Dbvisit
THE SMART ALTERNATIVE

Life of a transaction

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Agenda

- Look at data in redo log
- Simple transaction examples
- And with rollbacks
- And distributed transactions
- Global temporary tables
- Q&A

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- Working with Oracle Database since 8*i*
- Oracle Certified Master
- Principal developer of Dbvisit Replicate
- … which gets its data by parsing Oracle redo logs

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Approach of this session

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- Focus on redo logs
- We look at what Oracle stores on disk for the transactions
- We look at several common examples of transactions

- Oracle keeps more info about transactions than it stores in redo
- But redo is a good start to understand what is going on
- And usually more than enough
- (This is true for many other Oracle stuff)

Changes in redo

- All persistent changes are written to redo
- Undo is written, too – Oracle may need it to recover after instance crash

- Let's look at different transactions
- To see what and where Oracle stores about them

- Oracle 12*c* multitenant used

Transactions overview

- Simple heap table with one index (primary key)
- Insert, then commit
- Add rollback, rollback to savepoint
- Kill session
- Abort instance and crash recovery
- Detached transaction
- Autonomous transaction
- Global transactions

Case #1: insert, commit

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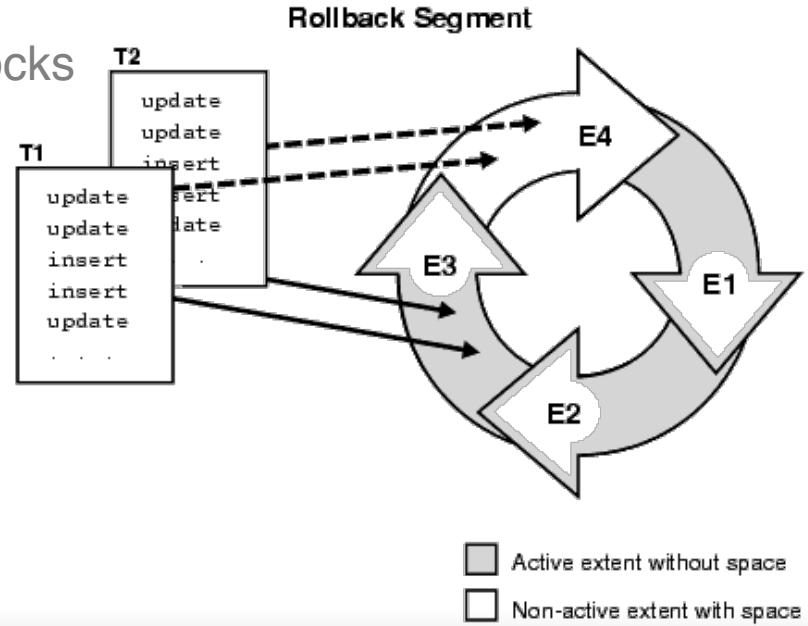
- Start transaction (allocate undo header): 5.2 (undo tbs)
- Allocated in undo/rollback segment
- Undo for the insert: 5.1 (undo tbs)
- Redo for the insert: 11.2 (data tbs)
- (and again 5.1, 10.* for index)
- Session information 5.19/5.20 (not in tbs)
- Commit (undo tbs)

Case #1: insert, commit

- Rollback segment
- Transaction allocates a header
- And then writes undo records to undo blocks



```
CHANGE #1 CON_ID:1 TYP:0 CLS:19 AFN:4 DBA:0x01000090 OBJ:4294967295 SCN:
0x0000.0040fe2b SEQ:1 OP:5.2 ENC:0 RBL:0
ktudh redo: slt: 0x000b sqn: 0x00000d9f flg: 0x0052 siz: 136 fbi: 0
            uba: 0x01000a4b.01b0.1e    pxid:  0x0000.000.00000000
CHANGE #2 CON_ID:1 TYP:0 CLS:20 AFN:4 DBA:0x01000a4b OBJ:4294967295 SCN:
0x0000.0040fe2a SEQ:1 OP:5.1 ENC:0 RBL:0
ktudb redo: siz: 136 spc: 4168 flg: 0x0012 seq: 0x01b0 xid:  0x0002.00b.00000d9f
ktubl redo: slt: 11 rci: 0 opc: 11.1 [objn: 104325 objd: 104325 tsn: 3]
KDO Op code: DRP row dependencies Disabled
itli: 1  ispac: 0  maxfr: 4858
tabn: 0 slot: 0(0x0)
CHANGE #3 CON_ID:3 TYP:0 CLS:1 AFN:10 DBA:0x028168ec OBJ:104325 SCN:0x0000.0040fe9b
SEQ:2 OP:11.2 ENC:0 RBL:0
KDO Op code: IRP row dependencies Disabled
itli: 1  ispac: 0  maxfr: 4858
tabn: 0 slot: 0(0x0) size/delt: 10
fb: --H-FL-- lb: 0x1  cc: 2
null: --
col  0: [ 1]  80
col  1: [ 4]  74 78 74 30
```

