Recovery Log Notes

Gus Björklund, Progress

Dan Foreman, Bravepoint

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Abstract

The OpenEdge RDBMS uses two kinds of transaction logs. These form the basis for a variety of important features like transaction rollback, crash recovery, replication, media failure recovery and so on.

In this talk we will open the bonnet on the topic of After-Image Journaling and Recovery Log Records (aka "Notes").

We will describe what they are, what they do, and how to monitor them. But most importantly, we will show you some practical applications of your newfound understanding of Notes.

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BRAVEPOINT

who uses after-imaging ?

who uses after-imaging ?
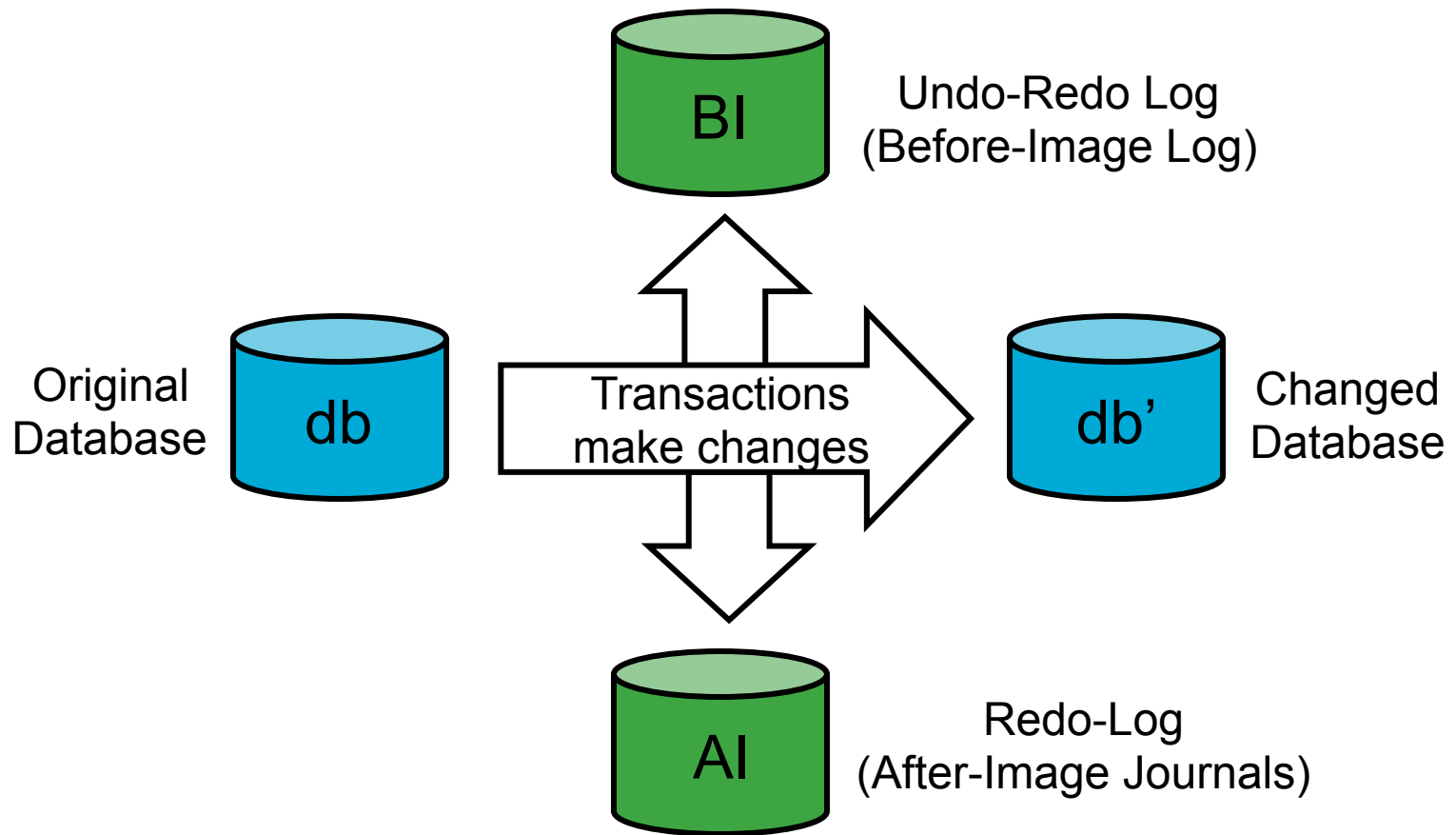
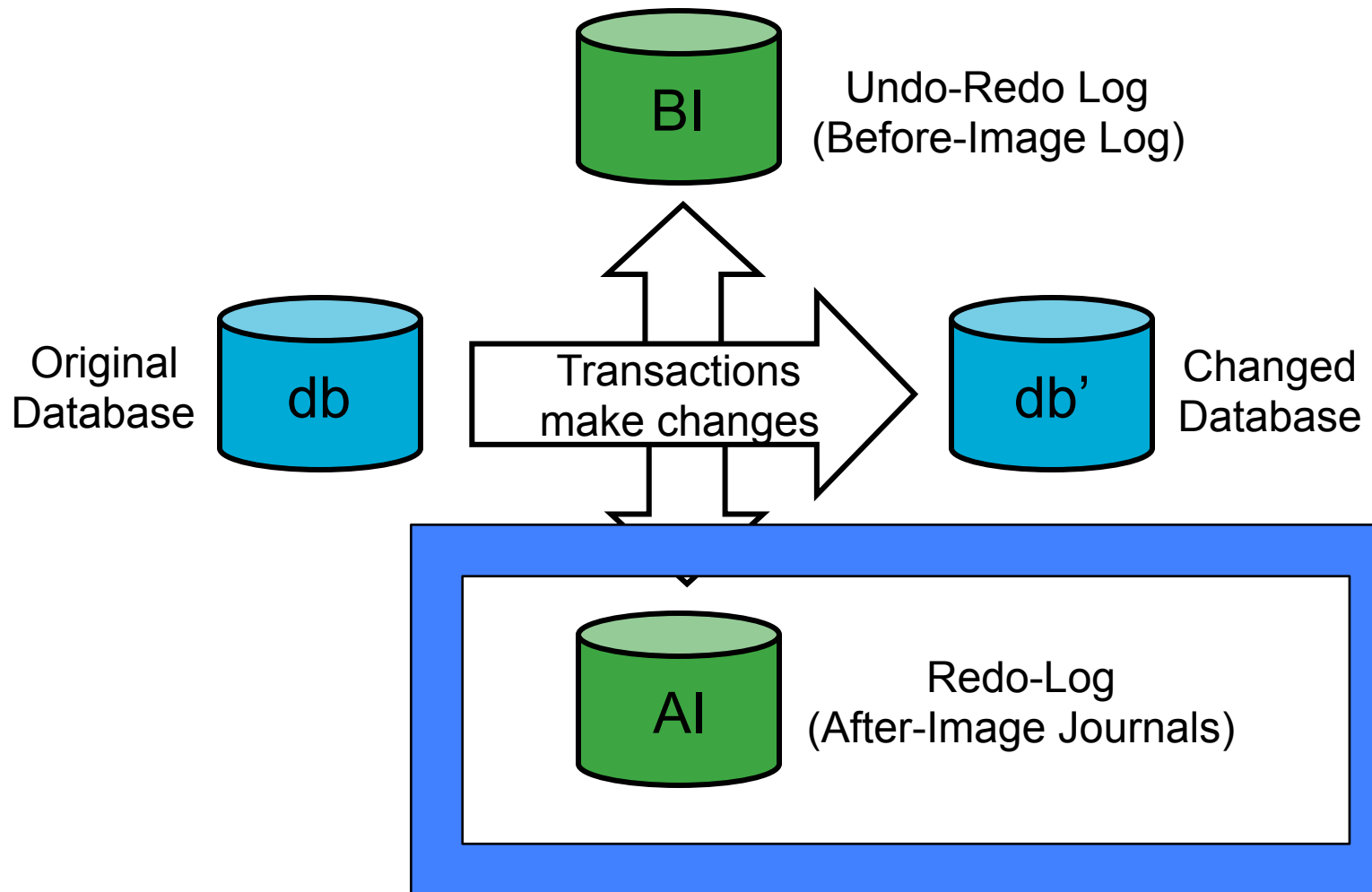who uses the after-imaging daemon ?

