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Oracle GoldenGate 12c: Conflict Detection and Resolution

What is it and how to use it

Bobby Curtis, EMBA

Senior Technical Consultant

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Submit an Abstract: http://www.enkitec.com/e4/submit-an-abstract

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Speaker

Douglasville, Georgia
Senior Technical Consultant
IOUG, RMOUG, GAOUG, RACSIG

ORACLE ACE

Apress AUTHOR

@dbasolved

http://dbasolved.com

bcurtis@enkitec.com
curtisbl@gmail.com

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Agenda

- Oracle GoldenGate 12c Architecture
- Conflict Management
- Examples
- Statistics
- Summary

Oracle GoldenGate 12c

Architecture

Capture: committed transactions are captured (and can be filtered) as they occur by reading the transaction logs. **As of** V.11.2.1, GoldenGate offers two options for capture for Oracle; Classic & Integrated Capture

Trail: stages and queues data for routing.

Pump: distributes data for routing to target(s).

Route: data is compressed, encrypted for routing to target(s).

Delivery: applies data with transaction integrity. **New** with GoldenGate 12c, Integrated Delivery.

Oracle GoldenGate 12c

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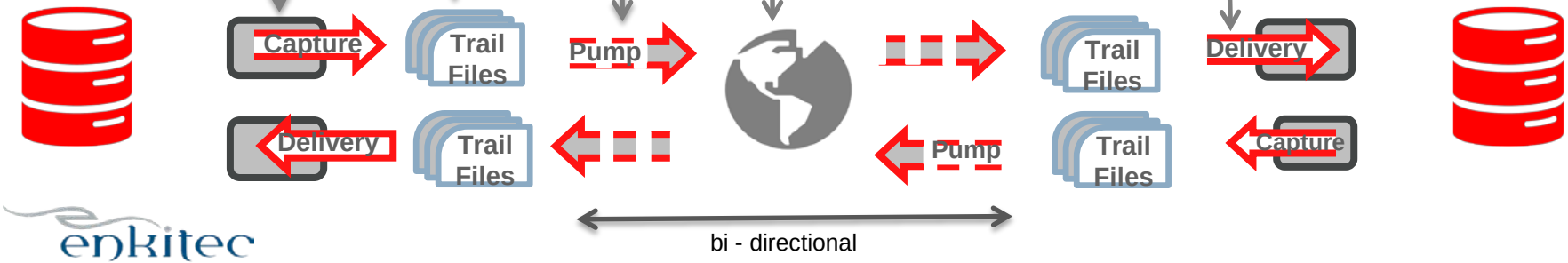


Oracle GoldenGate 12c

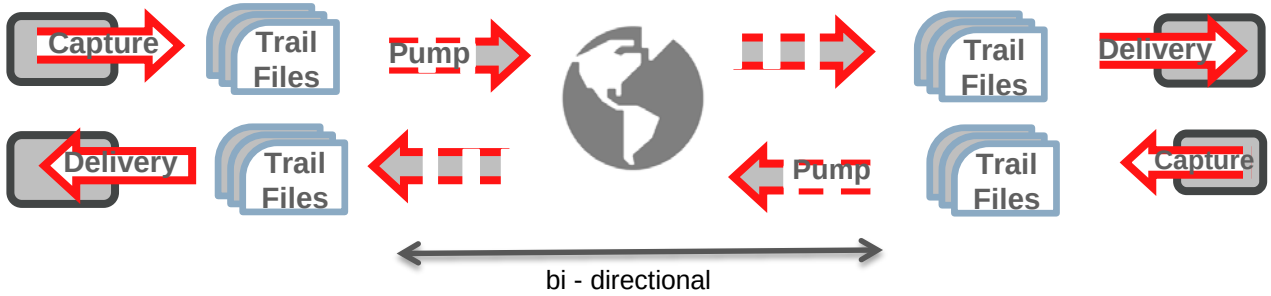
Conflict Management

- All most all Active/Active systems will have a form of conflict
- Conflicts happen due to at least one row is modified on more than one system with difference data
- Common Situations:
  1. Row already exists (Inserts)
  2. Row does not exist (deletes)
  3. Values in row already changed (updates)