Case #1: insert, commit

- Multiple ids indicates where the info is stored:
- CON_ID: 12c multitenant. 1=CDB$ROOT, that's the undo (and redo for internal stuff, too)
- CLS: block class. 1=data block. >16: undo. Odd is undo header, even is undo block. (Each undo segment gets it's own pair of ids.)
- AFN: absolute file number (see v$datafile)
- DBA: data block address

```
CHANGE #4 MEDIA RECOVERY MARKER CON_ID:3 SCN:0x0000.00000000 SEQ:0 OP:5.20 ENC:0
session number   = 33
serial  number   = 9
transaction name =
version 202375424
audit sessionid 4294967295
Client Id =
login   username = SYS

CHANGE #1 CON_ID:1 TYP:0 CLS:19 AFN:4 DBA:0x01000090 OBJ:4294967295 SCN:
0x0000.0040fe9b SEQ:1 OP:5.4 ENC:0 RBL:0
ktucm redo: slt: 0x000b sqn: 0x00000d9f srt: 0 sta: 9 flg: 0x2 ktucf redo: uba:
0x01000a4b.01b0.1f ext: 4 spc: 3936 fbi: 0
```

Case #2: insert, rollback

- Start transaction (allocate undo header): 5.2 (undo tbs)
- Undo for the insert: 5.1 (undo tbs)
- Redo for the insert: 11.2 (data tbs)
- (and again 5.1, 10.* for index)
- Session information 5.19/5.20 (not in tbs)
- Rollback of the insert (and index) – 5.6, 5.11 (5.11 includes undo header)
- Rollback (undo tbs) – the transaction is empty now, so it's really just commit with a flag

```
CHANGE #1 CON_ID:1 TYP:0 CLS:19 AFN:4 DBA:0x01000090 OBJ:4294967295 SCN:
0x0000.004026ee SEQ:1 OP:5.2 ENC:0 RBL:0
ktudh redo: slt: 0x0021 sqn: 0x00000d8f flg: 0x0052 siz: 136 fbi: 0
            uba: 0x01000e9e.01af.34    pxid:  0x0000.000.00000000
CHANGE #2 CON_ID:1 TYP:0 CLS:20 AFN:4 DBA:0x01000e9e OBJ:4294967295 SCN:
0x0000.004026ed SEQ:1 OP:5.1 ENC:0 RBL:0
ktudb redo: siz: 136 spc: 1860 flg: 0x0012 seq: 0x01af xid:  0x0002.021.00000d8f
ktubl redo: slt: 33 rci: 0 opc: 11.1 [objn: 104321 objd: 104321 tsn: 3]
KDO Op code: DRP row dependencies Disabled
itli: 1  ispac: 0  maxfr: 4858
tabn: 0 slot: 0(0x0)
CHANGE #3 CON_ID:3 TYP:0 CLS:1 AFN:10 DBA:0x028168d4 OBJ:104321 SCN:0x0000.0040271a
SEQ:2 OP:11.2 ENC:0 RBL:0
KDO Op code: IRP row dependencies Disabled
itli: 1  ispac: 0  maxfr: 4858
tabn: 0 slot: 0(0x0) size/delt: 11
fb: --H-FL-- lb: 0x1  cc: 2
null: --
col  0: [ 2]  c1 02
col  1: [ 4]  74 78 74 31
```

```
CHANGE #4 MEDIA RECOVERY MARKER CON_ID:3 SCN:0x0000.00000000 SEQ:0 OP:5.20 ENC:0

CHANGE #1 CON_ID:3 TYP:0 CLS:1 AFN:10 DBA:0x028168db OBJ:104322 SCN:0x0000.0040271a
SEQ:1 OP:10.3 ENC:0 RBL:0
index redo (kdxlpu):  purge leaf row (count = 2)
CHANGE #2 CON_ID:1 TYP:0 CLS:20 AFN:4 DBA:0x01000e9e OBJ:4294967295 SCN:
0x0000.0040271a SEQ:2 OP:5.6 ENC:0 RBL:0
ktubu redo: slt: 33 rci: 52 opc: 10.22 objn: 104322 objd: 104322 tsn: 3
Undo type:  Regular undo       Undo type:  User undo done

CHANGE #1 CON_ID:3 TYP:0 CLS:1 AFN:10 DBA:0x028168d4 OBJ:104321 SCN:0x0000.0040271a
OP:11.3
KDO Op code: DRP row dependencies Disabled
CHANGE #2 CON_ID:1 TYP:0 CLS:19 AFN:4 DBA:0x01000090 OBJ:4294967295 SCN:
0x0000.0040271a SEQ:1 OP:5.11 ENC:0 RBL:0
ktubu redo: slt: 33 rci: 0 opc: 11.1 objn: 104321 objd: 104321 tsn: 3
Undo type:  Regular undo       Undo type:  User undo done    Begin trans

CHANGE #1 CON_ID:1 TYP:0 CLS:19 AFN:4 DBA:0x01000090 OBJ:4294967295 SCN:
0x0000.0040271e SEQ:1 OP:5.4 ENC:0 RBL:0
ktucm redo: slt: 0x021 sqn: 0x00000d8f srt: 0 sta: 9 flg: 0x4 rolled back transaction
```