disaster strikes ! (ap photo)
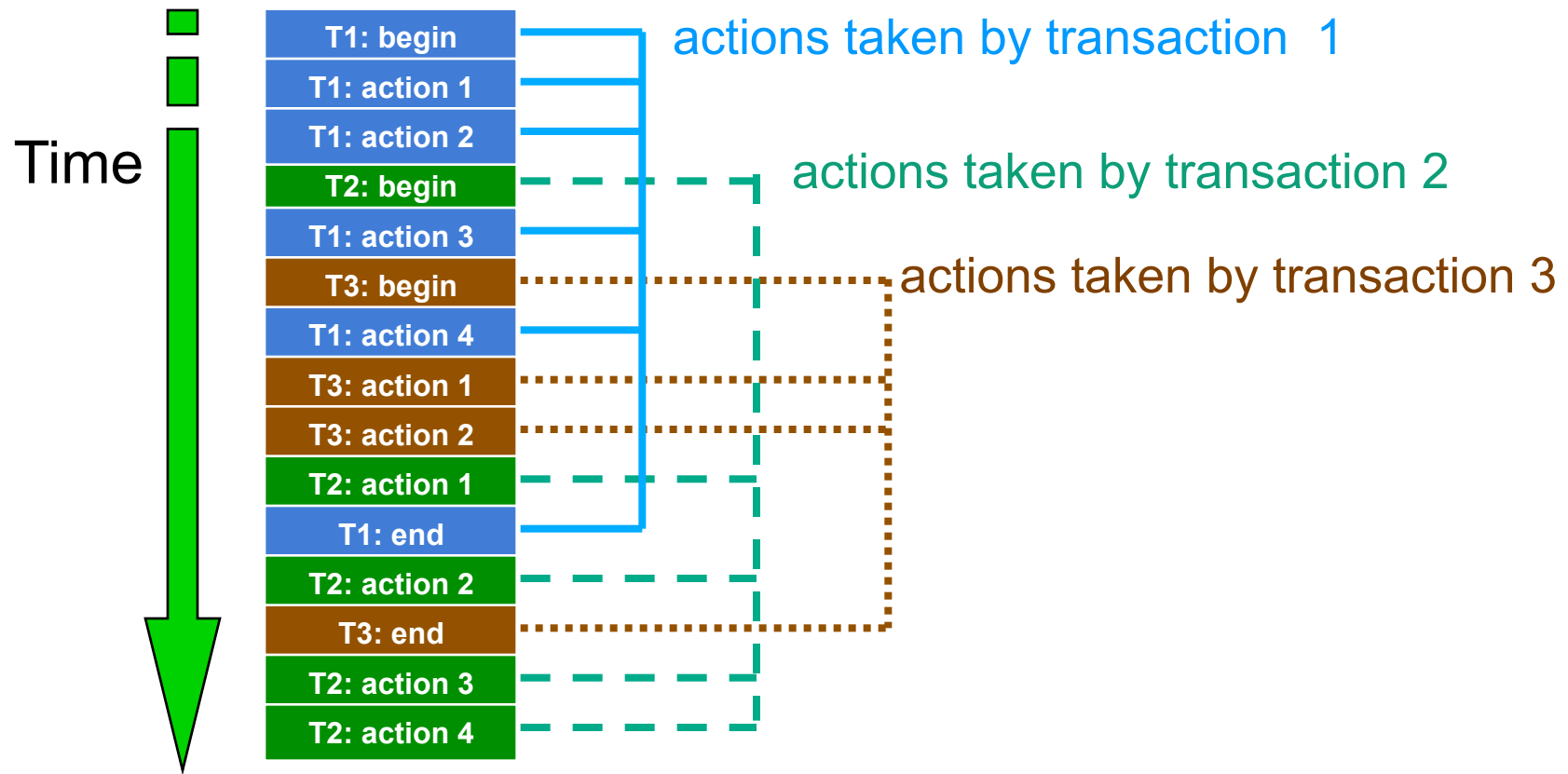
transaction logging to the rescue!

