Finding Problems in a
Mixed Environment:
Transaction Analysis Workbench
for z/OS

Webcast
October 16, 2012
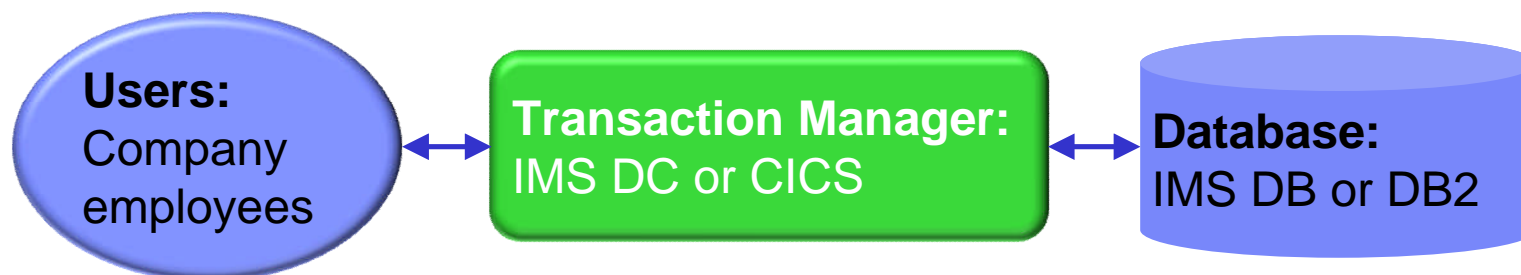
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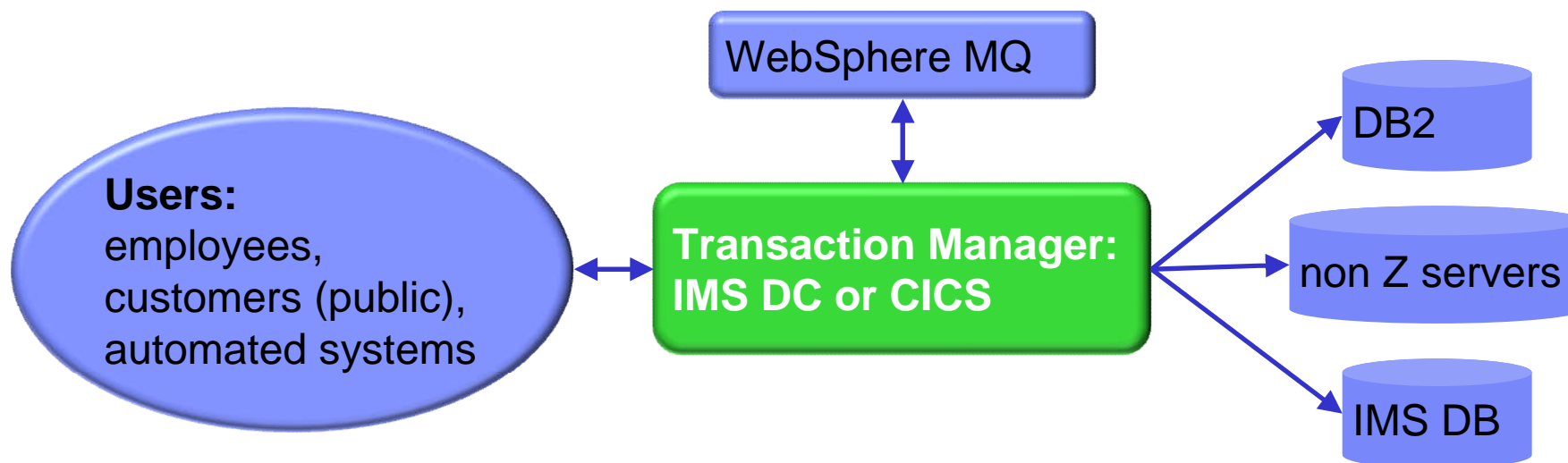
Agenda

- **It's all about evolution:**

  - Transaction systems have evolved from *simple* to *complex and heterogeneous*.

  - Analysis tools have not kept pace.

- **IBM Transaction Analysis Workbench for z/OS:**

  - Provides a view of transaction activity across subsystems.

  - Enables a collaborative workflow:

    - Between "first responders" (help desk; level 1 support) and subject-matter experts

    - Between experts in different areas

- **Example scenario: IMS DB2 transaction analysis**

It's all about application evolution

1980 application: in-house users only; simple data, single data store

Users: Company employees ⟷ **Transaction Manager: IMS DC or CICS** ⟷ **Database:** IMS DB or DB2

Today: users are customers; data is complex, often distributed

WebSphere MQ

Users: employees, customers (public), automated systems ⟷ **Transaction Manager: IMS DC or CICS** → DB2 / non Z servers / IMS DB

Analysis tools targeted at "silo" model

There are many tools to help analyze *individual* transaction environments on System z:

CICS Performance Analyzer	IMS Performance Analyzer	DB2 Performance Manager	Many others...