Case #3: insert, savepoint, insert, rollback to savepoint, commit

- Start transaction (allocate undo header): 5.2 (undo tbs)
- Session information 5.19/5.20 (not in tbs)*
- Undo for the insert: 5.1 (undo tbs), Redo for the insert: 11.2 (data tbs)
- *nothing in the redo about the savepoint – that is not written to disk*
- Undo for the insert: 5.1 (undo tbs), Redo for the insert: 11.2 (data tbs)
- Rollback of the insert (and index) – 5.6, 5.11 (5.11 includes undo header)
- Commit (undo tbs)

```
CHANGE #1 CON_ID:3 TYP:0 CLS:1 AFN:10 DBA:0x028168db OBJ:104322 SCN:0x0000.00402721
SEQ:2 OP:10.3 ENC:0 RBL:0
CHANGE #2 CON_ID:1 TYP:0 CLS:34 AFN:4 DBA:0x010006d2 OBJ:4294967295 SCN:
0x0000.00402721 SEQ:4 OP:5.6 ENC:0 RBL:0
CHANGE #1 CON_ID:3 TYP:0 CLS:1 AFN:10 DBA:0x028168d4 OBJ:104321 SCN:0x0000.00402721
SEQ:2 OP:11.3 ENC:0 RBL:0
CHANGE #2 CON_ID:1 TYP:0 CLS:34 AFN:4 DBA:0x0100                    95 SCN:
0x0000.00402721 SEQ:5 OP:5.6 ENC:0 RBL:0

CHANGE #1 CON_ID:1 TYP:0 CLS:33 AFN:4 DBA:0x01000100 OBJ:4294967295 SCN:
0x0000.00402721 SEQ:1 OP:5.4 ENC:0 RBL:0
ktucm redo: slt: 0x0019 sqn: 0x00000d7f srt: 0 sta: 9 flg: 0x2 ktucf redo: uba:
0x010006d2.0260.18 ext: 6 spc: 5146 fbi: 0
```

End of rollback

Case #4: insert, killed session

- Start transaction (allocate undo header): 5.2 (undo tbs)
- Session information 5.19/5.20 (not in tbs)
- Undo for the insert: 5.1 (undo tbs), Redo for the insert: 11.2 (data tbs)
- *nothing in the redo about the kill*
- *it's really just a transaction rollback*
- Rollback of the insert (and index) – 5.6, 5.11
- Rollback transaction (undo tbs)

