IBM Transaction Analysis Workbench:

It's not just for IMS – we cover DB2, CICS, and more!

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Agenda

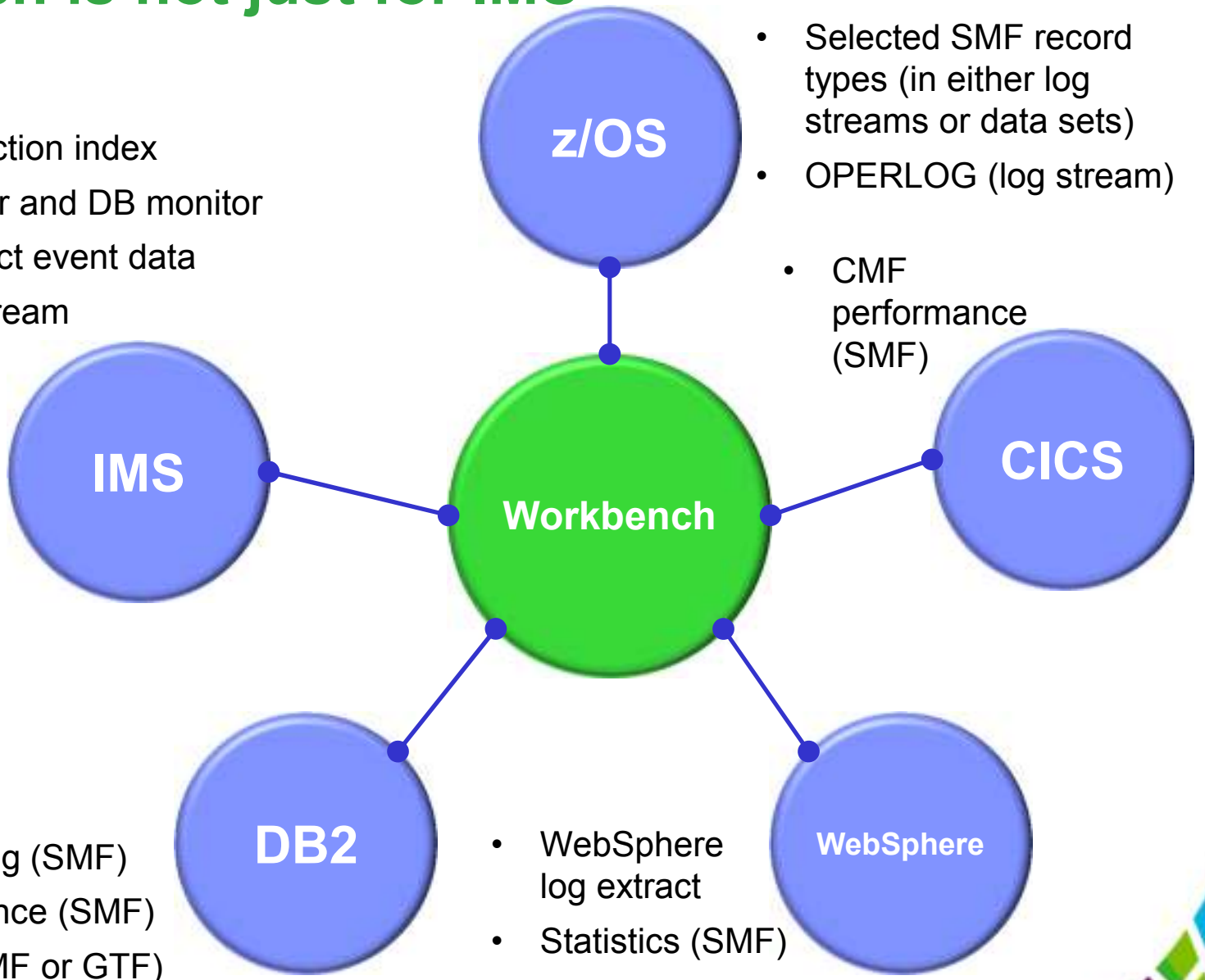
1. **IBM Transaction Analysis Workbench for z/OS** (“Workbench”) covers IMS, DB2, CICS, and more…
2. Workbench and big data: identifying transaction “exceptions” in instrumentation data
3. Why z/OS transaction analysis must be collaborative and span z/OS subsystems
4. Introducing Workbench
5. How Workbench can help application development teams
6. Coming soon: future Workbench features

Additional slides (for reference; not presented)

7. Scenario: IMS-DB2 problem

Workbench is not just for IMS

- IMS log
- IMS transaction index
- IMS monitor and DB monitor
- IMS Connect event data
- CQS log stream



- Selected SMF record types (in either log streams or data sets)
- OPERLOG (log stream)

- CMF performance (SMF)

- DB2 log
- Accounting (SMF)
- Performance (SMF)
- Trace (SMF or GTF)

- WebSphere log extract
- Statistics (SMF)
- Accounting (SMF)

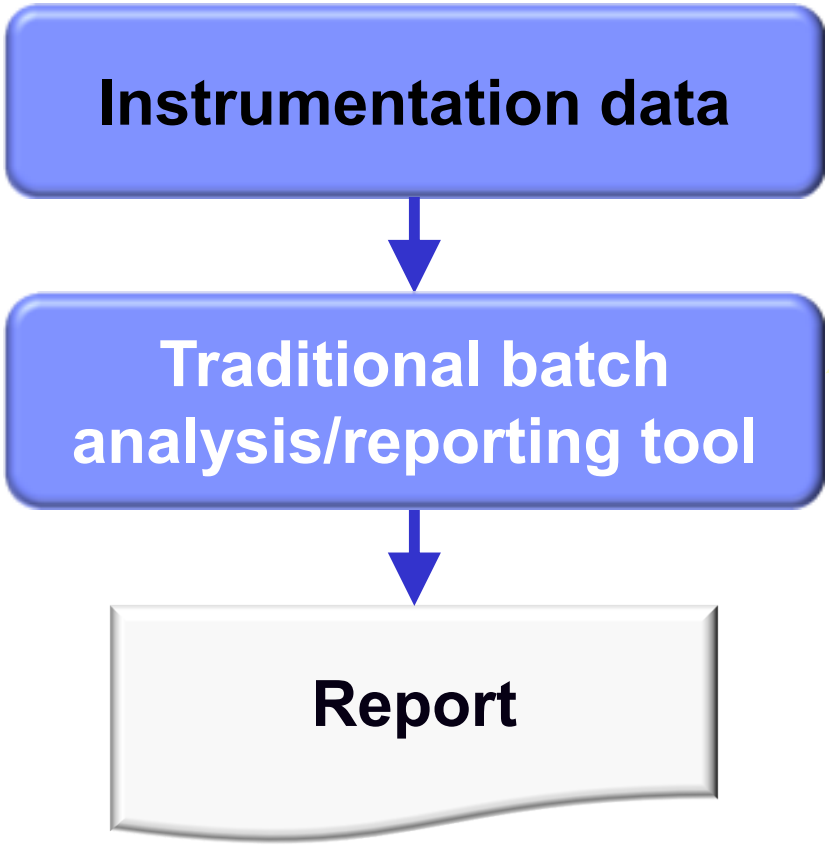
Workbench is not just for IMS (cont.)

- Workbench merges logs from multiple subsystems to present a consolidated, cross-subsystem view of a transaction's life cycle
- Interactive ISPF dialog log browser provides a consistent interface to all log types from all subsystems (finding, navigating, filtering, formatting: when you know how to work with one log type, you know how to work with them all)
- Automated file selection for IMS logs, DB2 logs, and (soon) SMF
- Specific additional support for combined CICS-DBCTL reporting (other combinations coming soon: CICS-DB2, IMS-DB2)
- Various SMF record-type specific batch reports (aimed at transaction analysis)

Workbench and big data: identifying transaction “exceptions” in instrumentation data

Problem: today's instrumentation data overwhelms traditional tools

- Good performance monitoring should identify possible performance issues before they become critical
- Today's systems create so much instrumentation data that existing techniques cannot keep up: **takes too long, costs too much!**



- Processes and reports on all records
- Processing time and cost grows with size of instrumentation data, beyond practical limits
- Reports can grow too long to be useful, and contain unwanted detail