Conflict Management

Example - Financial Institution: Active/Active

ACCTINFO
ID (PK)
NAME
ADDRESS
CITY
BALANCE
CHANGE_TS

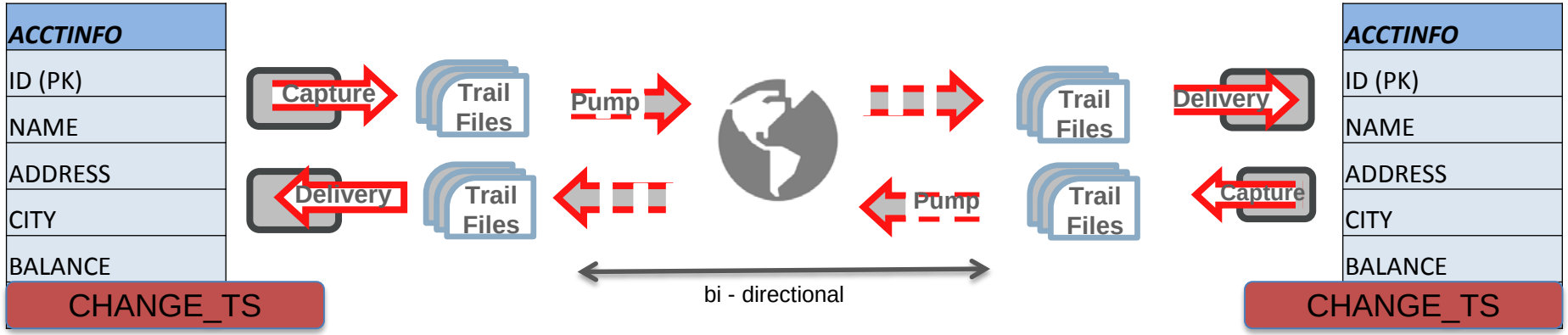


ACCTINFO
ID (PK)
NAME
ADDRESS
CITY
BALANCE
CHANGE_TS

AcctInfo Table: General details related to bank accounts between San Francisco and Atlanta

Conflict Management

Example - Financial Institution: Active/Active



Note: Tables should be able to identify when a record has been changes.

Conflict Management

Conflicts Supported

Basic Resolution for conflicts within GoldenGate environment:

- `INSERT`
  Uniqueness conflict for INSERT
- `UPDATE`
  conflict for “No Data Found” when row exists (before image diffs)
  conflict for “No Data Found” when row does not exists
- `DELETE`
  conflict for “No Data Found” when row exists (before image diffs)
  conflict for “No Data Found” when row does not exists

Conflict Management

Supported Data Types

Data Types that can be compared are supported:

- NUMERIC
- DATE
- TIMESTAMP
- CHAR/NCHAR
- VARCHAR/NVARCHAR

Typically these data types are used with parameters like `COMPARECOLS`, `GETBEFORECOLS`, and in resolution parameters using `RESOLVECONFLICT ([USEMIN] | [USEMAX])`

Conflict Management

Before and After Images

ACCTINFO	*BEFORE*	*AFTER*
ID (PK)	10	10
NAME	32	32
ADDRESS	96 Smith Rd	96 Smith Rd
CITY	Atlanta	Atlanta
BALANCE	1500	1550
CHANGE_TS	2014-10-29 00.00.00.000000 AM	2014-10-30 01.32.05.000000 PM

- Transaction logs are needed for recovery
- Before Images
  - Deletes and Updates
- After Images
  - Inserts and Updates

Note: LogDump utility is useful for reading trail files to identify before/after images

Conflict Management

Requirements - Environment

Full before image of each record

Transactional Data

```
GGSCI> dblogin user <gg user> password <password>
GGSCI> add trandata SFAA.ACCTINFO, allcols
```

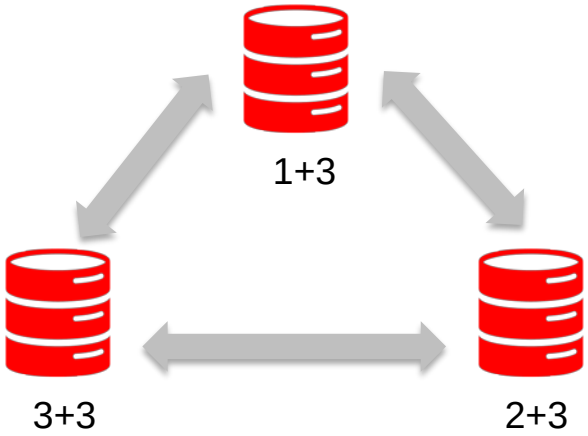
Behind the scene:

```
SQL> ALTER TABLE SFAA.ACCTINFO ADD SUPPLEMENTAL LOG GROUP
GGS_94879(id, name, address, city, balance, change_ts)
ALWAYS;
```