Two transaction logs

BI — Undo-Redo Log (Before-Image Log)

db — Original Database

Transactions make changes

db' — Changed Database

AI — Redo-Log (After-Image Journals)

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Two transaction logs

Original Database — db

Transactions make changes

db' — Changed Database

BI — Undo-Redo Log (Before-Image Log)

AI — Redo-Log (After-Image Journals)

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transaction log records (aka "notes")

Time

T1: begin	actions taken by transaction 1
T1: action 1	
T1: action 2	
T2: begin	actions taken by transaction 2
T1: action 3	
T3: begin	actions taken by transaction 3
T1: action 4	
T3: action 1	
T3: action 2	
T2: action 1	
T1: end	
T2: action 2	
T3: end	
T2: action 3	
T2: action 4	

notes form a complete history of everything

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Over to Dan

log records (notes)

- generated for <u>every</u> change to database.
- each describes exactly one change to one database block.
  - almost - there are log records that describe changes to purely memory-resident data structures like the transaction table
- apply only to specific version number of block
- some operations require more than one change
  - index splits, multi-block records
- written in same order changes are executed.
- notes from concurrent transactions are mixed together.

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Undo-Redo (aka Before-Image) Log Records

- **each log record (or "note") contains:**
  - transaction number
  - data area number
  - database block number (its dbkey)
  - database block's version number
  - note type – specifies what operation to perform

  - any information needed to undo the operation
    - in case we have to roll back

  - any information needed to redo the operation
    - in case we lose the result before writing to disk

Redo (aka After-Image) Log Records

- each log record (or "note") contains:
  - transaction number
  - data area number
  - database block number (its dbkey)
  - database block's version number
  - note type – specifies what operation to perform

  - any information needed to undo the operation
    - in case we have to roll back

  - any information needed to redo the operation
    - in case we lose the result before writing to disk

Did you notice anything about those two kinds of notes (bi and ai) ????

Special cases

- **After-image journalling**

  - AI extent switches generate notes

- **Replication**

  - causes "parenthesis" notes to bracket logical operations

- **JTA (Java Transaction API)**

  - can cause bracketing notes

- **Auditing**

  - generates extra notes for creating audit records and their index entries

- **TDE (Transparent Data Encryption)**

  - generates extra notes when encryption policies set or changed

- **etc.**

The So-Called "Before-Image" File Is NOT

- Does not really contain before images

- It has a record of all *recent* database changes

- The data are sufficient to:

  - Undo or roll back transactions

  - Perform crash recovery

BRAVEPOINT

The So-Called "After-Image" File Is NOT

- Does not really contain after images

- It has a record of *all* database changes after a backup

  - this can be called time 0

- The data are sufficient to:

  - Recreate everything that happened since time 0

  - Recreate the before-image log

  - Undo or roll back transactions

  - Perform crash recovery

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why?