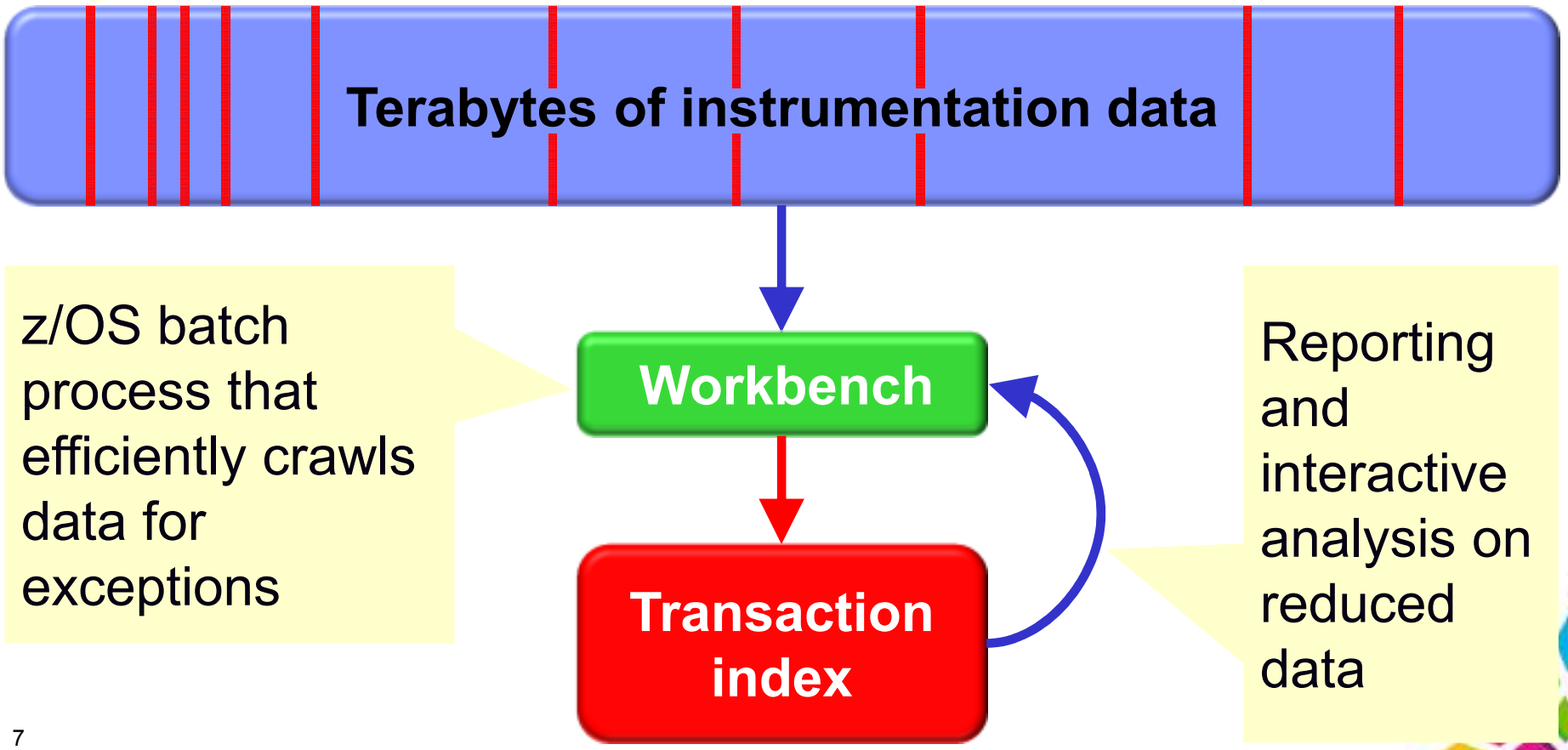
Problem: today's instrumentation data overwhelms traditional tools (cont.)

- The increase in instrumentation data dictates a shift in how we approach performance monitoring
- Instead of reporting on the details of what happened, we need to be able to process the wealth of instrumentation data and identify areas where more in-depth performance evaluation is warranted

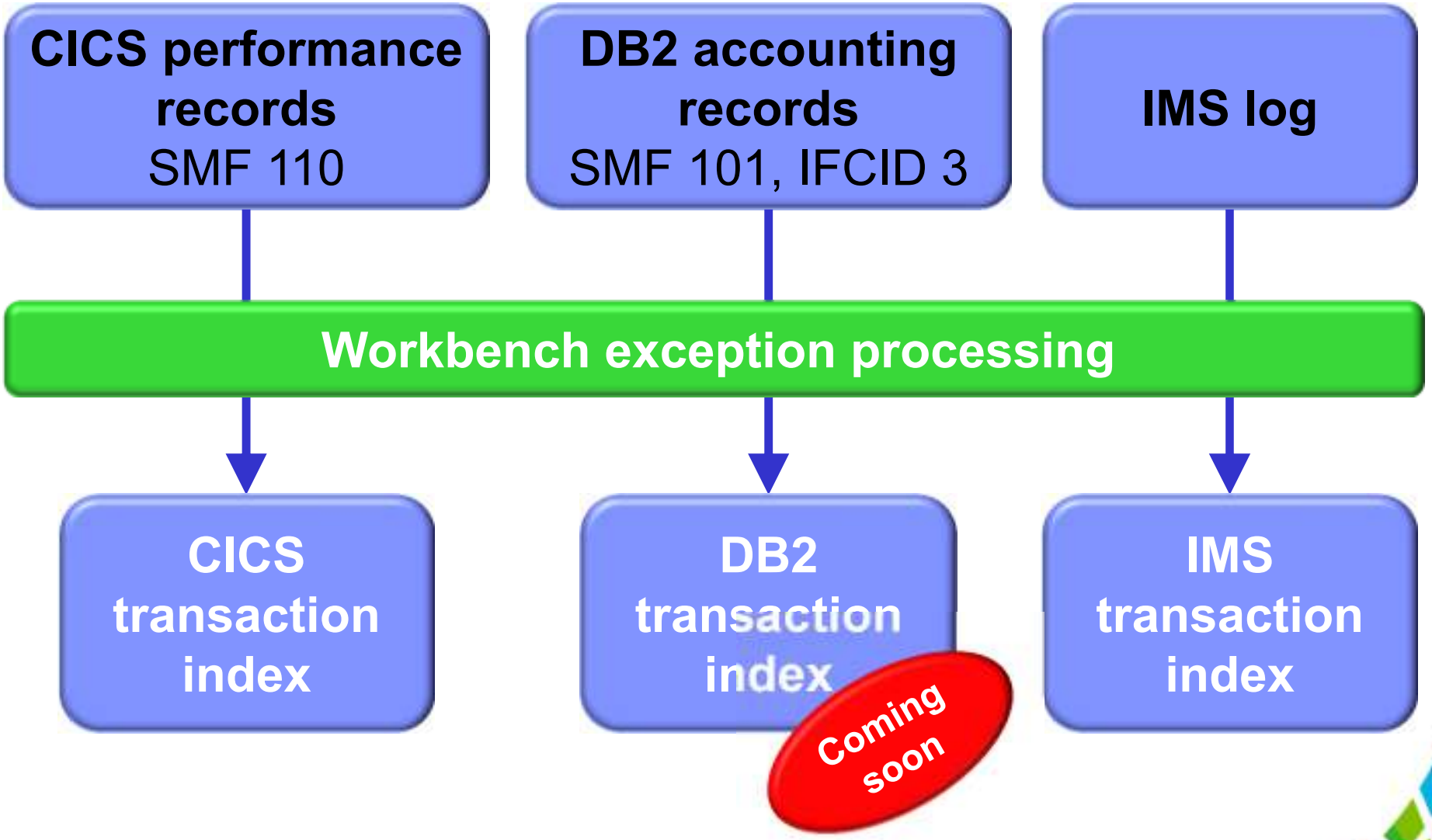
For performance issues and problem analysis, we want to identify and then analyse the (typically, relatively few) records that exhibit *exceptional* behaviour, not get swamped by the bulk of "normal" instrumentation data

Solution: Workbench exception processing

Exception: a transaction that matches specific *exception criteria*, such as long response time or an abend



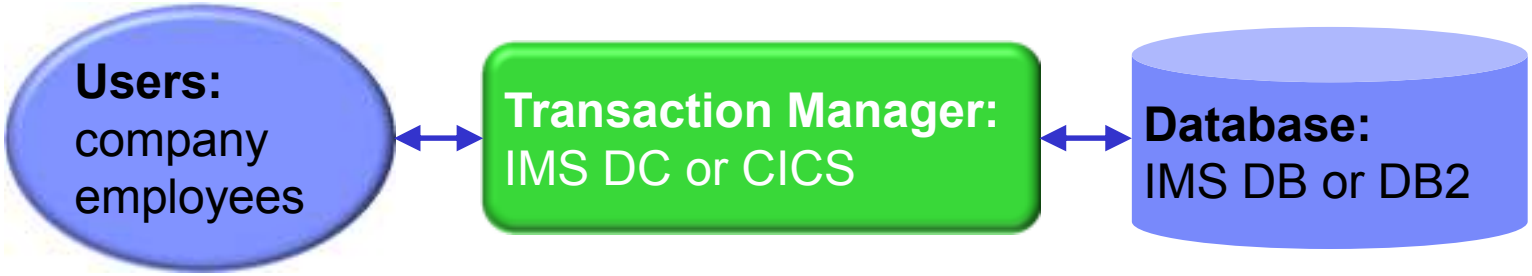
Exception processing for CICS, DB2, and IMS