- Large transactions: delayed block cleanout (done during some other change)

```
CHANGE #1 CON_ID:1 TYP:0 CLS:27 AFN:4 DBA:0x010000d0 OBJ:4294967295 SCN:
0x0000.004026c2 SEQ:1 OP:5.2 ENC:0 RBL:0
CHANGE #2 CON_ID:1 TYP:1 CLS:28 AFN:4 DBA:0x010002e4 OBJ:4294967295 SCN:
0x0000.00402723 SEQ:1 OP:5.1 ENC:0 RBL:0
CHANGE #3 CON_ID:3 TYP:2 CLS:1 AFN:10 DBA:0x028168d4 OBJ:104321 SCN:0x0000.00402722
SEQ:1 OP:11.2 ENC:0 RBL:0
CHANGE #4 MEDIA RECOVERY MARKER CON_ID:3 SCN:0x0000.00000000 SEQ:0 OP:5.2
```

kill session

```
CHANGE #1 CON_ID:3 TYP:0 CLS:1 AFN:10 DBA:0x028168d4 OBJ:104321 SCN:0x0000.00402723
SEQ:1 OP:11.3 ENC:0 RBL:0
KDO Op code: DRP row dependencies Disabled
CHANGE #2 CON_ID:1 TYP:0 CLS:27 AFN:4 DBA:0x010000d0 OBJ:4294967295 SCN:
0x0000.00402723 SEQ:1 OP:5.11 ENC:0 RBL:0

CHANGE #1 CON_ID:1 TYP:0 CLS:27 AFN:4 DBA:0x010000d0 OBJ:4294967295 SCN:
0x0000.00402729 SEQ:1 OP:5.4 ENC:0 RBL:0
ktucm redo: slt: 0x0008 sqn: 0x00000ca7 srt: 0 sta: 9 flg: 0x4
rolled back transaction
```

```
CHANGE #2 CON_ID:3 TYP:2 CLS:1 AFN:8 DBA:0x0041b90a OBJ:8 SCN:0x0000.00402713 SEQ:1
OP:11.5 ENC:0 RBL:0
KTB Redo
op: 0x11  ver: 0x01
compat bit: 4 (post-11) padding: 1
op: F  xid:  0x0004.005.00000b4e    uba: 0x010008d1.0244.20
Block cleanout record, scn:  0x0000.00402717 ver: 0x01 opt: 0x02, entries follow...
  itli: 2  flg: (opt=2 whr=1)  scn: 0x0000.00402713
KDO Op code: URP row dependencies Disabled
  xtype: XA flags: 0x00000000  bdba: 0x0041b90a  hdba: 0x004000c0
itli: 2  ispac: 0  maxfr: 4863
tabn: 2 slot: 13(0xd) flag: 0x6c lock: 2 ckix: 13
ncol: 16 nnew: 16 size: 0
col  0: [ 2]  c1 06
col  1: [ 2]  c1 09
col  2: [ 2]  c1 02
col  3: [ 2]  c1 09
col  4: [ 2]  c1 02
col  5: [ 6]  c5 16 30 31 25 2e
…
```

Case #5: insert, instance abort

- Start transaction (allocate undo header): 5.2 (undo tbs)
- Session information 5.19/5.20 (not in tbs)*
- Undo for the insert: 5.1 (undo tbs), Redo for the insert: 11.2 (data tbs)
- *no rollback of change*
- cleanup of the data block (block cleanout)
- cleanup of undo header
- (was the block written to disk at all?)

- Oracle does as little work as possible

```
CHANGE #1 CON_ID:1 TYP:0 CLS:35 AFN:4 DBA:0x01000110 OBJ:4294967295 SCN:
0x0000.004026c7 SEQ:1 OP:5.2 ENC:0 RBL:0
CHANGE #2 CON_ID:1 TYP:0 CLS:36 AFN:4 DBA:0x010017c2 OBJ:4294967295 SCN:
0x0000.004026c6 SEQ:7 OP:5.1 ENC:0 RBL:0
CHANGE #3 CON_ID:3 TYP:0 CLS:1 AFN:10 DBA:0x028168d4 OBJ:104321 SCN:0x0000.00402729
SEQ:1 OP:11.2 ENC:0 RBL:0
CHANGE #4 MEDIA RECOVERY MARKER CON_ID:3 SCN:0x0000.00000000 SEQ:0 OP:5.19
```

shutdown abort

```
CHANGE #1 CON_ID:3 TYP:0 CLS:1 AFN:10 DBA:0x028168d4 OBJ:104321 SCN:0x0000.0040272d
SEQ:1 OP:4.1 ENC:0 RBL:0
Block cleanout record, scn:  0x0000.00407877 ver: 0x01 opt: 0x01, entries follow...
  itli: 1  flg: (opt=2 whr=4)  scn: 0x0000.00402722

CHANGE #1 CON_ID:1 TYP:0 CLS:35 AFN:4 DBA:0x01000110 OBJ:4294967295 SCN:
0x0000.0040272d SEQ:1 OP:5.8 ENC:0 RBL:0
ktumr redo: slt: 1
```