Over to Gus

because

- What if someone unplugs server to plug in vacuum cleaner?

- What if we want to undo (roll back) ?

- What if we make several more changes and only one block of a fragmented record chain is written to disk to make room in the buffer pool ?

- What if our ship runs aground and falls down

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because

- What if someone unplugs server to plug in vacuum cleaner?

  - the change will be lost

- What if we want to undo (rollback) ?

  - we don't know the old value or how to undo

- What if we make several more changes and only one block of a fragmented record chain is written to disk to make room in the buffer pool ?

  - the database will be corrupted

- What if our ship runs aground and falls down

  - the database will disappear completely

these are all bad things (tm)

BRAVEPOINT

scanning after-image journals

over to Dan

Questions

- When was an 'evil' transaction started?
  Then i know how far to Roll Forward

- What transactions were active during an online backup?
  those would be reversed if the backup was restored

- What transactions were active during a quiet point?
  those would be reversed if the backup was restored

- What userid is causing the BI file to grow?
  and why?

- Is my database code crappy?

- Why did lock table overflow?
  Who caused it?

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rfutil aimage scan

Prerequisites:

- After Imaging is enabled

- Use the "verbose" option to get exquisite detail

- aimage scan verbose is VERY verbose.
  you might use up all of your disk space
  and cause a disaster

- Prior to V10.1A the transaction index rolls over at
  32767 in the report

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How to do it

```
prostrct add foo ai.st
rfutil foo -C mark
rfutil foo -C aimage begin

.... change stuff in database

rfutil bar -C aimage scan verbose \
        -a longaimagefilename.a1 \
        > aiscanreport.txt
```

NOTE: cannot do this with live ai extents, only archived ones or copies

dbname "bar" does not matter here.

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what do you get?

```
Trid: 17 dbkey = 0   update counter = 0 (12530)
Trid: 18 Wed Jan 27 16:54:06 2010. (2598)
Trid: 18 User Id: Dan (12531)
Trid: 18 code = RL_TBGN version = 1 (12528)
Trid: 18 dbkey = 0   update counter = 0 (12530)
Trid: 18 code = RL_RMCR version = 2 (12528)
Trid: 18 area = 7   dbkey = 480    update counter = 5 (12529)
Trid: 18 code = RL_CXINS version = 2 (12528)
Trid: 18 area = 9   dbkey = 28    update counter = 24 (12529)
Trid: 18 code = RL_CXINS version = 2 (12528)
Trid: 18 area = 9   dbkey = 36    update counter = 24 (12529)
Trid: 18 code = RL_CXINS version = 2 (12528)
Trid: 18 area = 9   dbkey = 44    update counter = 24 (12529)
Trid: 18 Wed Jan 27 16:54:06 2010. (2598)
Trid: 18 code = RL_TEND version = 1 (12528)
Trid: 18 dbkey = 0   update counter = 0 (12530)
Trid: 19 Wed Jan 27 16:54:06 2010. (2598
```

over to dan & gus

Now, let see some 4GL examples

and their patterns

a few are from George Potemkin

first, we play with customers

example 0

```
DO TRANSACTION:
  FIND Customer 1 NO-LOCK NO-ERROR.
END.
```

example 1

```
DO TRANSACTION:
  FIND Customer 1 EXCLUSIVE-LOCK NO-ERROR.
END.
```

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example 2

```
DO TRANSACTION:
   CREATE Customer.
   DELETE Customer.
END.
```

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```
Trid: 27955 Thu Jun  5 14:25:13 2014. (2598)
Trid: 27955 User Id: gus (12531)
Trid: 27955 code = RL_TBGN version = 1 (12528)
Trid: 27955 dbkey = 0  update counter = 0 (12530)
Trid: 27955 code = RL_SEINC version = 1 (12528)
Trid: 27955 area = 6   dbkey = 96   update counter = 27 (12529)
Trid: 27955 code = RL_TMSAVE version = 2 (12528)
Trid: 27955 dbkey = 0  update counter = 0 (12530)
Trid: 27955 code = RL_RMCR version = 2 (12528)
Trid: 27955 area = 9   dbkey = 1344   update counter = 22 (12529)
Trid: 27955 code = RL_CXINS version = 2 (12528)
Trid: 27955 area = 10   dbkey = 640   update counter = 220 (12529)
Trid: 27955 code = RL_CXREM version = 2 (12528)
Trid: 27955 area = 10   dbkey = 640   update counter = 221 (12529)
Trid: 27955 code = RL_RMDEL version = 2 (12528)
Trid: 27955 area = 9   dbkey = 1344   update counter = 23 (12529)
Trid: 27955 code = RL_RMCR version = 2 (12528)
Trid: 27955 area = 9   dbkey = 1344   update counter = 24 (12529)
Trid: 27955 Thu Jun  5 14:25:13 2014. (2598)
Trid: 27955 code = RL_TEND version = 1 (12528)
Trid: 27955 dbkey = 0  update counter = 0 (12530)
```

example 3

```
DISABLE TRIGGERS FOR LOAD OF Customer.
DO TRANSACTION:
  CREATE Customer.
  DELETE Customer.
END.
```

example 4

```
DEF VAR N AS INT NO-UNDO.