CICS **IMS** **DB2**

One transaction, not four!

IMS

CICS ── DB2

MQ

IMS → DB2

IMS → MQ
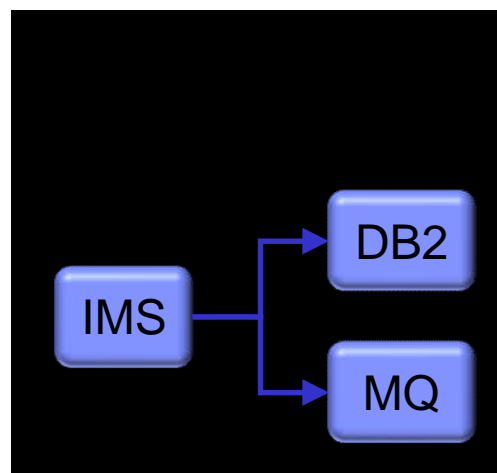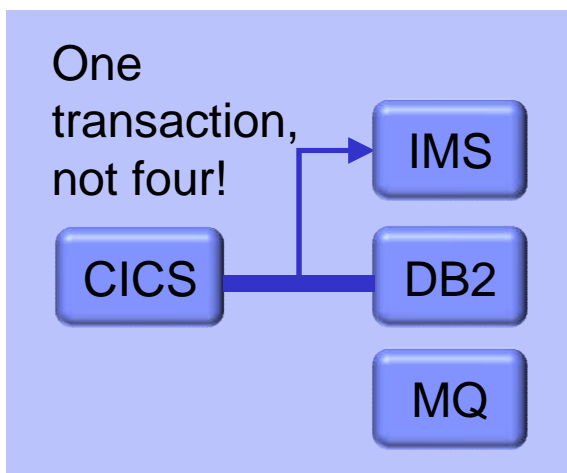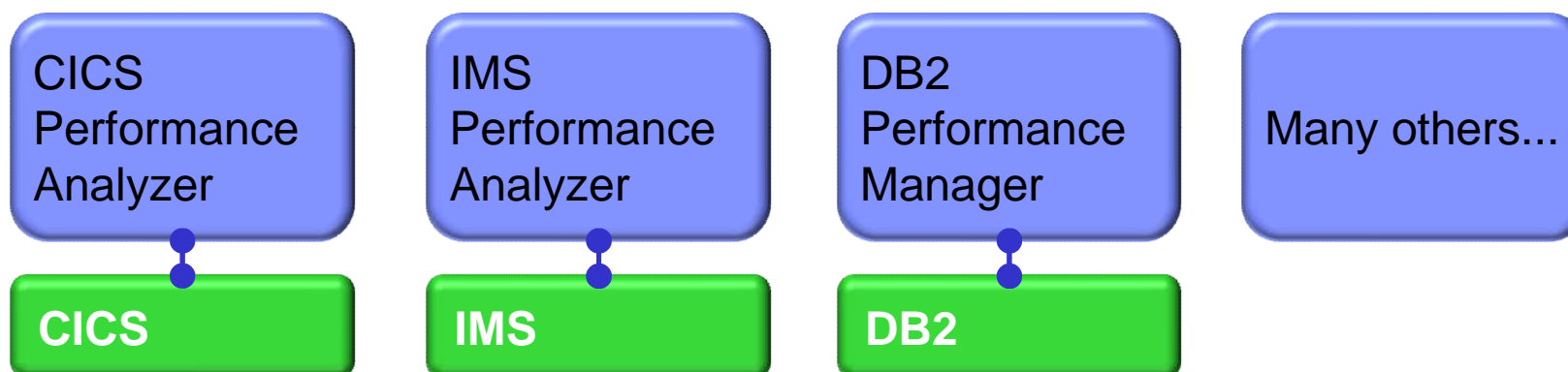
Each tool is well-suited to its environment, but you often need a subject-matter expert to use each tool

Expert collaboration must be improved

- Today, the process of problem diagnosis is often "silo-oriented". For example:

| CICS | DB2 | IMS | WebSphere |
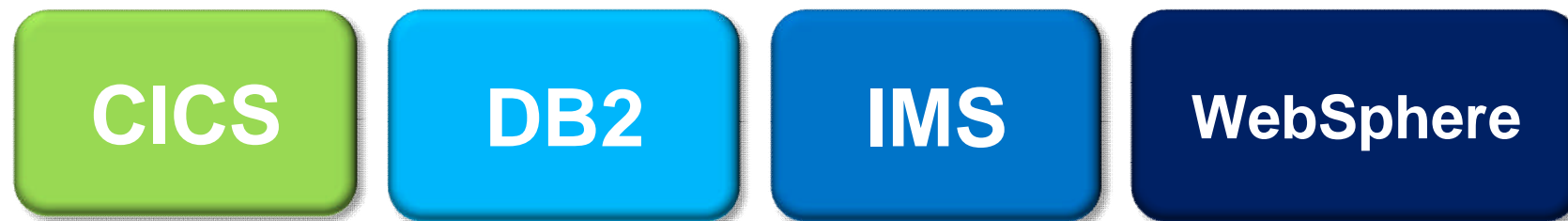
- Typically, each silo has its own set of subject-matter experts.