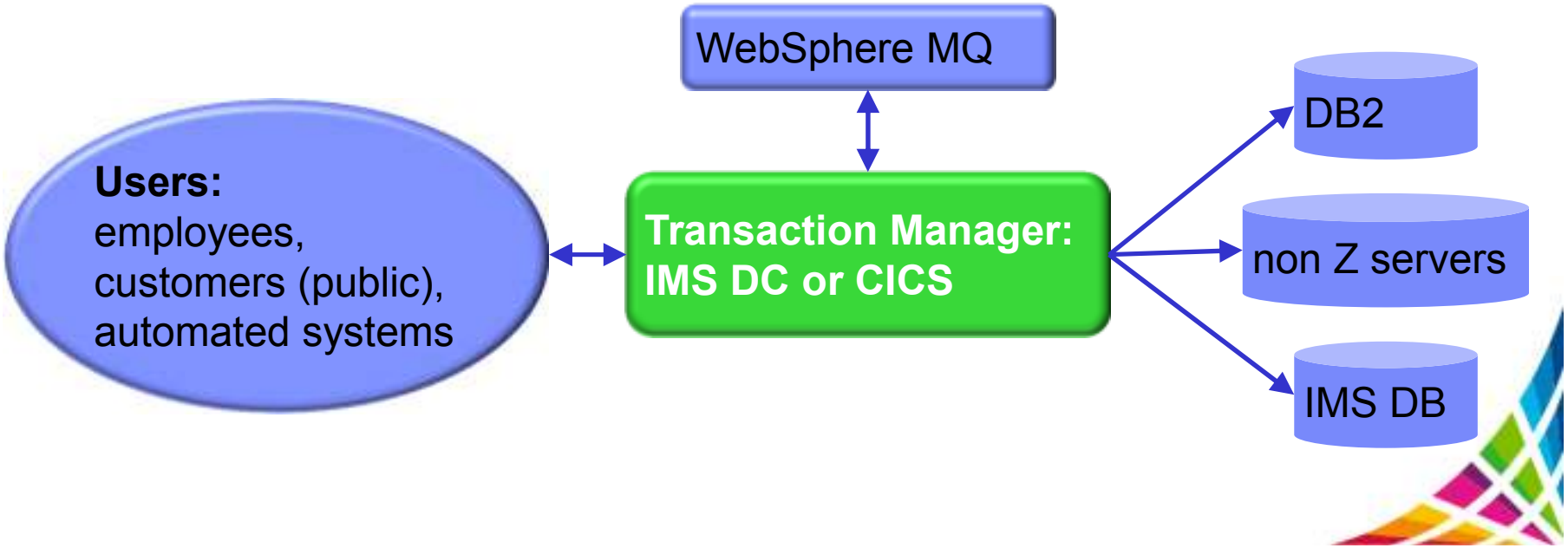
Why z/OS transaction analysis must be collaborative and span z/OS subsystems

It's about application evolution

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

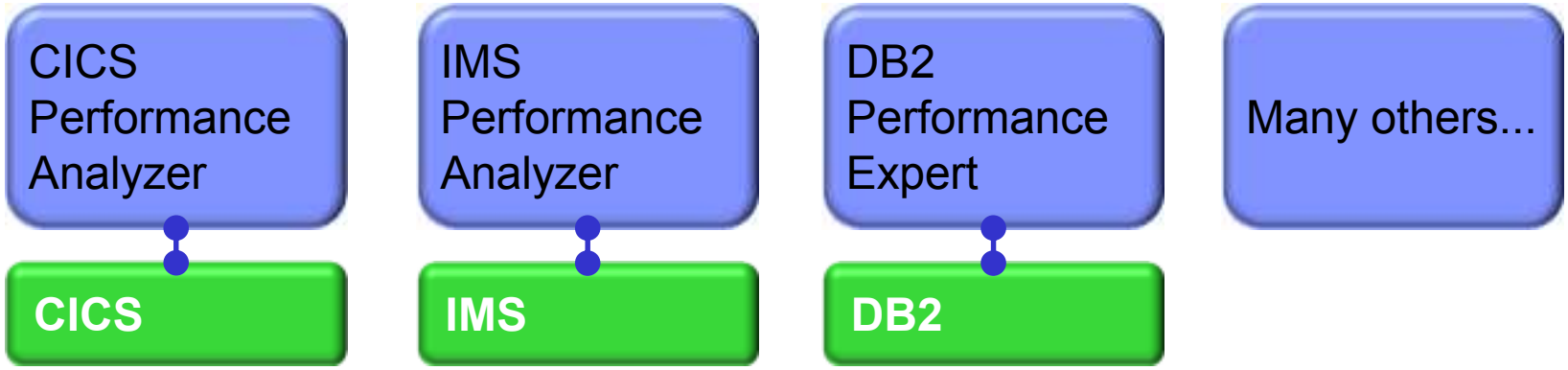


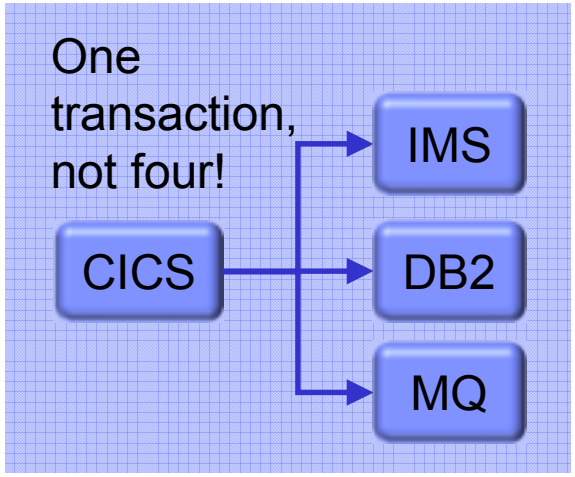
Today:
users are customers; data is **complex, heterogeneous**, often distributed

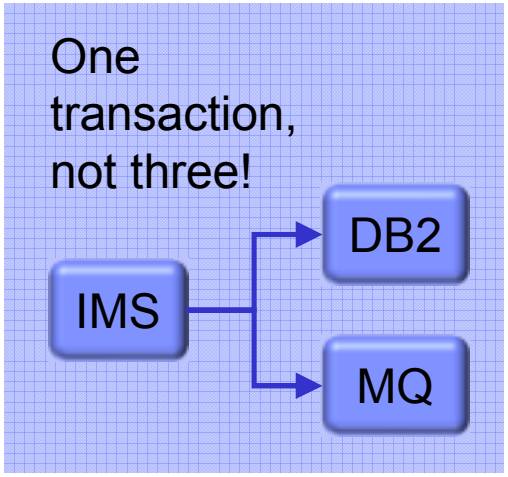


Traditional tools based on “silo” model

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



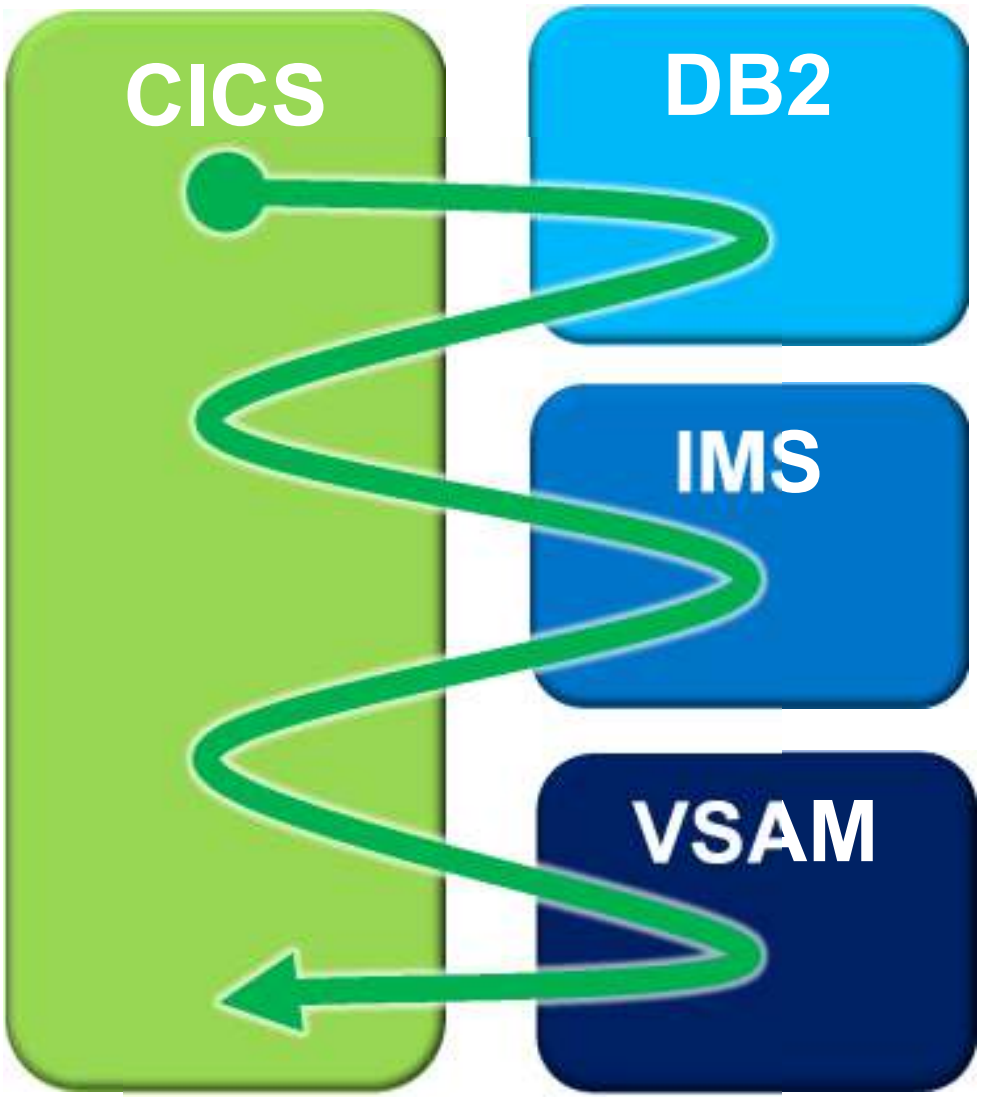




Each tool is well-suited to its environment, but you often need a subject-matter expert to use each tool