Case #6: detach a single transaction

- A single session can have multiple independent transactions opened at the same time
- OCIDetachTran()

- Really nothing special – looks like any two independent transacions
- Only sid/serial# show it's the same session

```
CHANGE #1 CON_ID:1 TYP:0 CLS:35 AFN:4 DBA:0x01000110 OBJ:4294967295 SEQ:1 OP:5.2
CHANGE #2 CON_ID:1 TYP:0 CLS:36 AFN:4 DBA:0x010017a6 OBJ:4294967295 SEQ:5 OP:5.1
CHANGE #3 CON_ID:3 TYP:2 CLS:1 AFN:10 DBA:0x028046d6 OBJ:104486 SEQ:1 OP:11.5
CHANGE #4 MEDIA RECOVERY MARKER CON_ID:3 SCN:0x0000.00000000 SEQ:0 OP:5.20 ENC:0
session number   = 272
serial  number   = 871

CHANGE #1 CON_ID:1 TYP:0 CLS:29 AFN:4 DBA:0x010000e0 OBJ:4294967295 SEQ:1 OP:5.2
CHANGE #2 CON_ID:1 TYP:0 CLS:30 AFN:4 DBA:0x0100039e OBJ:4294967295 SEQ:2 OP:5.1
CHANGE #3 CON_ID:3 TYP:0 CLS:1 AFN:10 DBA:0x028046d6 OBJ:104486 SEQ:1 OP:11.5
CHANGE #4 MEDIA RECOVERY MARKER CON_ID:3 SCN:0x0000.00000000 SEQ:0 OP:5.20 ENC:0
session number   = 272
serial  number   = 871

CHANGE #1 CON_ID:1 TYP:0 CLS:35 AFN:4 DBA:0x01000110 OBJ:4294967295 SEQ:1 OP:5.4
ktucm redo: slt: 0x001d sqn: 0x00000c85 srt: 0 sta: 9 flg: 0x2 ktucf redo: uba:
0x010017a6.024d.06 ext: 3 spc: 7070 fbi: 0
CHANGE #1 CON_ID:1 TYP:0 CLS:29 AFN:4 DBA:0x010000e0 OBJ:4294967295 SEQ:1 OP:5.4
ktucm redo: slt: 0x000c sqn: 0x00000b59 srt: 0 sta: 9 flg: 0x2 ktucf redo: uba:
0x0100039e.01c4.0d ext: 2 spc: 5408 fbi: 0
```

Case #7: autonomous transaction

- A single session can have multiple *nested* transactions opened at the same time
- Again, looks like normal transaction in the DB
- pxid is empty

```
REDO RECORD - Thread:1 RBA: 0x0000ef.0000001e.009c LEN: 0x01e8 VLD: 0x01 CON_UID:
2392015286
SCN: 0x0000.00446c2a SUBSCN: 10 08/16/2014 14:17:05
CHANGE #1 CON_ID:1 TYP:0 CLS:27 AFN:4 DBA:0x010000d0 OBJ:4294967295 SCN:
0x0000.00446bca SEQ:1 OP:5.2 ENC:0 RBL:0
ktudh redo: slt: 0x0007 sqn: 0x00000ce5 flg: 0x0052 siz: 136 fbi: 0
            uba: 0x010002f1.028b.09    pxid:  0x0000.000.00000000        pdbid:
2392015286

REDO RECORD - Thread:1 RBA: 0x0000ef.00000020.0010 LEN: 0x0218 VLD: 0x05 CON_UID:
2392015286
SCN: 0x0000.00446c2c SUBSCN:  1 08/16/2014 14:17:05
CHANGE #1 CON_ID:1 TYP:0 CLS:33 AFN:4 DBA:0x01000100 OBJ:4294967295 SCN:
0x0000.00446bf2 SEQ:1 OP:5.2 ENC:0 RBL:0
ktudh redo: slt: 0x000e sqn: 0x00000db3 flg: 0x0052 siz: 136 fbi: 0
            uba: 0x01000aeb.026a.29    pxid:  0x0000.000.00000000        pdbid:
2392015286

(rest omitted for brevity)
```