- Analysis between silos involves experts starting all over again. This slows problem resolution.

- Workbench offers a framework that spans the silos; effectively, *dissolving* barriers between silos.

- Experts from different areas can collaborate on the same problem without collecting log data all over again.

Step 1: where did the delay occur?

- A single transaction can involve activity across many subsystems

- Subsystem-specific tools offer a limited perspective

- To quickly identify performance issues, you need to track activity across subsystems

- Each subsystem has its own activity log

CICS

DB2

IMS

VSAM
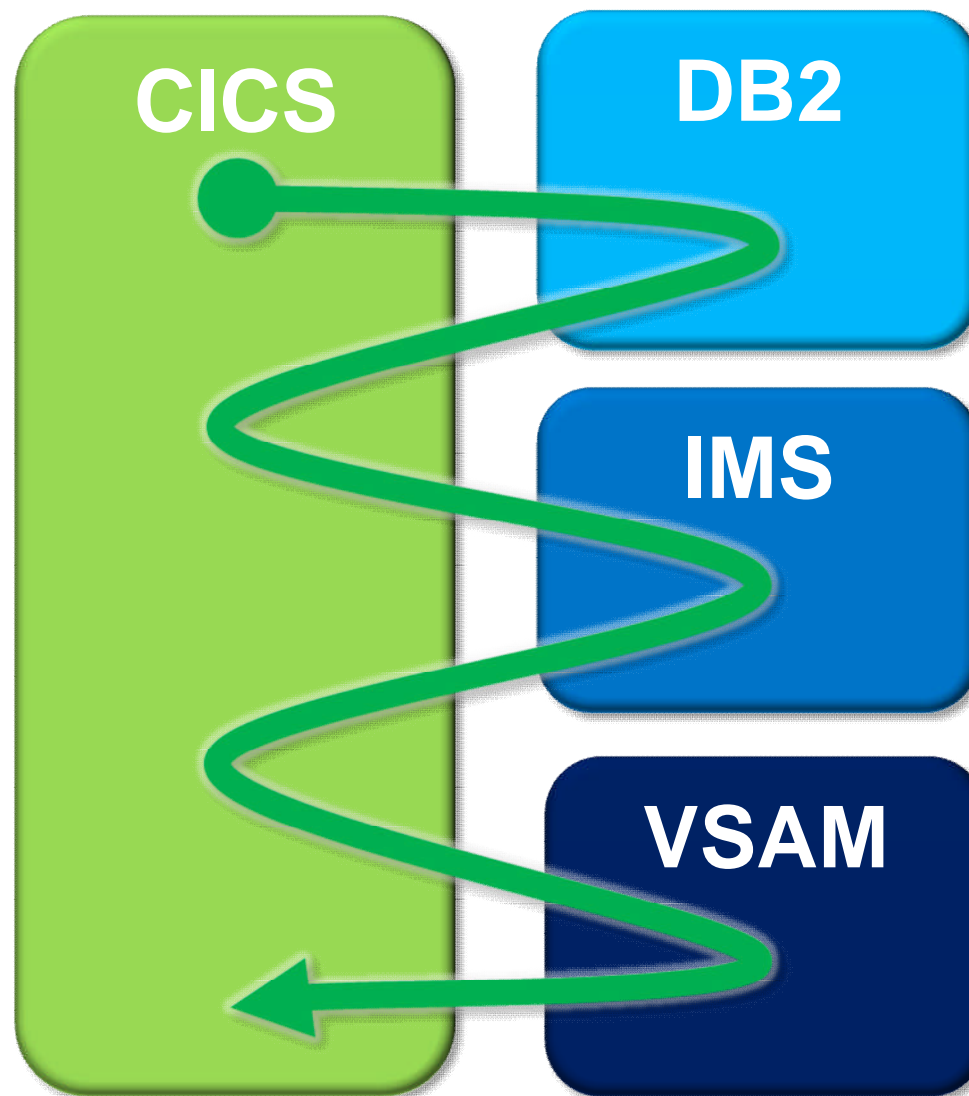
Step 2: deal with transaction lifecycle

- Automatically locates the log files for the problem time range (for some subsystems)

- Combines logs from many subsystems to provide a single, consolidated timeline of transaction activity