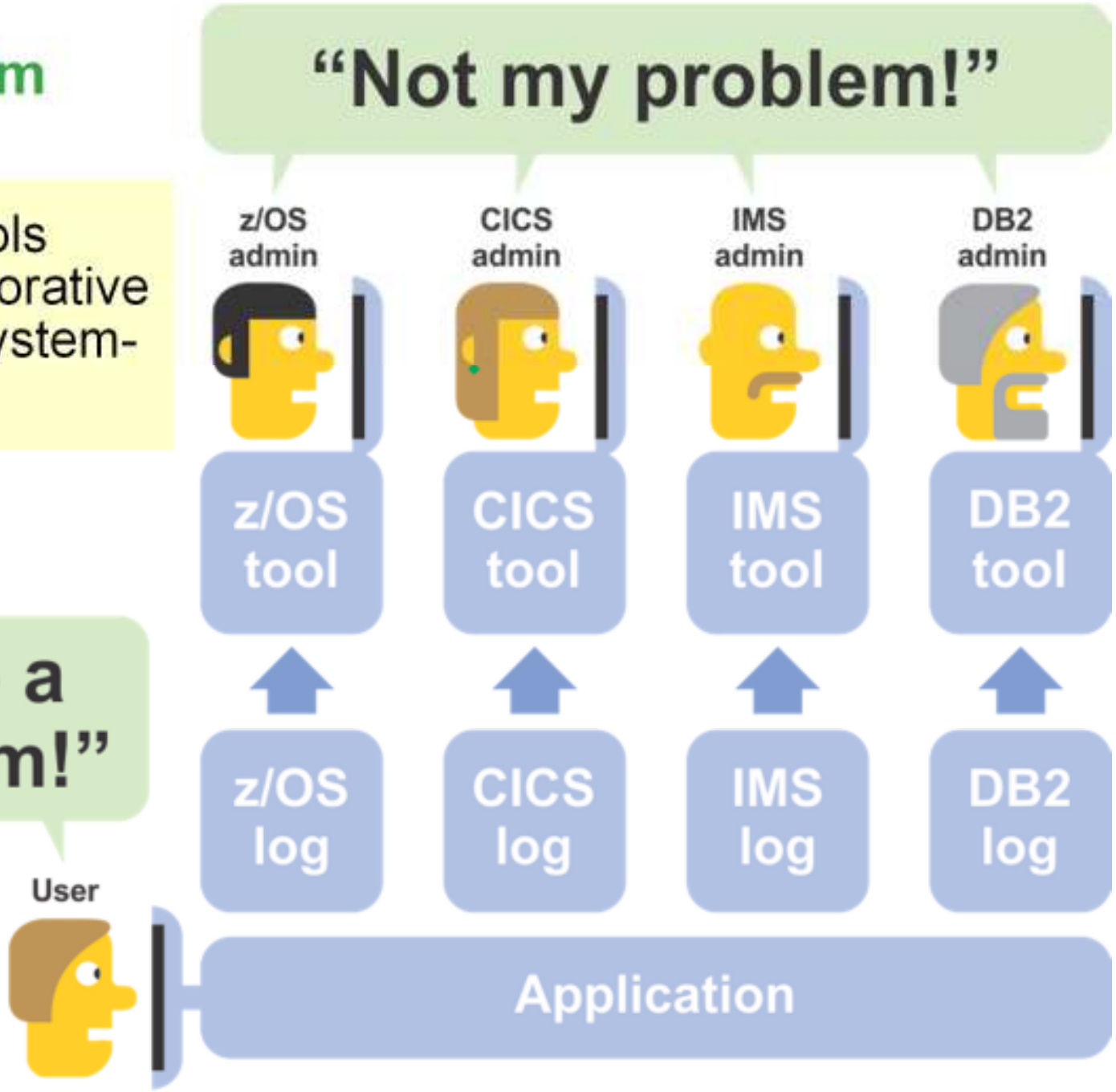
Where did the delay occur?

- 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



The problem

Traditional tools are not collaborative and are subsystem-specific

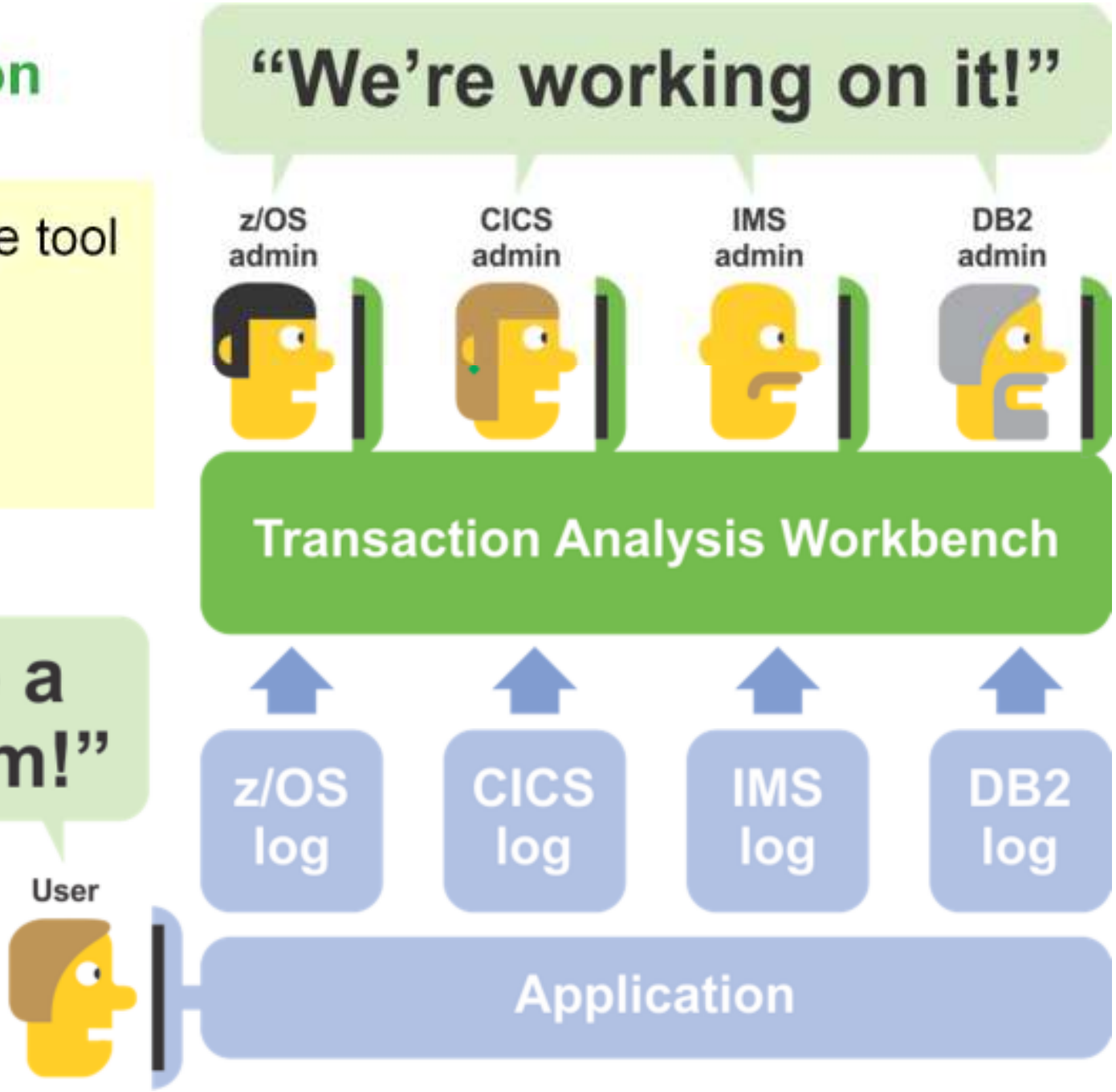


Collaboration is key with fewer staff

- Why is collaboration so difficult?
  - SME may be in silos
    - Unable or unwilling to cooperate easily
    - Takes too much time using current tools
- What do good collaboration tools achieve?
  - Conservation of SMEs' time (a valuable, limited resource)
  - Transparency of information (everyone using the same data)
- We need to encourage SMEs to see the benefit of collaboration
  - Reduced time to resolution
  - More SME time focused on problem resolution
  - Cross-training of first responders and SMEs