DISABLE TRIGGERS FOR LOAD OF Customer.
DO TRANSACTION:
  CREATE Customer.
  N = RECID(Customer).
  DELETE Customer.
END.
```

Trid: 27957 Thu Jun 5 14:25:13 2014. (2598)
Trid: 27957 User Id: gus (12531)
Trid: 27957 code = RL_TBGN version = 1 (12528)
Trid: 27957 dbkey = 0 update counter = 0 (12530)
Trid: 27957 code = RL_RMDEL version = 2 (12528)
Trid: 27957 area = 9   dbkey = 1344   update counter = 25 (12529)
Trid: 27957 code = RL_RMCR version = 2 (12528)
Trid: 27957 area = 9   dbkey = 1344   update counter = 26 (12529)
Trid: 27957 code = RL_RMDEL version = 2 (12528)
Trid: 27957 area = 9   dbkey = 1344   update counter = 27 (12529)
Trid: 27957 code = RL_RMCR version = 2 (12528)
Trid: 27957 area = 9   dbkey = 1344   update counter = 28 (12529)
Trid: 27957 Thu Jun 5 14:25:13 2014. (2598)
Trid: 27957 code = RL_TEND version = 1 (12528)
Trid: 27957 dbkey = 0 update counter = 0 (12530)

then, we play with orders

example 5

```
create order.
assign
    custnum = 1
    orderdate = today
    ordernum = time
    shipdate = today + 1
    .
```

Trid: 27985 code = RL_TBGN version = 1 (12528)
Trid: 27985 dbkey = 0 update counter = 0 (12530)

Trid: 27985 code = RL_SEINC version = 1 (12528)
Trid: 27985 area = 6   dbkey = 96   update counter = 33 (12529)
Trid: 27985 code = RL_TMSAVE version = 2 (12528)
Trid: 27985 dbkey = 0 update counter = 0 (12530)
Trid: 27985 code = RL_RMCR version = 2 (12528)
Trid: 27985 area = 11   dbkey = 20544   update counter = 14 (12529)
Trid: 27985 code = RL_CXINS version = 2 (12528)
Trid: 27985 area = 11   dbkey = 4768   update counter = 354 (12529)

part 1 ...

Trid: 27985 code = RL_CXREM version = 2 (12528)
Trid: 27985 area = 11   dbkey = 4768   update counter = 355 (12529)
Trid: 27985 code = RL_CXINS version = 2 (12528)
Trid: 27985 area = 11   dbkey = 864   update counter = 68 (12529)
Trid: 27985 code = RL_CXINS version = 2 (12528)
Trid: 27985 area = 11   dbkey = 4768   update counter = 356 (12529)
Trid: 27985 code = RL_CXINS version = 2 (12528)
Trid: 27985 area = 11   dbkey = 3104   update counter = 474 (12529)
Trid: 27985 code = RL_CXINS version = 2 (12528)
Trid: 27985 area = 11   dbkey = 384   update counter = 3956 (12529)
Trid: 27985 code = RL_CXINS version = 2 (12528)
Trid: 27985 area = 11   dbkey = 4704   update counter = 215 (12529)
Trid: 27985 code = RL_RMCHG version = 2 (12528)
Trid: 27985 area = 11   dbkey = 20544   update counter = 15 (12529)

Trid: 27985 Fri Jun 6 13:44:12 2014. (2598)
Trid: 27985 code = RL_TEND version = 1 (12528)

part 2

example 6

```
disable triggers for load of order.

create order.
assign
    custnum = 1
    orderdate = today
    ordernum = time
    shipdate = today + 1.
```

BRAVEPOINT

Trid: 27987 User Id: gus (12531)
Trid: 27987 code = RL_TBGN version = 1 (12528)
Trid: 27987 dbkey = 0 update counter = 0 (12530)
Trid: 27987 code = RL_RMCR version = 2 (12528)
Trid: 27987 area = 11   dbkey = 20544   update counter = 18 (12529)
Trid: 27987 code = RL_CXINS version = 2 (12528)
Trid: 27987 area = 11   dbkey = 864   update counter = 70 (12529)
Trid: 27987 code = RL_CXINS version = 2 (12528)
Trid: 27987 area = 11   dbkey = 4768   update counter = 360 (12529)
Trid: 27987 code = RL_CXINS version = 2 (12528)
Trid: 27987 area = 11   dbkey = 3104   update counter = 476 (12529)
Trid: 27987 code = RL_CXINS version = 2 (12528)
Trid: 27987 area = 11   dbkey = 384   update counter = 3958 (12529)
Trid: 27987 code = RL_CXINS version = 2 (12528)
Trid: 27987 area = 11   dbkey = 4704   update counter = 217 (12529)
Trid: 27987 Fri Jun 6 14:05:17 2014. (2598)
Trid: 27987 code = RL_TEND version = 1 (12528)
Trid: 27987 dbkey = 0 update counter = 0 (12530)

example 7