- Generates Exception reports and files of likely candidates for evaluation

- Shows events that are related to the same transaction lifecycle

CICS	0.000000s
DB2	0.002000s
IMS	0.004000s
VSAM	0.005000s
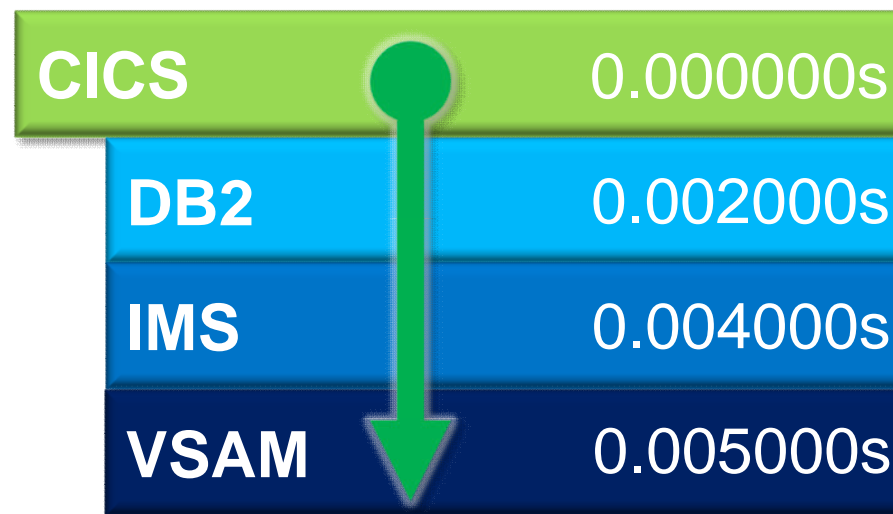
Enabling collaborative transaction analysis

- Automate trivial tasks commonly needed for problem determination.

  o Data acquisition – get the data needed for problem analysis

  o Autonomics – automated transaction analysis

    - Reporting – basic reporting without tool specific knowledge

- Enable the "first responder" to determine the most likely source of the problem.

  o Process flow approach to assignment

    - Give the receiving expert confidence in the assignment

- Allow for "deep dive" problem determination via synergy with other IBM tools

  o Create a "common" approach to transaction problem resolution

  o Increase the degree and ease of collaboration between experts

Collaborative workflow: setup

- Subject-matter experts use Workbench to define:

    o **Groups** of subsystems involved in applications

    o **Exceptions** (log data values that indicate a problem, such as long response times or abend codes)

- SMEs also help define **scripts** (step-by-step procedures) to be followed by first responders (help desk, level 1 support staff)

"Payroll"

IMS IMP1

DB2 DBP1

CICS CIP1

Log

Log

Log
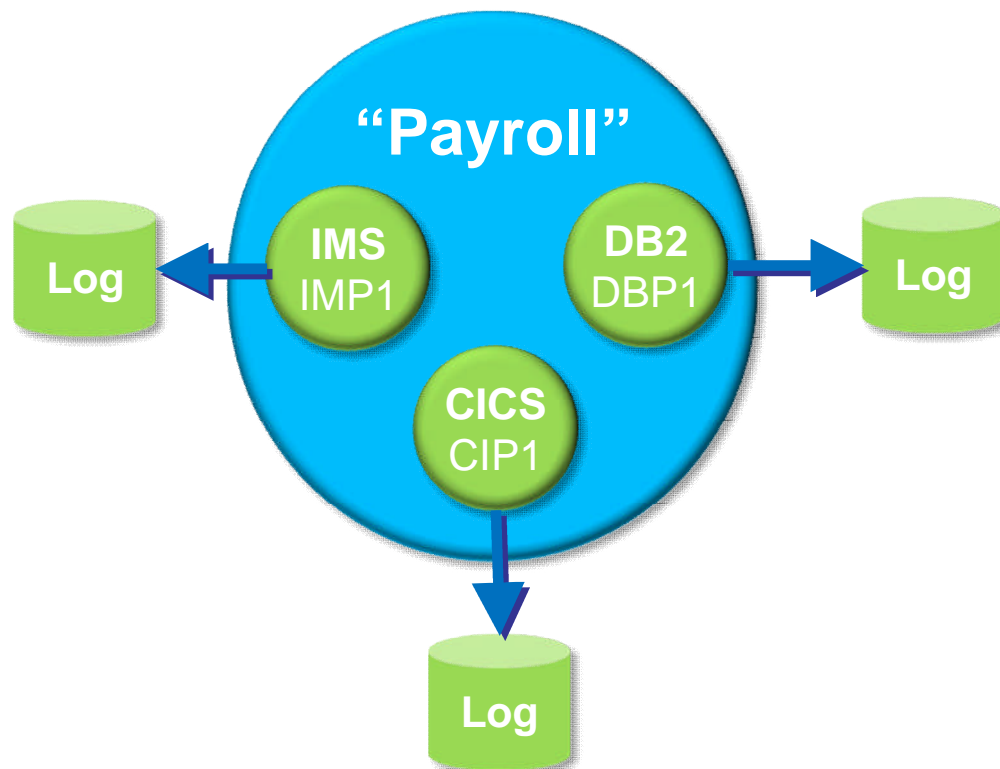
Help desk script

1. If user reports long response time in Payroll application, then…

Collaborative analysis workflow

First responder

1. Accepts an incoming support request and selects the appropriate group in Workbench. Workbench locates the log files for each subsystem.
2. Performs *preliminary analysis* according to predefined script.
3. Assigns problem to appropriate subject-matter expert.