The solution

A collaborative tool that spans subsystems; experts work together



Introducing Workbench

IBM Transaction Analysis Workbench for z/OS

- A tool for **collaborative problem solving**:
  - Between “first responders” and subject-matter experts (SMEs)
  - Between SMEs in different areas
- Provides a life cycle view of transaction activity across subsystems
  - Changes the way problem resolution is performed
  - Ensures everyone is looking at the same transactional data
- Goes in-depth.
  - Uses SMF, trace, and log records to follow transaction flow
- Better assignment of problems to the correct group
  - Improved confidence in problems assigned to experts

How Workbench can help application development teams

Application releases must work and perform when deployed

- Application teams perform validation testing during roll-out
  - Is performance a part of validation testing?
  - If performance validation is done, who does the validation?
  - What criteria are used?
- Does the evaluation occur at the transaction level?
- What is the cost of performance validation testing?
- What is the cost of a failed roll-out due to poor performance?
- Do the system programming staff have time to help?

Value of instrumentation data to application development teams

- Same value as for system programmers and DBAs:
  - Evaluate transaction response time
  - Evaluate application database update patterns
  - Diagnose application errors and/or performance issues

Inhibitors to instrumentation use by application development teams

- Value of instrumentation data not known
  - May not know what is available and how to use it
  - Not a traditional development tool
- Do not know how to obtain the data or data access not allowed
  - May not have access to system parts
- Limited or no knowledge of tools that use instrumentation data
- Limited access to system programmers' time
  - Reluctant to bother system programmers to get help

How Workbench can help

- Automates gathering of instrumentation data
  - Application development teams do not have to acquire those skills
- Performs automated reporting of validation testing
  - Includes reporting via CICS PA and/or IMS PA, in addition to its own reports
- Analyses instrumentation data for performance exceptions
  - Provides easy recognition of validation testing against expected results
- Provides transaction life cycle views of transaction exceptions
  - Identify what part of transaction is causing problem
- Saves results of each validation testing run
- Facilitates collaboration with system programmers and/or DBAs for help with transaction exception diagnosis

Summary of application team benefits

- Automate task often unfamiliar to application teams
  - Data acquisition – get the data needed for problem analysis
  - Autonomics – automated transaction analysis (life cycle)
  - Reporting – basic reporting without tool-specific knowledge
- Enables collaboration with other experts when required
  - Shared data approach to collaboration
    - DBA, system programmer provide assistance when needed
- Analysis of applications performance testing
  - Exceptions process provides evaluation of validation testing runs
  - Deeper transaction evaluation if exception process reports issues

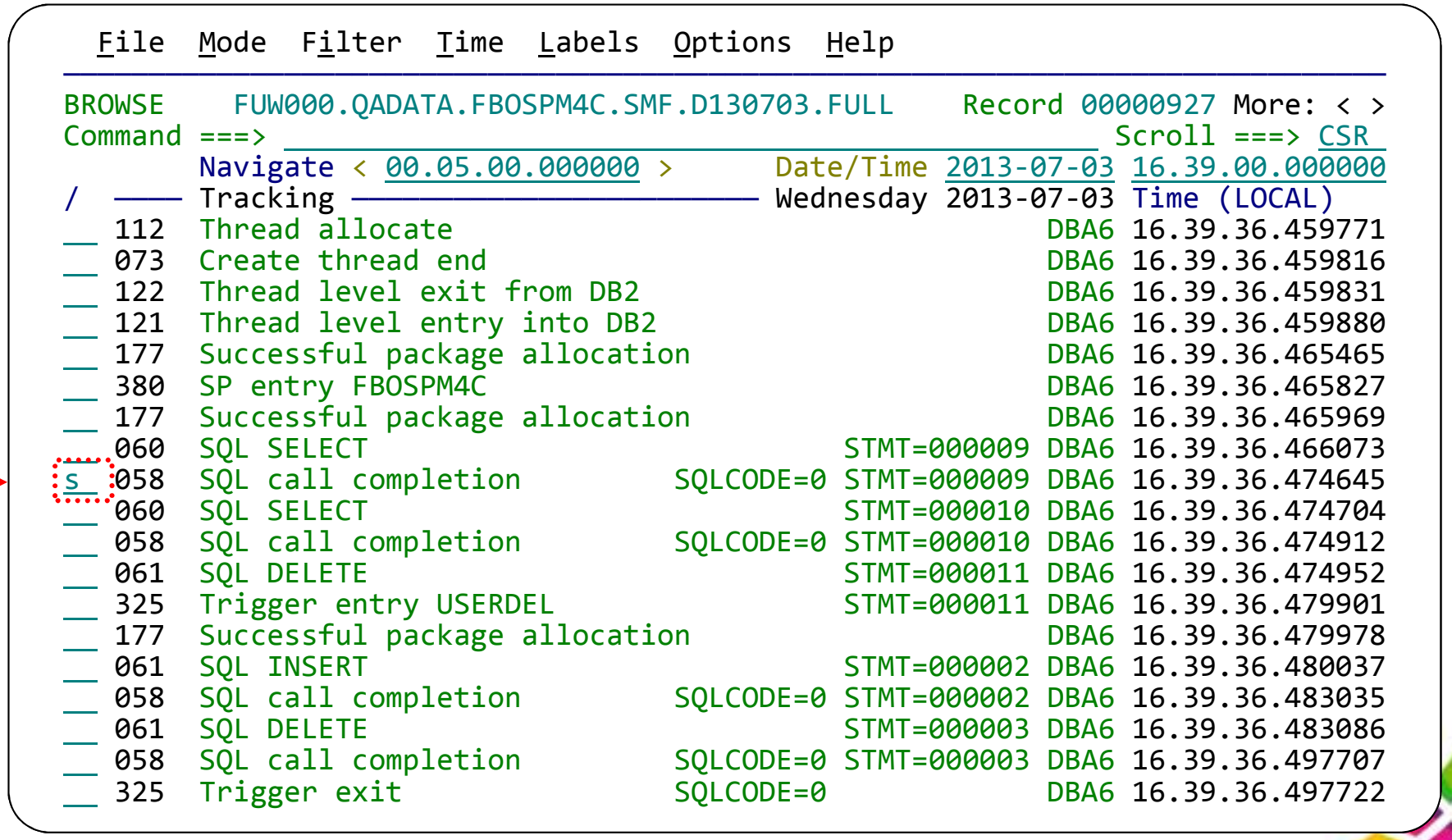
Coming soon:
future Workbench features

Coming soon

- **Enhanced support for DB2 trace records**
  Detailed field-by-field formatting for more than 60 IFCIDs.
- **Workflows and session templates**
  SMEs can define a workflow (a sequence of analysis tasks) and save them in a session template. When creating a new session, users can select the session template that best matches the problem.
- **Eclipse-based rich client platform (RCP) user interface**
  Implements a subset of the ISPF dialog. Primarily aimed at “first responders”: create a session; run a workflow; assign to appropriate SME.
- **Automated SMF file selection**
- **SMF 42.6 DASD Data Set I/O report**

Enhanced support for DB2 trace records

- New DB2 trace (“DTR”) log type for IFCID records (from SMF record types 100, 101, 102, or GTF data set records)