```
disable triggers for load of order.

create order.
assign
    custnum = 1
    orderdate = today
    ordernum = time.
    shipdate = today + 1.
```

BRAVEPOINT

example 7

```
disable triggers for load of order.
create order.
assign
    custnum = 1
    orderdate = today
    ordernum = time.
    shipdate = today + 1.
```

PROGRESS

BRAVEPOINT

Trid: 27988 Fri Jun 6 14:13:25 2014. (2598)
Trid: 27988 User Id: gus (12531)
Trid: 27988 code = RL_TBGN version = 1 (12528)
Trid: 27988 dbkey = 0 update counter = 0 (12530)
Trid: 27988 code = RL_RMCR version = 2 (12528)
Trid: 27988 area = 11   dbkey = 20544   update counter = 19 (12529)
Trid: 27988 code = RL_CXINS version = 2 (12528)
Trid: 27988 area = 11   dbkey = 864   update counter = 71 (12529)
Trid: 27988 code = RL_CXINS version = 2 (12528)
Trid: 27988 area = 11   dbkey = 4768   update counter = 361 (12529)
Trid: 27988 code = RL_CXINS version = 2 (12528)
Trid: 27988 area = 11   dbkey = 3104   update counter = 477 (12529)
Trid: 27988 code = RL_CXINS version = 2 (12528)
Trid: 27988 area = 11   dbkey = 384   update counter = 3959 (12529)
Trid: 27988 code = RL_CXINS version = 2 (12528)
Trid: 27988 area = 11   dbkey = 4704   update counter = 218 (12529)
Trid: 27988 code = RL_RMCHG version = 2 (12528)
Trid: 27988 area = 11   dbkey = 20544   update counter = 20 (12529)
Trid: 27988 Fri Jun 6 14:13:25 2014. (2598)
Trid: 27988 code = RL_TEND version = 1 (12528)
Trid: 27988 dbkey = 0 update counter = 0 (12530)

example 8 (… serendipity)

```
find order 1.

misc-info = fill("abc", 6000).

display record-length (order).
```

PROGRESS

BRAVEPOINT

```
Trid: 0 code = RL_INMEM version = 3 (12528)
Trid: 0 dbkey = 0  update counter = 0 (12530)
Trid: 0 code = RL_LSTMOD version = 2 (12528)
Trid: 0 area = 6   dbkey = 32   update counter = 31 (12529)
Trid: 15 Fri Jun  6 15:27:29 2014. (2598)
Trid: 15 User Id: gus (12531)
Trid: 15 code = RL_TBGN version = 1 (12528)
Trid: 15 dbkey = 0  update counter = 0 (12530)
Trid: 15 code = RL_RMDEL version = 2 (12528)
Trid: 15 area = 8   dbkey = 3136   update counter = 19 (12529)
Trid: 15 code = RL_RMCR version = 2 (12528)
Trid: 15 area = 8   dbkey = 3136   update counter = 20 (12529)
Trid: 15 code = RL_RMCR version = 2 (12528)
Trid: 15 area = 8   dbkey = 3152   update counter = 6 (12529)
Trid: 15 code = RL_BKFRM version = 2 (12528)
Trid: 15 area = 8   dbkey = 3072   update counter = 2 (12529)
Trid: 15 code = RL_BKFRB version = 2 (12528)
Trid: 15 area = 8   dbkey = 3152   update counter = 7 (12529)
Trid: 15 code = RL_RMCR version = 2 (12528)
Trid: 15 area = 8   dbkey = 3168   update counter = 1 (12529)
Trid: 15 code = RL_BKFRM version = 2 (12528)
Trid: 15 area = 8   dbkey = 3072   update counter = 3 (12529)
Trid: 15 code = RL_BKFRB version = 2 (12528)
Trid: 15 area = 8   dbkey = 3168   update counter = 2 (12529)
Trid: 15 code = RL_RMCR version = 2 (12528)
Trid: 15 area = 8   dbkey = 3184   update counter = 1 (12529)
Trid: 15 code = RL_BKFRM version = 2 (12528)
Trid: 15 area = 8   dbkey = 3072   update counter = 4 (12529)
Trid: 15 code = RL_BKFRB version = 2 (12528)
Trid: 15 area = 8   dbkey = 3184   update counter = 2 (12529)
Trid: 15 code = RL_RMCR version = 2 (12528)
Trid: 15 area = 8   dbkey = 3200   update counter = 1 (12529)
Trid: 15 code = RL_BKFRM version = 2 (12528)
Trid: 15 area = 8   dbkey = 3072   update counter = 5 (12529)
Trid: 15 code = RL_BKFRB version = 2 (12528)
Trid: 15 area = 8   dbkey = 3200   update counter = 2 (12529)
Trid: 15 code = RL_RMCR version = 2 (12528)
Trid: 15 area = 8   dbkey = 3216   update counter = 1 (12529)
Trid: 15 code = RL_RMNXTF version = 2 (12528)
Trid: 15 area = 8   dbkey = 3200   update counter = 3 (12529)
Trid: 15 code = RL_RMNXTF version = 2 (12528)
Trid: 15 area = 8   dbkey = 3184   update counter = 3 (12529)
Trid: 15 code = RL_RMNXTF version = 2 (12528)
Trid: 15 area = 8   dbkey = 3168   update counter = 3 (12529)
Trid: 15 code = RL_RMNXTF version = 2 (12528)
Trid: 15 area = 8   dbkey = 3152   update counter = 8 (12529)
Trid: 15 code = RL_RMNXTF version = 2 (12528)
Trid: 15 area = 8   dbkey = 3136   update counter = 21 (12529)
Trid: 15 Fri Jun  6 15:27:29 2014. (2598)
Trid: 15 code = RL_TEND version = 1 (12528)
Trid: 15 dbkey = 0  update counter = 0 (12530)
```

Trid: 0 code = RL_INMEM version = 3 (12528)
Trid: 0 dbkey = 0 update counter = 0 (12530)
Trid: 0 code = RL_LSTMOD version = 2 (12528)
Trid: 0 area = 6   dbkey = 32   update counter = 31 (12529)
Trid: 15 Fri Jun 6 15:27:29 2014. (2598)
Trid: 15 User Id: gus (12531)
Trid: 15 code = RL_TBGN version = 1 (12528)
Trid: 15 dbkey = 0 update counter = 0 (12530)
Trid: 15 code = RL_RMDEL version = 2 (12528)
Trid: 15 area = 8   dbkey = 3136   update counter = 19 (12529)
Trid: 15 code = RL_RMCR version = 2 (12528)
Trid: 15 area = 8   dbkey = 3136   update counter = 20 (12529)
Trid: 15 code = RL_RMCR version = 2 (12528)
Trid: 15 area = 8   dbkey = 3152   update counter = 6 (12529)
Trid: 15 code = RL_BKFRM version = 2 (12528)
Trid: 15 area = 8   dbkey = 3072   update counter = 2 (12529)

....