Subject-matter expert

1. Picks up analysis from where the first responder left off (no need to locate log files again).
2. Performs *"deep dive" analysis*: for example, using Workbench to interactively browse formatted details of log records.

Session manager (ISPF dialog)

- Session manager approach to problem management:

    o Register the problem

    o Locate the files required to diagnose the problem: IMS, DB2, CICS, SMF, OPERLOG etc.

    o Resume from where you left off, or from a previous save-point

    o Write reminder notes and information as you go

    o Re-assign the problem to the appropriate subject-matter expert

    o Use PI-style interactive analysis to look at related logs and other subsystem events via SMF, OPERLOG etc.

    o Run reports that are specific to the problem

    o Review identified transaction exceptions

Scenario: IMS DB2 problem

- On the following slides, we present an example scenario: a user has reported a long transaction response time for an IMS transaction performing DB2 updates

- The analysis is divided into two parts:

  o The **first responder**:

    1. Registers the problem in the Workbench session manager and collects the log files

    2. Follows a process orientated script to assign problem to initial expert

  o The **subject-matter expert** performs a "deep dive" on the problem: reviewing the reports, and using interactive analysis to identify the specific log records for the cause of the problem

First responder: Creating a session

```
   File   Help
 _____
                              Problem Details                    Row 1 to 3 of 3
 Command ===> _____       Scroll ===> PAGE

 Key  . . . . . : 00000007
 Summary  . . . . IMS DB2 problem                      Description...
 Severity . . . . _
 Reference  . . . _____   ── When problem occurred ──
 Reported by  . . _____        YYYY-MM-DD  HH.MM.SS.TH
 Assigned to  . . _____   From 2010-06-24  15.20.00.00
 Status . . . . . OPEN____     To   2010-06-24  16.50.00.00  Zone . . LOCAL

 Where problem occurred . . . . Payroll_____   +


 /  System +     Type +
 __  IADG____     IMS____
 __  DB3A____     DB2____
 __  FTS1____     IMAGE___
 ***************************** Bottom of data *****************************
```

Create a session (main menu ▸ option 1 **Sessions** ▸ **NEW**).
Select the environment where the problem occurred. This populates the system list.

First responder: CICS-DBCTL exception analysis reports

- Example of a Workbench report: combines data from CICS (CMF records, from SMF files) and IMS (IMS log records) to show details of IMS events in a CICS DBCTL transaction

2012-03-28 Wednesday   **CICS-DBCTL Summary**   Page   1

CICS

Tran	APPLID	CMF Count	Response	CPU Time	IMS Reqs	IMS Wait	ABEND	Rate/Sec
BANK	CICSP1	60	11.12982	0.008967	35	4.256977	10	0

IMS

08 Count	Elapsed	CPU Time	StaDelay	Schedule	IC Wait	PS Wait
42	10.94999	0.004092	0.011668	0.000183	0	0

07 Count	DB call	DB Gets	DB Upds	IO Count	IO Time	LockWait
41	33	13	19	4	0.003438	3.980170

FP Count	FP call	FP Gets	FP Upds	FP Wait	FP Fail
41	19	7	11	0	7

	Synctime	Phase 1	Phase 2	FP PH2	OTHREAD
	0.011938	0.006555	0.005383	0.002232	0.017659

Subject-matter expert: Exception candidate investigation

IBM.

```
    File    Mode    Filter    Time    Labels    Options    Help
  _____
  BROWSE      IMPOT01.SESSION7.TRANIX +                    Record 00004609 More: < >
  Command ===> _____       Scroll ===> CSR
     Slice . . Duration  00.03.00      Date   2010-06-24      Time  16.31.00.000000
     Code Description  < 00.05.00.000000 >  2010-06-24 Thursday  Time (LOCAL)
  /  ----  -------------------------------------------------------  ----------------
  TX  CA01  Transaction                                             16.33.33.575325
         UTC=16.33.33.575316 TranCode=MQATREQ1 Program=MQATPGM Userid=FUNTRM15
         LTerm=FUNTRM15 Terminal=SC0TCP15 Region=0004
         OrgUOWID=IADG/C62D2CB467860940 IMSID=IADG IMSRel=101
         RecToken=IADG/0000003600000000
         CPU=0.041999 InputQ=0.000562 Process=0.497229
         TotalTm=0.497791 RegTyp=MPP DBCalls=5
         ------------------------------------------------------------------------
  __  CA01  Transaction                                             16.33.59.157812
         UTC=16.33.59.157802 TranCode=MQATREQ1 Program=MQATPGM Userid=FUNTRM15
         LTerm=FUNTRM15 Terminal=SC0TCP15 Region=0004
         OrgUOWID=IADG/C62D2CCCCD3E6F81 IMSID=IADG IMSRel=101
         RecToken=IADG/0000003A00000000
         CPU=0.013980 InputQ=0.000543 Process=0.424378
         TotalTm=0.424921 RegTyp=MPP
         ------------------------------------------------------------------------
  __  CA01  Transaction                                             16.34.30.389305
```

This display has been filtered to show IMS transaction index (CA01) records with a process time of greater than 0.4 seconds. Enter TX to show records related to a transaction.