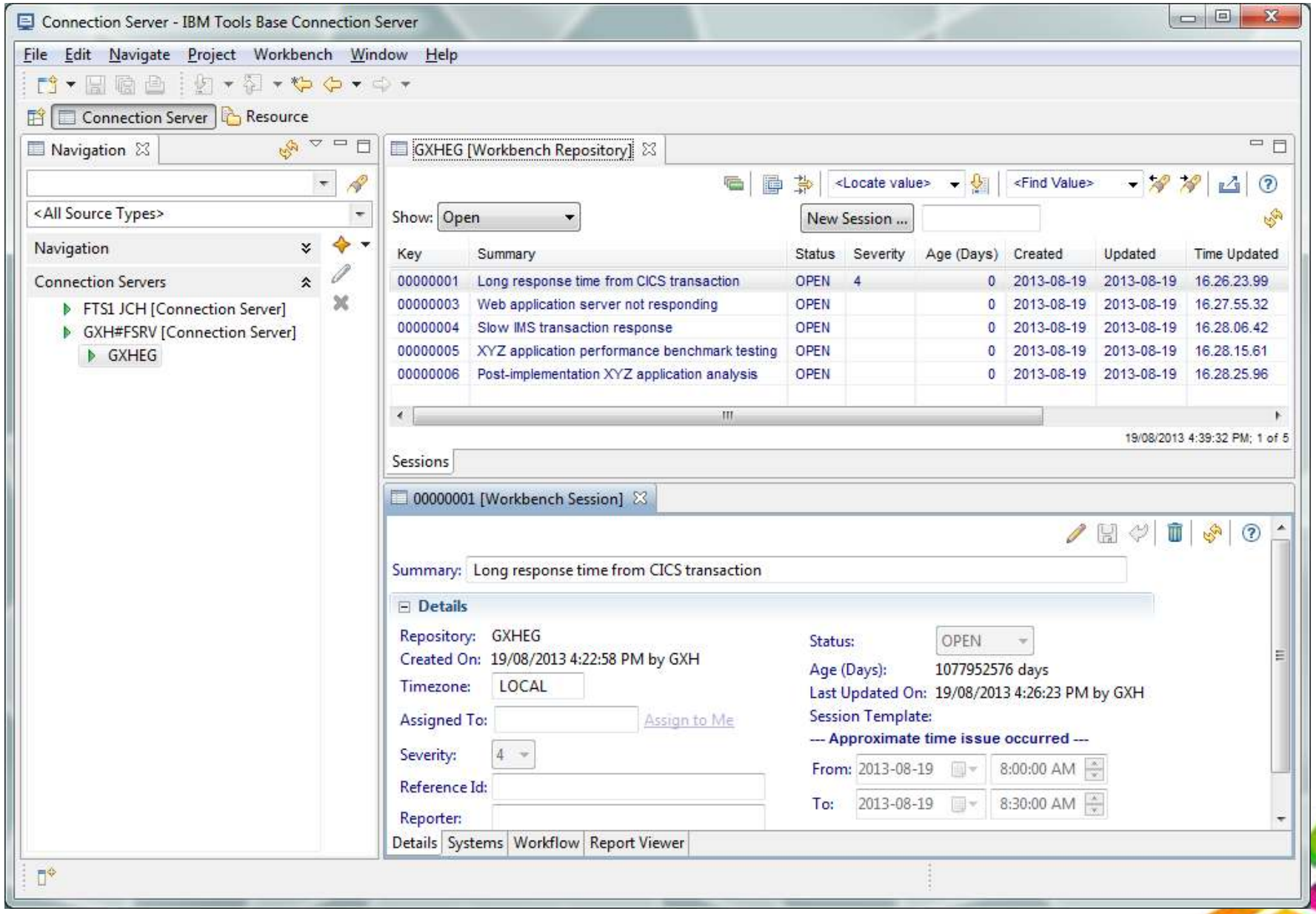
Enhanced support for DB2 trace records (cont.)

▶ **SP entry FBOSPM4C**		DTR 233
SP entry FBOSPM4C		DTR 380
Successful package allocation		DTR 177
▶ **SQL SELECT STMT=000009**		DTR 060
◀ SQL call completion SQLCODE=0 STMT=000009	0.008572s	DTR 058
▶ **SQL SELECT STMT=000010**		DTR 060
◀ SQL call completion SQLCODE=0 STMT=000010	0.000208s	DTR 058
▶ **SQL DELETE STMT=000011**		DTR 061
▶ **Trigger entry USERDEL STMT=000011**		DTR 325
Successful package allocation		DTR 177
▶ **SQL INSERT STMT=000002**		DTR 061
◀ SQL call completion SQLCODE=0 STMT=000002	0.002998s	DTR 058
▶ **SQL DELETE STMT=000003**		DTR 061
◀ SQL call completion SQLCODE=0 STMT=000003	0.014621s	DTR 058
◀ Trigger exit SQLCODE=0	0.017821s	DTR 325
◀ SQL call completion SQLCODE=0 STMT=000011	0.022827s	DTR 058
▶ **SQL SELECT STMT=000013**		DTR 060
◀ SQL call completion SQLCODE=0 STMT=000013	0.007439s	DTR 058
▶ **SQL SELECT STMT=000014**		DTR 060
◀ SQL call completion SQLCODE=0 STMT=000014	0.000307s	DTR 058
SP statement execution detail		DTR 499
◀ SP exit FBOSPM4C =0	0.039876s	DTR 233
SP exit FBOSPM4C =0		DTR 380

Web page created by a REXX exec: presents DB2 trace records as a nested hierarchy, rather than a flat list

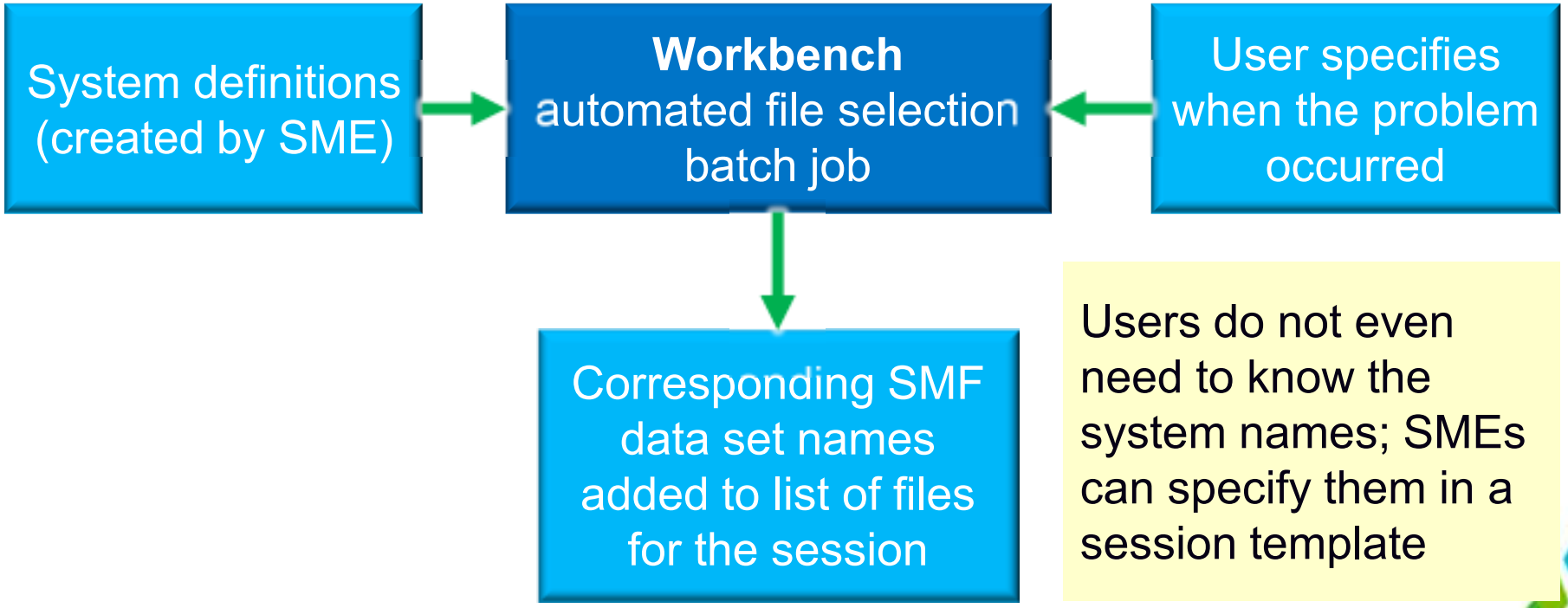
By matching start and end records, we can calculate elapsed times (for example, for stored procedures)

Eclipse-based rich client platform (RCP) UI



Automated SMF file selection

- One-time task: SMEs create system definitions that specify your enterprise-specific data set naming conventions (patterns) for SMF files
- Based on these definitions, the user can specify when a problem occurred; Workbench identifies the specific SMF files that contain the corresponding log records, and adds those files to your session



Users do not even need to know the system names; SMEs can specify them in a session template

Summary: Transaction Analysis Workbench

- **Saves time and money**
  - Well-defined problems are almost solved
  - Focus on areas with highest payback
- Much faster problem resolution
  - Better assignment of problems to the correct group
- Enables **collaborative problem solving**
  - Develop company-wide approach
  - Between first responders and subject-matter experts
  - Between experts in different areas
- Improves confidence in problem definition
  - Cross training
  - Better communication

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/
- Jim Martin, US Representative, Fundi Software:
  jim_martin@fundi.com.au
- James Martin, US Representative, Fundi Software:
  james_martin@fundi.com.au
- John Hancy, CICS and IMS Tools development, Fundi Software:
  john_hancy@fundi.com.au

