	1.00
CDR UPDATEROWEXISTS conflicts	1.00
*** Hourly statistics since 2012-11-07 17:00:00 ***	
No database operations have been performed.	
*** Latest statistics since 2012-11-07 16:28:24 ***	
Total inserts	1.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	2.00
Total CDR conflicts	1.00
CDR resolutions succeeded	1.00
CDR UPDATEROWEXISTS conflicts	1.00
Replicating from TEST5.ACCOUNT to TEST5.ACCOUNT_EX:	
*** Total statistics since 2012-11-07 16:28:24 ***	
Total inserts	0.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	1.00
*** Daily statistics since 2012-11-07 16:28:24 ***	
Total inserts	0.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	1.00
*** Hourly statistics since 2012-11-07 17:00:00 ***	
No database operations have been performed.	
*** Latest statistics since 2012-11-07 16:28:24 ***	
Total inserts	0.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	1.00
Replicating from TEST5.SEAT_ASSIGNMENT to TEST5.SEAT_ASSIGNMENT:	
*** Total statistics since 2012-11-07 16:28:24 ***	
Total inserts	6.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00
Total operations	7.00
Total CDR conflicts	1.00
CDR resolutions succeeded	1.00
CDR UPDATEROWEXISTS conflicts	1.00
*** Daily statistics since 2012-11-07 16:28:24 ***	
Total inserts	6.00
Total updates	1.00
Total deletes	0.00
Total discards	0.00



```

180009 07-NOV-12 SQL COMPUPDA 1403 OCI Error OR TEST5.SEAT_ASSIGNMEN
7 John Smith 07-NOV-12 04.52.31.618956 PM
120 2A 07-NOV-12 7 07-NOV-12 04.40.25.4
120 2A 07-NOV-12 7 Pier Cardin
07-NOV-12 04.52.46.481506 PM

```

```

TE A-01403: no
81803 PM

```

```

data found,
SQL <UPDATE
"TEST5". "SEA
T_ASSIGNMENT
" SET "PASSE
NGER_NAME" =
:a1, "LATEST
_TIMESTAMP"
= :a2 WHERE

```

```

ID PK RES DATE OPTYPE DBERRNUM DBERRMSG TABLNAME
ID CURR PASSENGER_NAME CURR LATEST_TIMESTAMP CURR
FLIGHT_NO CURR SEAT_NO CURR FLIGHT_TI ID BEFORE PASSENGER_NAME BEFOR
LATEST_TIMESTAMP BEF FLIGHT_NO BEFORE SEAT_NO BEFORE FLIGHT_TI ID AFTER
PASSENGER_NAME AFTER LATEST_TIMESTAMP_AFTER
FLIGHT_NO AFTER SEAT_NO AFTER FLIGHT_TI

```

```

"ID" = :b0 A
ND "LATEST T
IMESTAMP" >
:b1>

```

```

Elapsed: 00:00:00.01
16:56:43 SQL> select * from account_ex;

```

```

ID PK RES DATE OPTYPE DBERRNUM DBERRMSG TABLNAME
ACCOUNT_ID CURR ACCOUNT_NAME CURR ACCOUNT_TEL ACCOUNT_AD BALANCE_CURR
ACCOUNT_ID BEFORE ACCOUNT_NAME BEFORE ACCOUNT_TEL ACCOUNT_AD BALANCE_BEFORE ACCOUNT_ID
ACCOUNT_NAME ACCOUNT_TEL ACCOUNT_AD BALANCE

```

```

180007 07-NOV-12 SQL COMPUPDA 1403 TEST5.ACCOUNT
1 Smith 555-555-5555 1234 Some 1100 1 Smith
555-555-5555 1234 Some 1000 1
900

```

```

TE
street nam street nam
e e

```

```

Elapsed: 00:00:00.01
16:57:08 SQL> spool off
16:57:41 SQL> select * from seat_assignment where seat_no='2A';

```

```

ID PASSENGER_NAME LATEST_TIMESTAMP
FLIGHT_NO SEAT_NO FLIGHT_TI
-----
7 John Smith 07-NOV-12 04.52.31.618956
PM 120 2A 07-NOV-
12

```

```

Elapsed: 00:00:00.00
16:57:48 SQL> select * from seat_assignment_ex;

```