Life cycle evaluation using relative time

```
   File   Mode   Filter   Time   Labels   Options   Help
_____
BROWSE      IMPOT01.SESSION7.TRANIX +              Record 00004609 More: < >
Command ===>  _____         Scroll ===> CSR
   Slice . . Duration  00.00.00      Date   2010-06-24     Time  16.31.00.000000
   Code Description  <  00.05.00.000000  >  2010-06-24 Thursday  Time (Relative)
/  ----                                                          -----------------
__ CA01 Transaction TranCode=MQATREQ1 Region=0004               16.33.33.575325
__ 01   Input Message TranCode=MQATREQ1                               +0.000000
__ 35   Input Message Enqueue TranCode=MQATREQ1                       +0.000025
__ 08   Application Start TranCode=MQATREQ1 Region=0004               +0.000521
__ 5607 Start of UOR Program=MQATPGM Region=0004                      +0.000522
__ 31   DLI GU TranCode=MQATREQ1 Region=0004                          +0.000557
__ 5616 Start of protected UOW Region=0004                            +0.000965
__ 5E   SB Handler requests Image Capture Region=0004                 +0.009128
__ 5E   SB Handler requests Image Capture Region=0004                 +0.009131
__ 50   Database Update Database=DI21PART Region=0004                 +0.009395
__ 50   Database Update Database=DI21PART Region=0004                 +0.009517
__ 50   Database Update Database=DI21PART Region=0004                 +0.009551
__ 50   Database Update Database=DI21PART Region=0004                 +0.009634
__ 50   Database Update Database=DI21PART Region=0004                 +0.009678
__ 5600 Sign-on to ESAF Region=0004 SSID=DB3A                         +0.011431
__ 5600 Thread created for ESAF SSID=DB3A                             +0.011460
__ 66   DB2 Performance 072 Create thread entry                       +0.011480
```

The Time column now shows relative times. Scroll forward through the related records.
(Here, we have collapsed each record onto a single line by scrolling right.)

16

Transaction life cycle investigation

```
  File   Mode   Filter   Time   Labels   Options   Help
_____

BROWSE      IMPOT01.SESSION7.TRANIX +                    Record 00004707 More: < >
Command ===> _____       Scroll ===> CSR
    Slice . . Duration  00.00.00       Date  2010-06-24      Time  16.31.00.000000
    Code Description  < 00.05.00.000000 >  2010-06-24 Thursday  Time (Relative)
/   ----  ----------------------------------------------------------  ----------------
__   66    DB2 Performance 058 SQL call completion                      +0.022230
__   66    DB2 Performance 122 Thread level exit from DB2               +0.022268
__   66    DB2 Performance 121 Thread level entry into DB2              +0.022412
__   66    DB2 Performance 061 SQL del/insert/update                    +0.022496
__   66    DB2 Performance 016 First insert (SRT1) entry                +0.022564
__   66    DB2 Performance 021 Lock detail                              +0.472641
__  0020  DB2 Insert into a Data Page                                   +0.472690
__   66    DB2 Performance 058 SQL call completion                      +0.472731
__   66    DB2 Performance 122 Thread level exit from DB2               +0.472769
__  5600  Sign-on to ESAF Region=0004 SSID=CSQ6                         +0.474004
__  5600  Thread created for ESAF SSID=CSQ6                             +0.474033
__   74    MQ Accounting Class 1 SSID=CSQ6 CONN=IMS.IADG                +0.474674
__  5600  Commit Prepare starting Region=0004 SSID=CSQ6                 +0.480774
__   66    DB2 Performance 121 Thread level entry into DB2              +0.482382
__   66    DB2 Performance 084 Prepare entry                           +0.482475
__   66    DB2 Performance 018 Exit from OSET, SRT1, or RNXT           +0.482619
__  0020  DB2 Unit of Recovery Control - End Commit Phase 1            +0.482722
```

Keep scrolling forward until you see the jump in relative time, then scroll forward again to the 65 record.