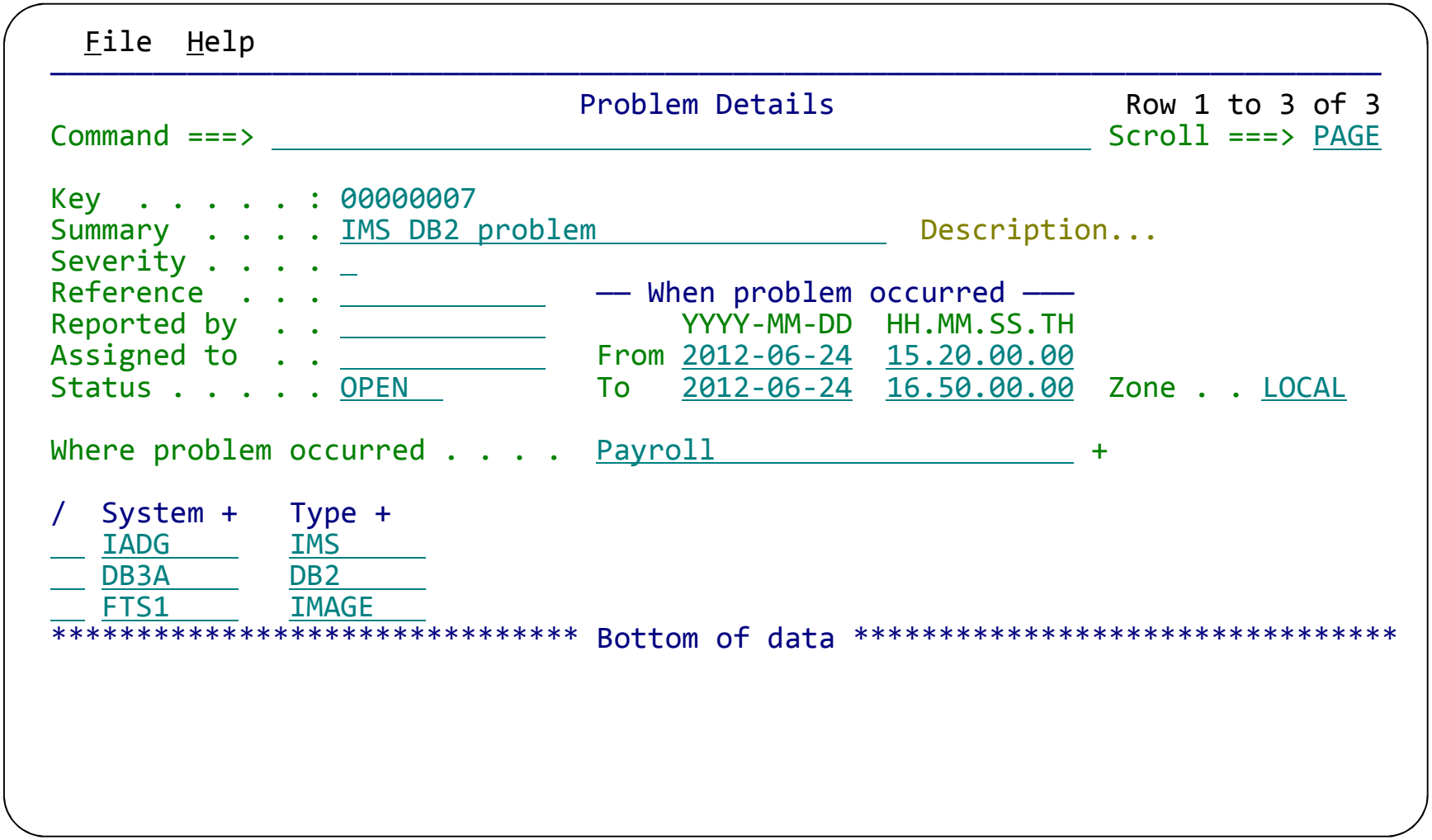
Scenario:
IMS-DB2 problem

Scenario: IMS DB2 problem

1. 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

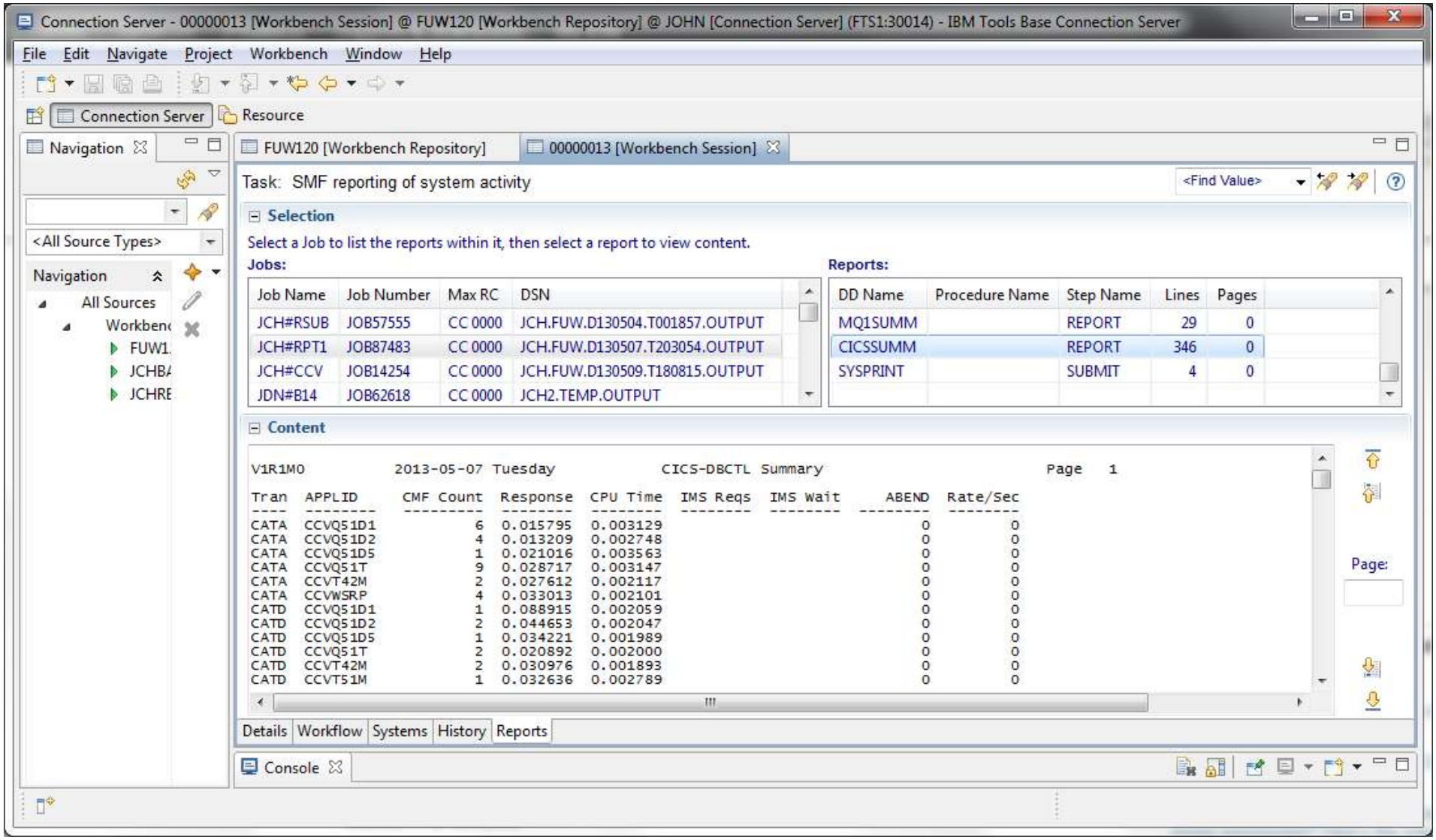
- The analysis is divided into two parts:
  1. The **first responder**:
     - Registers the problem in the Workbench session manager and collects the log files
     - Follows a process orientated script to assign problem to initial expert
       - Based on what is found
  2. The **subject-matter expert** 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