Note: System generated log group names can be located in DBA_LOG_GROUPS

Conflict Management

Requirements - Environment



- Sequences need to be unique on each system
  - Use starting value and increment by number of systems
  - Applies to existing sequences and identity columns

Conflict Management

Requirements - Extract

- `LOGALLSUPCOLS`

  Extract captures before images for UPDATE operations
  Extract captures before images of supplemental logged columns for both UPDATE and DELETE operations

- `GETBEFORECOLS`

  Ensures certain columns are logged
  `GETBEFOREUPDATES` (DB2 only)
  `TABLE` option in extract
  `GETBEFORECOLS (ON UPDATE ALL, ON DELETE ALL)`

Conflict Management

Requirements - Extract

- `TRANSLOGOPTION EXCLUDETAG`
  - Tag supplied to transaction as it is extracted to prevent receiving replicat from trying to send it back to source
    - Classic/Integrated Extract (primary or pump)
  - Tag can be any number/letter [0-9 A-Z]

  Example:
  `TRANSLOGOPTION EXCLUDETAG 0294`

Conflict Management

Requirements - Replicat

- REPERROR

  Used to control how Replicat responds to errors

Default:

```
REPERROR(default, abend)
```

For CDR:

```
REPERROR(default, exception)
REPERROR(default2, [ abend | discard ])
REPERROR(-1, exception)
```

Conflict Management

Requirements - Replicat

- `COMPARECOLS`
  Used by Replicat to detect and resolve update/delete conflicts

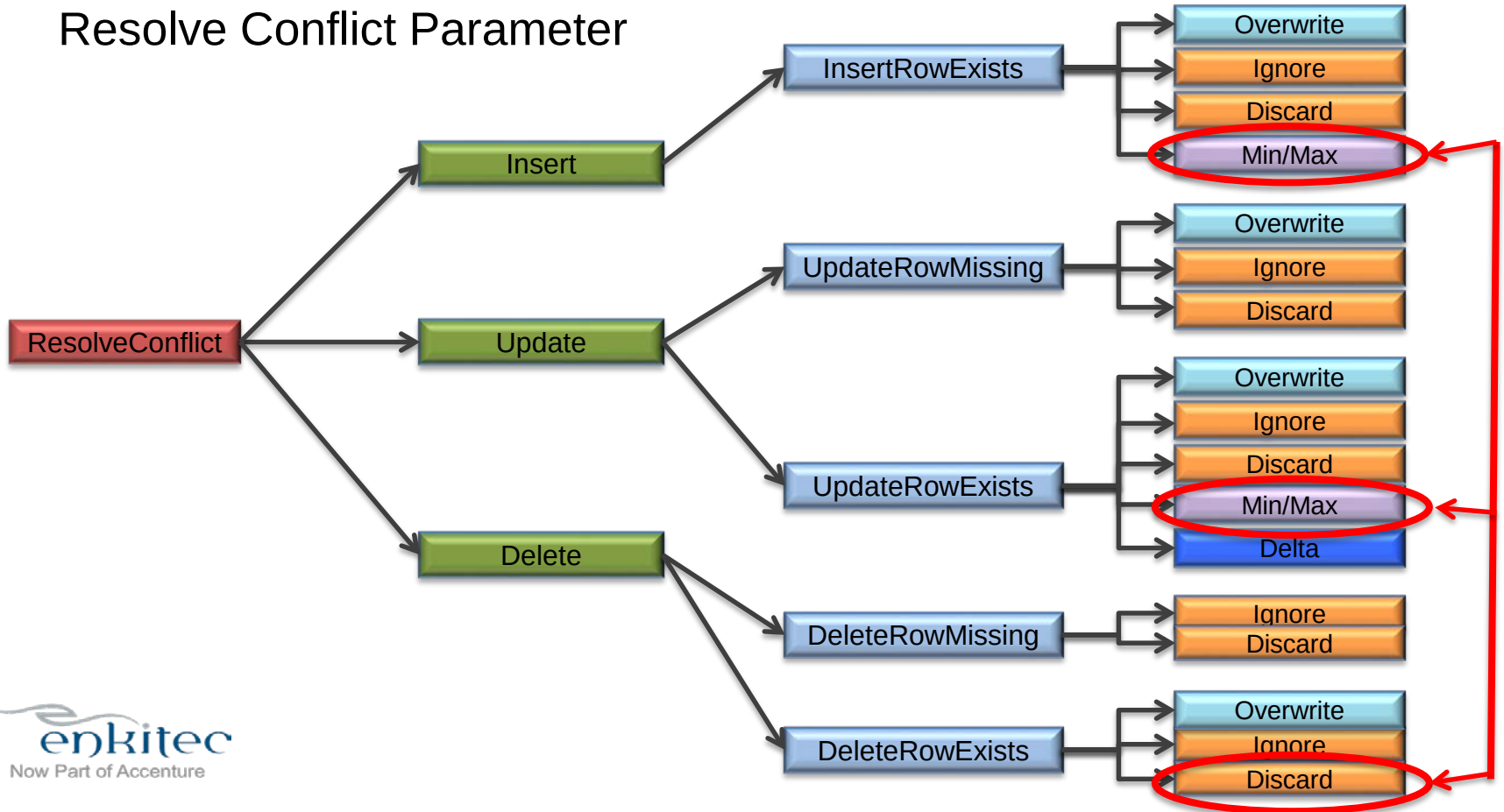
- `RESOLVECONFLICT`
  Used by Replicat in bi-directional/multi-master to handle conflicts for DML operations