Life cycle events: expanded summary view

```
   File   Mode   Filter   Time   Labels   Options   Help
 ─────────────────────────────────────────────────────────────────────────
BROWSE      IMPOT01.SESSION7.TRANIX +                Record 00004787 More: < >
Command ===> _____      Scroll ===> CSR
    Slice . . Duration  00.00.00      Date  2010-06-24      Time  16.31.00.000000
    Code Description  < 00.05.00.000000 >  2010-06-24 Thursday  Time (Relative)
/   ----  ----------------------------------------------------   ----------------
__   65   DB2 Accounting 003                                          +0.497189
          Program=MQATPGM Userid=FUNTRM15 Region=0004
          RecToken=IADG/0000003600000000
          CPU1=00.033593 CPU2=00.005305 I/O3=00.000000 Source=IMS_MPP
          GtPgRq=7 SyPgUp=3 Suspnd=0 DeadLk=0 TimOut=0 MxPgLk=1
          Sel=0 Ins=1 Upd=1 Del=1 LUWID=FTS3/DB3ALU/C62D2CB46A5A/0001
          ---------------------------------------------------------------
__   66   DB2 Performance 046 Synchronous EU switch                   +0.497252
          Program=MQATPGM Userid=FUNTRM15 Region=0004
          SSID=DB3A SYSID=FTS3 ConType=MPP Plan=MQATPGM
          LUWID=FTS3/DB3ALU/C62D2CB46A5A/0001
          ---------------------------------------------------------------
__   66   DB2 Performance 093 Suspend                                 +0.497298
          Program=MQATPGM Userid=FUNTRM15 Region=0004
          SSID=DB3A SYSID=FTS3 ConType=MPP Plan=MQATPGM
          LUWID=FTS3/DB3ALU/C62D2CB46A5A/0001
          ---------------------------------------------------------------
```

Scroll right to show the records in expanded view with relative times.

Identifying events for review or collaboration

```
    File   Mode   Filter   Time   Labels   Options   Help
   _____
   BROWSE      IMPOT01.SESSION7.TRANIX +                  Record 00005399 More: < >
   Command ===> _____          Scroll ===> CSR
      Slice . . Duration  00.05.00        Date    2010-06-24     Time  16.25.44.803974
      Code Description  < 00.05.00.000000 >  2010-06-24 Thursday  Time (Relative)
 /    ----  ----------------------------------------------------------  ----------------
 __   CA01 Transaction                                              16.33.33.575325
           UTC=16.33.33.575316 TranCode=MQATREQ1 Program=MQATPGM Userid=FUNTRM15
           LTerm=FUNTRM15 Terminal=SC0TCP15 Region=0004
           OrgUOWID=IADG/C62D2CB467860940 IMSID=IADG IMSRel=101
           RecToken=IADG/0000003600000000
           CPU=0.041999 InputQ=0.000562 Process=0.497229
           TotalTm=0.497791 RegTyp=MPP DBCalls=5
           ------------------------------------------------------
 __   TAG  IMS DB2 transaction with long response time
           -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 __    G   0020 DB2 Unit of Recovery Control - Begin UR
           Userid=FUNTRM15  IMSID=IADG  URID=00002A4010EA
           LUWID=FTS3/DB3ALU/C62D2CB46A5A/0001
           -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
 __   0020 DB2 Update In-Place in a Data Page
           DBID=0105 PSID=0002 URID=00002A4010EA
           ------------------------------------------------------
```

A DB2 expert can now use the DB2 Log Analysis Tool to investigate the associated DB2 table updates, based on the transaction's URID

Enter **FIND LUWID** on the command line.
Enter **G** to "tag" (bookmark) this DB2 record.

DB2 expert help using DB2 Log Analysis Tool

```
RECORD IDENTIFIER: 1

ACTION DATE        TIME        TABLE OWNER   TABLE NAME                        URID
------ ---------- -------- ------------ -------------------------------- -------------
INSERT 2011-06-24 16.33.34 JOHN         HR                               00002A4010EA

DATABASE TABLESPACE DBID  PSID  OBID  AUTHID   PLAN      CONNTYPE LRSN
-------- ---------- ----- ----- ----- -------- -------- -------- ------------
HR_DB    HR_SPACE   00456 00002 00003 FUNTRM15 HR_PLAN  IMS      C62D2CB46CB3

MEMID CORRID       CONNID   LUW=NETID/LUNAME/UNIQUE/COMMIT       PAGE/RID
----- ------------ -------- ----------------------------------- -----------
00000 0004MQATPGM  IMS      FTS3    /DB3ALU  /C62D2CB46A5A/0001 00000002/02

ROW STATUS   EMP_ID EMP_NAME   EMP_PHONE        EMP_YEAR   EMP_SALARY
----------- ------ ---------- --------------- ---------- -----------
CURRENT      +330   JIM MARTIN 475-712-9508    2009-06-24 +0041000.00
POST-CHANGE  +330   JIM MARTIN 475-712-9508    2009-06-24 +0042000.00
```