Case #8: distributed transaction

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- Two sessions work on branches of the same transaction
- Two-phase commit
- Shows as single transaction in database, but with two undo headers, two session information
- Usually application adds more transaction info, that's stored, too (external name, internal name)

```
CHANGE #1 CON_ID:1 TYP:0 CLS:25 AFN:4 DBA:0x010000c0 OBJ:4294967295 SEQ:1 OP:5.2
ktudh redo: slt: 0x000c sqn: 0x00000d24 flg: 0x0052 siz: 288 fbi: 0
            uba: 0x0100083e.0244.34    pxid:  0x0000.000.00000000
CHANGE #2 CON_ID:1 TYP:0 CLS:26 AFN:4 DBA:0x0100083e OBJ:4294967295 SEQ:4 OP:5.1
ktudb redo: siz: 288 spc: 400 flg: 0x1012 seq: 0x0244 rec: 0x34
            xid:  0x0005.00c.00000d24
CHANGE #3 CON_ID:3 TYP:0 CLS:1 AFN:10 DBA:0x028046d6 OBJ:104486 SEQ:1 OP:11.5
CHANGE #4 MEDIA RECOVERY MARKER CON_ID:3 SCN:0x0000.00000000 SEQ:0 OP:5.20 ENC:0
session number   = 44, serial  number   = 2211

CHANGE #1 CON_ID:1 TYP:0 CLS:25 AFN:4 DBA:0x010000c0 OBJ:4294967295 SEQ:1 OP:5.2
ktudh redo: slt: 0x000c sqn: 0x00000000 flg: 0x000a siz: 132 fbi: 0
            uba: 0x0100083f.0244.01    pxid:  0x0000.000.00000000
CHANGE #2 CON_ID:1 TYP:1 CLS:26 AFN:4 DBA:0x0100083f OBJ:4294967295 SEQ:1 OP:5.1
ktudb redo: siz: 132 spc: 110 flg: 0x100a seq: 0x0244 rec: 0x01
            xid:  0x0005.00c.00000d24
CHANGE #3 CON_ID:3 TYP:0 CLS:1 AFN:10 DBA:0x028046d6 OBJ:104486 SEQ:1 OP:11.5
CHANGE #4 MEDIA RECOVERY MARKER CON_ID:3 SCN:0x0000.00000000 SEQ:0 OP:5.20 ENC:0
session number   = 264, serial  number   = 2957
```

```
CHANGE #1 CON_ID:1 TYP:0 CLS:26 AFN:4 DBA:0x0100083f OBJ:4294967295 SCN:
0x0000.0044f63b SEQ:1 OP:5.1 ENC:0 RBL:0
ktudb redo: siz: 292 spc: 7930 flg: 0x1024 seq: 0x0244 rec: 0x03
            xid:  0x0005.00c.00000d24
Dumping kcocv element #2 size 256:
7F744FE8B060 01000100 00000000 00000904 6D656401  [.............dem]
7F744FE8B070 6E78746F 6D656420 0000326F 00000000  [otxn demo2......]

CHANGE #1 CON_ID:1 TYP:0 CLS:25 AFN:4 DBA:0x010000c0 OBJ:4294967295 SCN:
0x0000.0044f63c SEQ:1 OP:5.12 ENC:0 RBL:0
ktust redo: slt: 12 sqn: 0x00000d24 sta: 2 cfl: 0x22

CHANGE #1 CON_ID:1 TYP:0 CLS:25 AFN:4 DBA:0x010000c0 OBJ:4294967295 SCN:
0x0000.0044f643 SEQ:1 OP:5.4 ENC:0 RBL:0
ktucm redo: slt: 0x000c sqn: 0x00000d24 srt: 0 sta: 3 flg: 0x0
```

Case #9: discrete transaction

- This is really Oracle 7 (1993), then happily forgotten
- alter system set "_discrete_transactions_enabled"=TRUE scope=spfile;
- dbms_transaction.begin_discrete_transaction;

- Does nothing today… the redo looks the same, even the restrictions for discrete transaction don't apply anymore