```
Trid: 15 code = RL_BKFRB version = 2 (12528)
Trid: 15 area = 8   dbkey = 3152   update counter = 7 (12529)
Trid: 15 code = RL_RMCR version = 2 (12528)
Trid: 15 area = 8   dbkey = 3168   update counter = 1 (12529)
Trid: 15 code = RL_BKFRM version = 2 (12528)
Trid: 15 area = 8   dbkey = 3072   update counter = 3 (12529)
Trid: 15 code = RL_BKFRB version = 2 (12528)
Trid: 15 area = 8   dbkey = 3168   update counter = 2 (12529)
Trid: 15 code = RL_RMCR version = 2 (12528)
Trid: 15 area = 8   dbkey = 3184   update counter = 1 (12529)
Trid: 15 code = RL_BKFRM version = 2 (12528)
Trid: 15 area = 8   dbkey = 3072   update counter = 4 (12529)
Trid: 15 code = RL_BKFRB version = 2 (12528)
Trid: 15 area = 8   dbkey = 3184   update counter = 2 (12529)
Trid: 15 code = RL_RMCR version = 2 (12528)
Trid: 15 area = 8   dbkey = 3200   update counter = 1 (12529)
Trid: 15 code = RL_BKFRM version = 2 (12528)
Trid: 15 area = 8   dbkey = 3072   update counter = 5 (12529)
Trid: 15 code = RL_BKFRB version = 2 (12528)
Trid: 15 area = 8   dbkey = 3200   update counter = 2 (12529)
Trid: 15 code = RL_RMCR version = 2 (12528)
Trid: 15 area = 8   dbkey = 3216   update counter = 1 (12529)
Trid: 15 code = RL_RMNXTF version = 2 (12528)
Trid: 15 area = 8   dbkey = 3200   update counter = 3 (12529)
Trid: 15 code = RL_RMNXTF version = 2 (12528)
Trid: 15 area = 8   dbkey = 3184   update counter = 3 (12529)
Trid: 15 code = RL_RMNXTF version = 2 (12528)
Trid: 15 area = 8   dbkey = 3168   update counter = 3 (12529)
Trid: 15 code = RL_RMNXTF version = 2 (12528)
Trid: 15 area = 8   dbkey = 3152   update counter = 8 (12529)
Trid: 15 code = RL_RMNXTF version = 2 (12528)
Trid: 15 area = 8   dbkey = 3136   update counter = 21 (12529)
Trid: 15 Fri Jun  6 15:27:29 2014. (2598)
Trid: 15 code = RL_TEND version = 1 (12528)
Trid: 15 dbkey = 0  update counter = 0 (12530)
```

other stuff

example 9

```
DO TRANSACTION:
  CREATE _View.
  DELETE _View.
END.
```

Trid: 27958 Thu Jun 5 14:25:13 2014. (2598)
Trid: 27958 User Id: gus (12531)
Trid: 27958 code = RL_TBGN version = 1 (12528)
Trid: 27958 dbkey = 0 update counter = 0 (12530)
Trid: 27958 code = RL_RMCR version = 2 (12528)
Trid: 27958 area = 6   dbkey = 12384   update counter = 22 (12529)
Trid: 27958 code = RL_RMDEL version = 2 (12528)
Trid: 27958 area = 6   dbkey = 12384   update counter = 23 (12529)
Trid: 27958 code = RL_RMCR version = 2 (12528)
Trid: 27958 area = 6   dbkey = 12384   update counter = 24 (12529)
Trid: 27958 Thu Jun 5 14:25:13 2014. (2598)
Trid: 27958 code = RL_TEND version = 1 (12528)
Trid: 27958 dbkey = 0 update counter = 0 (12530)

example 10

```
DISABLE TRIGGERS FOR LOAD OF Customer.