Viewing the details of transaction event data

```
    File   Mode   Filter   Time   Labels   Options   Help
_____
BROWSE     IMPOT01.SESSION7.TRANIX +                    Tracking is active
Command ===> _____  Scroll ===> CSR
    Slice . . Duration  00.00.00      Date  2010-06-24   Time  16.31.00.000000
    Code Description  < 00.05.00.000000 >  2010-06-24 Thursday  Time (Relative)
/   ----  ---------------------------------------------------    -----------------
___ CA01 Transaction TranCode=MQATREQ1 Region=0004              16.33.33.575325
 S  01   Input Message TranCode=MQATREQ1                             +0.000000
___ 35   Input Message Enqueue TranCode=MQATREQ1                     +0.000025
___ 08   Application Start TranCode=MQATREQ1 Region=0004             +0.000521
___ 5607 Start of UOR Program=MQATPGM Region=0004                    +0.000522
___ 31   DLI GU TranCode=MQATREQ1 Region=0004                        +0.000557
___ 5616 Start of protected UOW Region=0004                          +0.000965
___ 5E   SB Handler requests Image Capture Region=0004               +0.009128
___ 5E   SB Handler requests Image Capture Region=0004               +0.009131
___ 50   Database Update Database=DI21PART Region=0004               +0.009395
___ 50   Database Update Database=DI21PART Region=0004               +0.009517
___ 50   Database Update Database=DI21PART Region=0004               +0.009551
___ 50   Database Update Database=DI21PART Region=0004               +0.009634
___ 50   Database Update Database=DI21PART Region=0004               +0.009678
___ 5600 Sign-on to ESAF Region=0004 SSID=DB3A                       +0.011431
___ 5600 Thread created for ESAF SSID=DB3A                           +0.011460
```

Scroll back to the top of the tracked transaction (type M, then press F7). Select the 01 record.

Detail event data view using forms view

```
   File   Menu   Format   Help
   _____
   BROWSE        IMPOT01.SESSION7.TRANIX +              Record 00004610 Line 00000000
   Command ===>                                                      Scroll ===> CSR
   Form    ===> MSC02        +  _   Use Form in Filter              Format ===> FORM
   ****************************************** Top of data ******************************
   +0004   Code... 01      Input Message
   +0195   STCK... C62D2CB46789D940     LSN.... 0000000000000177D
           Date... 2010-06-24 Thursday  Time... 16.33.33.575325.578

   +0004   MSGLCODE... 01              MSGFLAGS... C1          MSGDFLG2... 81
   +0014   MSGUOW..... Unit of Work (UOW) - Tracking
   +0014   MSGORGID... 'IADG    '  MSGORGTK... C62D2CB467860940
   +0024   MSGPROID... 'IADG    '  MSGPROTK... C62D2CB467860940

   +00BE   MSGMSE..... Message System Extension; Item ID = 8A
   +00C2   MSGUTC..... Coordinated Universal Time (UTC)
   +00C2   MSGUDATE... 2010175F    MSGUTIME... 083333575316
   +00CC   MSGUZONE... 032C

   +00D6   MSGMSC..... TMR System Segment; Item ID = 8C
   +00F6   MSGMSOID... 00          MSGMSIID... 00          MSGMSFL1... 01
   +00F9   MSGMSFL2... 48          MSGMSFL3... 40          MSGMSFL4... 00
   +00FC   MSGMSUID... 0000000000000000
```

To reduce "noise", and show only the fields that are of interest to you, use a form.
To "zoom" on a field, move your cursor to the field, and then press Enter.

Demystifying field data in the event

```
   File   Menu   Help
_____

BROWSE     IMPOT01.SESSION7.TRANIX +                      Line 00000000
Command ===> _____     Scroll ===> PAGE
******************************** Top of data ****************************
+0006   MSGDFLG2... 81    Flags from QDFLG2 of QDEST

 On     QDF2PRM.... 80    This Destination is permanent and implies that
                          fields exist for
                          1. Average Msg length
                          2. Enqueue and Dequeue counts
                          3. Name field If the above  bit is off, the
                          fields  are assumed to be absent
 Off    QDF2BKR.... 40    Backup queue is required, either for Resend or
                          Conversational process
 Off    QDF2QMOV... 20    QMOVE in Process : XRF
 Off    QDF2LQUE... 10    Local QPOOL in Use : XRF
 Off    QDF2CLNR... 08    Cleanup Check Request Flag : XRF
 Off    QDF2MDEL... 04    Message Deletion in Progress Flag : XRF
 Off    QDF2BTYP... 03    Destination Type bits
 On     QDF2SMB.... 81    Generated SMB - Transaction
 Off    QDF2CNT.... 82    Generated CNT - Logical Terminal
******************************** End of data ****************************
```

End of scenario

- The cause of the IMS transaction problem has been narrowed down to a slowdown in DB2

- Sufficient information about the DB2 update activity has been collected and can be passed on to the DB2 DBA for further investigation.

Summary: Transaction Analysis Workbench

- Enables a change in the way problem resolution is performed within an organization

- Automatically locates log files for the problem time range for supported subsystems.

  - Manual addition of files also provided

- Identifies exceptions (using criteria defined by your subject-matter experts)

- Better assignment of problems to the correct group

  - Improved confidence in problem assigned by experts

- Enables a **collaborative workflow**:

  - Between first responders and subject-matter experts

  - Between experts in different areas

More information

- IBM DB2 and IMS Tools website:
  www.ibm.com/software/data/db2imstools/

- IBM Transaction Analysis Workbench for z/OS:
  www.ibm.com/software/data/db2imstools/imstools/trans-analysis/

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