Example:

```
MAP SFAA.ACCTINFO, TARGET ATLAA.ACCTINFO,
    COMPARECOLS (ON UPDATE ALL, ON DELETE ALL),
    RESOLVECONFLICT (INSERTROWEXISTS, (DEFAULT,USEMAX(CHANGE_TS)));
```


Oracle GoldenGate 12c

Resolve Conflict Parameter



Conflict Management

Requirements - Exceptions

- Exception Table[s]
  - User defined
  - Used for troubleshooting or handling errors
  - Referenced in REPERR0R and MAP parameters
  - Best if defined through macros

COLUMN_NAME	DATA_TYPE	NULLABLE
EXCEPTION_ID	NUMBER	No
EXCEPTION_TS	TIMESTAMP(6)	Yes
EXCEPTION_STATUS	VARCHAR2(15 BYTE)	Yes
REP_NAME	VARCHAR2(8 BYTE)	Yes
TABLE_NAME	VARCHAR2(61 BYTE)	Yes
BEFORE_AFTER	VARCHAR2(32 BYTE)	Yes
OPTYPE	VARCHAR2(20 BYTE)	Yes
TRANSIND	VARCHAR2(20 BYTE)	Yes
LOGCSN	NUMBER	Yes
FILESEQNO	NUMBER	Yes
FILERBA	NUMBER	Yes
LOGRBA	NUMBER	Yes
LOGPOSITION	NUMBER	Yes
COMMITTIMESTAMP	TIMESTAMP(6)	Yes
ERRTYPE	VARCHAR2(20 BYTE)	Yes
ERRNO	NUMBER	Yes
DBERRMSG	VARCHAR2(4000 BYTE)	Yes

Conflict Management

Beware

BATCHSQL

- Increases apply performance of Replicat by organizing similar SQL statements and apply them at an accelerated rate.
- CDR is not performed in this mode
- Replicat reverts, as needed, to help resolve conflict
  1. GROUPTRANSOPS
  2. Single-transaction mode

Conflict Management

Example 1 – Insert Row Exists

ACCTINFO	SF	ATL
ID	944	**944**
NAME	32	32
ADDRESS	55 5th Street	55 5th Street
CITY	Symrna	Symrna
BALANCE	1100	**1200**
CHANGE_TS	31-OCT-14 10.40.36.000000000 PM	31-OCT-14 10.40.**40**.000000000 PM

INSERTROWEXISTS

- Violates the unique constraint on the target

```
MAP SFAA.ACCTINFO, TARGET ATLAA.ACCTINFO,
COMPARECOLS (ON UPDATE ALL, ON DELETE ALL),
RESOLVECONFLICT (INSERTROWEXISTS, (DEFAULT, USEMAX(CHANGE_TS)));
```