DO TRANSACTION:
  DO i = 1 TO 1:
    CREATE Customer.
    DELETE Customer.
  END.
END.
```

example 11

```
DISABLE TRIGGERS FOR LOAD OF Customer.

DO TRANSACTION:
  REPEAT i = 1 TO 1:
    CREATE Customer.
    DELETE Customer.
  END.
END.
```

PROGRESS

BRAVEPOINT

Trid: 27960 Thu Jun 5 14:25:13 2014. (2598)
Trid: 27960 User Id: gus (12531)
Trid: 27960 code = RL_TBGN version = 1 (12528)
Trid: 27960 dbkey = 0 update counter = 0 (12530)
Trid: 27960 code = RL_TMSAVE version = 2 (12528)
Trid: 27960 dbkey = 0 update counter = 0 (12530)
Trid: 27960 Thu Jun 5 14:25:13 2014. (2598)
Trid: 27960 code = RL_TEND version = 1 (12528)
Trid: 27960 dbkey = 0 update counter = 0 (12530)

subtransaction causes transaction to start

0 notes if using -nosavepoint

example 12

```
DEF VAR N AS INT NO-UNDO.

DO TRANSACTION:
  N = CURRENT-VALUE(NextCustNum).
END.
```

example 13

```
DEF VAR N AS INT NO-UNDO.

DO TRANSACTION:
  N = NEXT-VALUE(NextCustNum).
END.
```

BRAVEPOINT

Trid: 27962 Thu Jun 5 14:25:13 2014. (2598)
Trid: 27962 User Id: gus (12531)
Trid: 27962 code = RL_TBGN version = 1 (12528)
Trid: 27962 dbkey = 0 update counter = 0 (12530)
Trid: 27962 code = RL_SEINC version = 1 (12528)
Trid: 27962 area = 6   dbkey = 96   update counter = 28 (12529)
Trid: 27962 Thu Jun 5 14:25:13 2014. (2598)
Trid: 27962 code = RL_TEND version = 1 (12528)
Trid: 27962 dbkey = 0 update counter = 0 (12530)

example 14

```
DISABLE TRIGGERS FOR LOAD OF Customer.

DO TRANSACTION:
  REPEAT i = 1 TO 1:
    CREATE Customer.
    UNDO.
  END.
END.
```

PROGRESS

BRAVEPOINT

Trid: 27963 Thu Jun 5 14:25:13 2014. (2598)
Trid: 27963 User Id: gus (12531)
Trid: 27963 code = RL_TBGN version = 1 (12528)
Trid: 27963 dbkey = 0 update counter = 0 (12530)
Trid: 27963 code = RL_TMSAVE version = 2 (12528)
Trid: 27963 dbkey = 0 update counter = 0 (12530)
Trid: 27963 code = RL_TMSAVE version = 2 (12528)
Trid: 27963 dbkey = 0 update counter = 0 (12530)
Trid: 27963 Thu Jun 5 14:25:13 2014. (2598)
Trid: 27963 code = RL_TEND version = 1 (12528)
Trid: 27963 dbkey = 0 update counter = 0 (12530)

subtransaction causes main transaction to start

0 notes if using -nosavepoint

example 15

```
DISABLE TRIGGERS FOR LOAD OF Customer.

DO TRANSACTION:
  CREATE Customer.
  UNDO.
END.
```

BRAVEPOINT

example 16

```
DO TRANSACTION:
   FIND FIRST Customer NO-LOCK
      WHERE RECID(Customer) EQ 1 NO-ERROR.
   UNDO.
END.
```

PROGRESS

BRAVEPOINT

example 17

```
DEF VAR N AS INT NO-UNDO.

DO:
  N = NEXT-VALUE(NextCustNum).
END.
```

Trid: 0 code = RL_SEINC version = 1 (12528)
Trid: 0 area = 6   dbkey = 96   update counter = 29 (12529)

example 18

```
do transaction:
    find _myconnect.
    _myconn-numseqbuffers = 3.
end.
```

PROGRESS

BRAVEPOINT

So ...

- When was an 'evil' transaction started?

- What transactions were active during an online backup?

- What transactions were active during a quiet point?

- What userid is causing the BI file to grow? and why?

- Is my database code crappy?

- Why did lock table overflow? Who caused it?

PROGRESS

BRAVEPOINT

Answers

email:

gus@progress.com

danf@prodb.com

PROGRESS

BRAVE