Case #10: GTT (<12c)

- set temp_undo_enabled=FALSE (default) or use <12c
- insert - select
- there is no data redo written at all
- but undo is written as usual
- (this is array insert, so undo is QMD (bulk delete) instead of the DRP we saw before - this is not GTT specific)

```
CHANGE #1 CON_ID:0 TYP:0 CLS:31 AFN:4 DBA:0x010000f0 SCN:0x0000.008cf8f5 SEQ:1 OP:5.2
ktudh redo: slt: 0x000f sqn: 0x00001d72 flg: 0x0012 siz: 648 fbi: 0
            uba: 0x0100065f.06ce.04    pxid:  0x0000.000.00000000
CHANGE #2 CON_ID:0 TYP:0 CLS:32 AFN:4 DBA:0x0100065f SCN:0x0000.008cf8f4 SEQ:1 OP:5.1
ktudb redo: siz: 648 spc: 6544 flg: 0x0012 seq: 0x06ce rec: 0x04
            xid:  0x0008.00f.00001d72
ktubl redo: slt: 15 rci: 0 opc: 11.1 [objn: 117105 objd: 4213376 tsn: 3]
Undo type:  Regular undo        Begin trans    Last buffer split:  No
Temp Object:  Yes
KDO undo record:
KTB Redo
op: 0x03  ver: 0x01
KDO Op code: QMD row dependencies Disabled
  xtype: XA flags: 0x00000000  bdba: 0x00404a81  hdba: 0x00404a80
itli: 1  ispac: 0  maxfr: 4863
tabn: 0 lock: 0 nrow: 255
slot[0]: 0
slot[1]: 1
CHANGE #1 CON_ID:0 TYP:0 CLS:31 AFN:4 DBA:0x010000f0 SCN:0x0000.008cf929 SEQ:1 OP:5.4
ktucm redo: slt: 0x000f sqn: 0x00001d72 srt: 0 sta: 9 flg: 0x2 ktucf redo: uba:
0x0100065f.06ce.08 ext: 2 spc: 4026 fbi: 0
```

Case #11: GTT (12c)

- set temp_undo_enabled=TRUE
- insert - select
- there is no data redo written at all
- undo is written to temp, so it is NOT written to redo
- so virtually no redo generated
- but it still is a transaction, so Oracle needs to keep transaction-related undo

```
CHANGE #1 CON_ID:0 TYP:0 CLS:25 AFN:4 DBA:0x010000c0 SCN:0x0000.008cfed3 OP:5.2
ktudh redo: slt: 0x0013 sqn: 0x00001f49 flg: 0x0011 siz: 80 fbi: 0
            uba: 0x01004eae.0799.08    pxid:  0x0000.000.00000000
CHANGE #2 CON_ID:0 TYP:0 CLS:26 AFN:4 DBA:0x01004eae SCN:0x0000.008cfed2 OP:5.1
ktudb redo: siz: 80 spc: 6560 flg: 0x0010 seq: 0x0799 rec: 0x08
            xid:  0x0005.013.00001f49
ktubl redo: slt: 19 rci: 0 opc: 5.7 [objn: 0 objd: 0 tsn: 0]
Undo type:  Regular undo        Begin trans    Last buffer split:  No
Temp Object:  No
Tablespace Undo:  No
CHANGE #3 MEDIA RECOVERY MARKER CON_ID:0 SCN:0x0000.00000000 OP:5.20
session number   = 53
serial  number   = 53
CHANGE #1 CON_ID:0 TYP:0 CLS:25 AFN:4 DBA:0x010000c0 SCN:0x0000.008cff8e OP:5.4
ktucm redo: slt: 0x0013 sqn: 0x00001f49 srt: 0 sta: 9 flg: 0x2 ktucf redo: uba:
0x01004eae.0799.08 ext: 4 spc: 6478 fbi: 0
```

Do try this at home

```
drop table scott.gt;
alter system set temp_undo_enabled=true;
alter system switch logfile;
create global temporary table scott.gt (v varchar2(4000), i number) on
   commit delete rows;

insert into scott.gt select level, level from dual connect by level<=1000;
commit;

column member new_value fname
select member from v$logfile join v$log using (group#) where v
   $log.status='CURRENT' and rownum =1;
alter system dump logfile '&fname';
oradebug setmypid
oradebug tracefile_name
```

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