Conflict Management

Example 2 – Update Row Exists

ACCTINFO	BEFORE	AFTER
ID	**944**	944
NAME	32	32
ADDRESS	55 5th Street	55 5th Street
CITY	Symrna	Symrna
BALANCE	**1150**	1100
CHANGE_TS	31-OCT-14 10.40.**36**.000000000 PM	31-OCT-14 10.40.40.000000000 PM

UPDATEROWEXISTS

- Updated row exists on target side
- One or more columns have a before image different from current value

```
MAP SFAA.ACCTINFO, TARGET ATLAA.ACCTINFO,
COMPARECOLS (ON UPDATE ALL, ON DELETE ALL),
RESOLVECONFLICT (UPDATEROWEXISTS, (DEFAULT, USEMIN(CHANGE_TS)));
```

Conflict Management

Example 3 – Delete Row

ACCTINFO	SF	ATL
ID	**944**	null
NAME	32	null
ADDRESS	55 5th Street	null
CITY	Symrna	null
BALANCE	1100	null
CHANGE_TS	31-OCT-14 10.40.36.000000000 PM	null

DELETEROWMISSING

- Deleted row does not exist on target

```
MAP SFAA.ACCTINFO, TARGET ATLAA.ACCTINFO,
COMPARECOLS (ON UPDATE ALL, ON DELETE ALL),
RESOLVECONFLICT (DELETEROWMISSING, (DEFAULT, [ DISCARD | IGNORE ]));
```

Conflict Management

Statistics

```
GGSCI> stats replicat <group name>, reportcdr
```

Replicating from ATLAA.ACCTINFO to SFAA.ACCTINFO:

*** Total statistics since 2014-11-02 00:30:43 ***

Total inserts	719.00
Total updates	93.00
Total deletes	524.00
Total discards	0.00
Total operations	1336.00
Total CDR conflicts	**377.00**
CDR resolutions succeeded	**377.00**
CDR INSERTROWEXISTS conflicts	**257.00**
CDR UPDATEROWEXISTS conflicts	**93.00**
CDR DELETEROWMISSING conflicts	**27.00**

Example Extract Parameter File

```
-- CHECKPARAMS
EXTRACT EXTAA
USERID <gg user>, PASSWORD <pwd>
TRANLOGOPTIONS DBLOGREADER
TRANLOGOPTIONS EXCLUDETAG 0294
SETENV (ORACLE_HOME="/u01/app/oracle/product/12.1.0/db12cr1")
SETENV (ORACLE_SID="oragg")
WARNLONGTRANS 10m, CHECKINTERVAL 5m
LOGALLSUPCOLS
EXTTRAIL ./dirdat/la
WILDCARDRESOLVE IMMEDIATE

TABLE SFAA.ACCTINFO, GETBEFORECOLS(ON UPDATE ALL, ON DELETE ALL);
```

Example Replicat Parameter File

```
-- CHECKPARAMS
REPLICAT REPAB
SETENV (ORACLE_HOME="/u01/app/oracle/product/12.1.0/db12cr1")
SETENV (ORACLE_SID="oragg")
USERID ggate, PASSWORD <pwd>
DISCARDFILE ./dirrpt/REPAB.discard APPEND MEGABYTES 100
REPERROR (default, exception)
REPERROR (default2, abend)
ASSUMETARGETDEFS
WILDCARDRESOLVE IMMEDIATE
INCLUDE ./dirmac/exceptions.mac

MAP ATLAA.ACCTINFO, target SFAA.ACCTINFO,
        COMPARECOLS (ON UPDATE ALL, ON DELETE ALL),
        RESOLVECONFLICT (insertrowexists, (default, usemax(change_ts))),
        RESOLVECONFLICT (updaterowexists, (default, usemin(change_ts))),
        RESOLVECONFLICT (deleterowmissing, (default, discard));

map ATLAA.ACCTINFO, #exception_handler(ggate);
```

Conflict Management

Summary

- Architecture
- Conflict Management
  - Parameters Required
- Examples
  - INSERTROWEXISTING
  - UPDATEROWEXISTING
  - DELETEROWMISSING
- Statistics

Contact Info

@dbasolved

http://dbasolved.com

bcurtis@enkitec.com
curtisbl@gmail.com