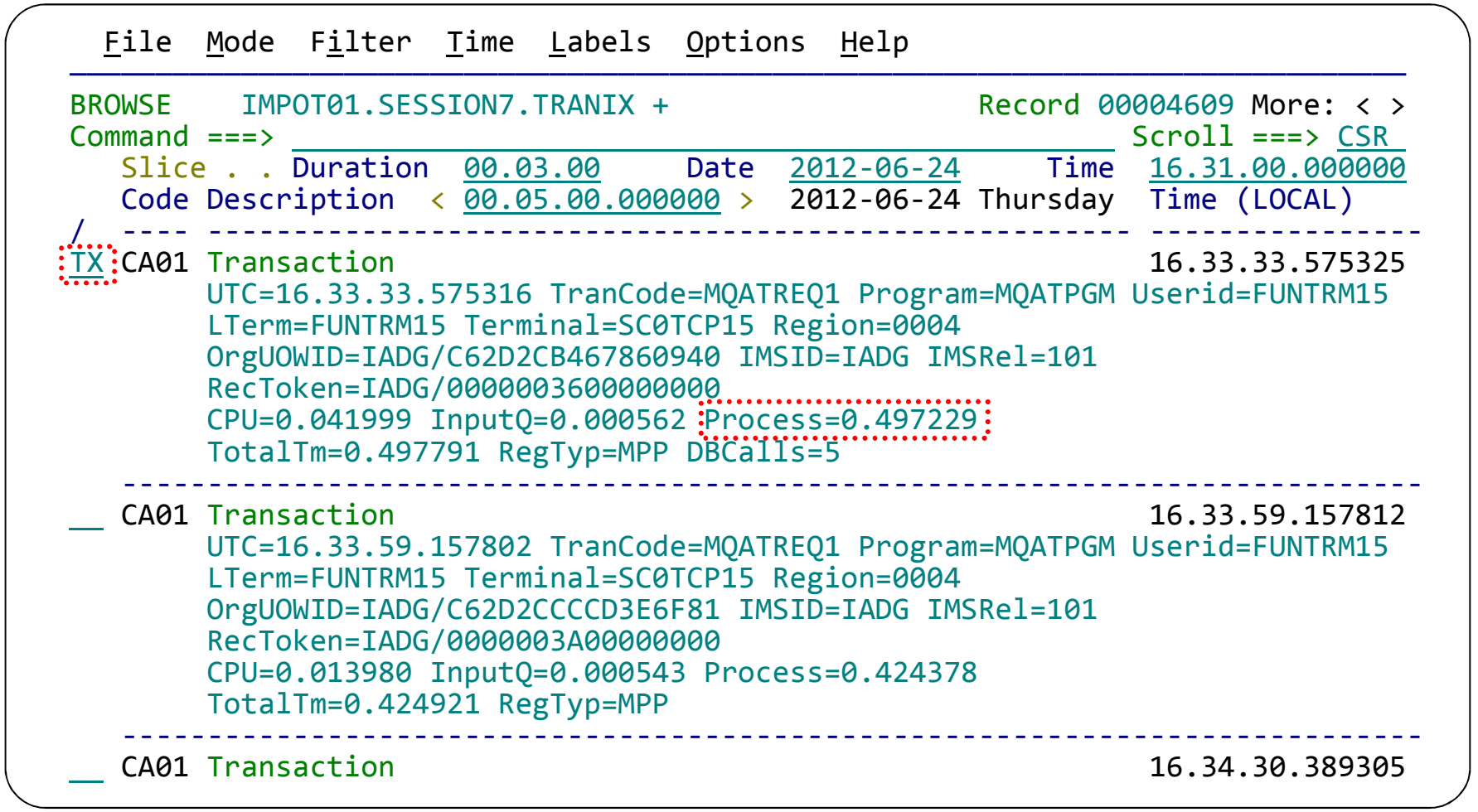
Create a session (main menu ▸ option 1 **Sessions** ▸ **NEW**).
Select the environment where the problem occurred. This populates the system list.

Coming soon: Eclipse-based GUI



1. Register a new problem; work on an existing problem
2. Execute the workflow to locate the required diagnostic data
3. Run reports; view the output

Subject-matter expert: Exception candidate investigation



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

Transaction life cycle investigation

```
BROWSE    JCH.FUW.P0000003.D130625.T094351.EXTRACT   Record 00003211 More: < >
Command ===> ____________________________________________ Scroll ===> CSR
        Navigate < 00.00.01.000000 >      Date/Time 2013-06-22 14.57.57.969312
/  ____ Tracking ____________________  Saturday 2013-06-22 Time (Relative)
TX CA01 IMS Transaction TranCode=FBOIAT42 Region=0001           15.18.02.863040
__ 01   Input Message TranCode=FBOIAT42                              +0.000000
__ 35   Input Message Enqueue TranCode=FBOIAT42                      +0.000016
__ 08   Application Start TranCode=FBOIAT42 Region=0001              +0.022361
__ 5607 Start of UOR Program=FBOIAP42 Region=0001                    +0.022361
__ 31   DLI GU TranCode=FBOIAT42 Region=0001                         +0.022378
__ 5616 Start of protected UOW Region=0001                           +0.022635
__ 5600 Sign-on to ESAF Region=0001 SSID=DBA6                        +0.043671
__ 5600 Thread created for ESAF SSID=DBA6                            +0.043684
__ 380  SP entry FBOSPM3C                                 DBA6       +0.044408
__ 0020 DB2 Unit of Recovery Control - Begin UR                      +0.082207
__ 0010 DB2 Savepoint                                                +0.082223
__ 0020 DB2 Type 2 Index Update                                      +0.082223
__ 0020 DB2 Delete from a Data Page                                  +0.136815
__ 0020 DB2 Update Spacemap                                          +0.136831
__ 233  SP exit  FBOSPM3C                  SQLCODE=0000 DBA6         +0.488788
__ 380  SP exit  FBOSPM3C                  SQLCODE=0000 DBA6         +0.488800
__ 5600 Commit Prepare starting Region=0001 SSID=DBA6                +0.489774
__ 0020 DB2 Unit of Recovery Control - End Commit Phase 1            +0.490271
__ 03   Output Message Response LTerm=FUNTRM06                       +0.490908
__ 35   Output Message Enqueue LTerm=FUNTRM06 Region=0001            +0.490918
__ 3730 Syncpoint End of Phase 1 Region=0001                         +0.490931
__ 0020 DB2 Unit of Recovery Control - Begin Commit Phase 2          +0.491423
__ 0020 DB2 Unit of Recovery Control - End Commit Phase 2            +0.492095
__ 239  Package accounting-Native SP                      DBA6       +0.492299
__ 003  Thread accounting                                 DBA6       +0.492321
__ 5600 Commit Continue completed Region=0001 SSID=DBA6              +0.492947
__ 37   Syncpoint Message Transfer Region=0001                       +0.492964
__ 33   Free Message                                                 +0.492977
__ 5612 Syncpoint End of Phase 2 Program=FBOIAP42 Region=0001        +0.492987
__ 31   Communications GU LTerm=FUNTRM06                             +0.493048
__ 07   Application Terminate TranCode=FBOIAT42 Region=0001          +0.493201
```

1. Start tracking a CICS or IMS transaction
2. See the transaction life cycle events from the IMS and DB2 logs, SMF and traces; merged together with no preparation required
3. Notice when the response time starts to increase rapidly
4. In this case, the problem was caused by a table scan in a DB2 stored procedure.

   A drill down of the DB2 trace was able to determine this.

Detail DB2 event data view using forms view

```
******************************** Top of data ********************************
+018C  Code... 058   SQL Call completion           RC=0000 STMT=002896 DBA6
+0198  Date... 2012-11-21 Wednesday  Time... 17.40.04.013647.813

       Package
+0034  Location...... 'DB2ALOC'         Collection ID........ 'CSQ5L710'
+0056  Package name... 'CSQ5L710'       Consistency token.... 193153A81425EA0D

+0072  SQLCA...... SQL communication area (SQLCA)
+0072  SQLCAID.... 'SQLCA   '  SQLCABC.... +136        SQLCODE.... +0
+0082  SQLERRML... +0          SQLERRM.... '        '
+00CA  SQLERRP.... 'DSN     '  SQLERRD1... +0          SQLERRD2... +0
+00DA  SQLERRD3... +0          SQLERRD4... FFFFFFFF    SQLERRD5... +0
+00E6  SQLERRD6... +0          SQLWARN0... ' '         SQLWARN1... 'N'
+00EC  SQLWARN2... ' '         SQLWARN3... ' '         SQLWARN4... ' '
+00EF  SQLWARN5... '1'         SQLWARN6... ' '         SQLWARN7... ' '
+00F2  SQLWARN8... ' '         SQLWARN9... ' '         SQLSTATE... '00000'

+00FC  Statement number... +2896
+0106  Query command ID... 00000000     Query instance ID.... 00000000

+0118  QW0058ID... Scantype
+0118  Data type....  'INDX'  Rows processed.. +234    Rows examined.... +12
+012C  Rows qualified... +7   After stage 1... +4      After stage 2.... +3
+0140  Rows inserted.... +17  Rows updated.... +12     Rows deleted..... +24
+0158  Pages scanned.... +76
+015C  Pages scanned (RI)... +0         Rows deleted (RI).... +0
+0160  Pages scanned (LOB).. +0         Pages updated (LOB).. +0

+0188  QWHS....... Product section standard header
+0194  DB2 subsystem.... 'DBA1'

+01BC  QWHSLWID... LUWID
+01BC  Network ID... 'FTS1'             LU name.... 'DBA1LU  '
+01C4  Uniqueness value... CA80E6B51165 Commit count... +1
****************************** Bottom of data ******************************
```

Program statement number 2896 caused an index scan that processed 234 rows in the table

Zoom to see more detail about log record fields

```
+002C  QW0065..... IFCID data
       Package
+002C  Location... 'DB2BLOC'   Collection ID.... 'MQATPGM'
+004E  Package name... 'MQATPGM'
+0060  Consistency token.... 189E34F81745545D
       Statement
+006A  Statement type... 91      Cursor name.... 'C1'
+0080  Reoptimization... 0000    Statement number... +835
+0088  Cursor scrollability... 40
+0089  Cursor sensitivity... 40
+008A  Result table type.... 40  Close commit... D5
+0094  Query command ID... 0
```

Isolation.... 'U'

Zoom

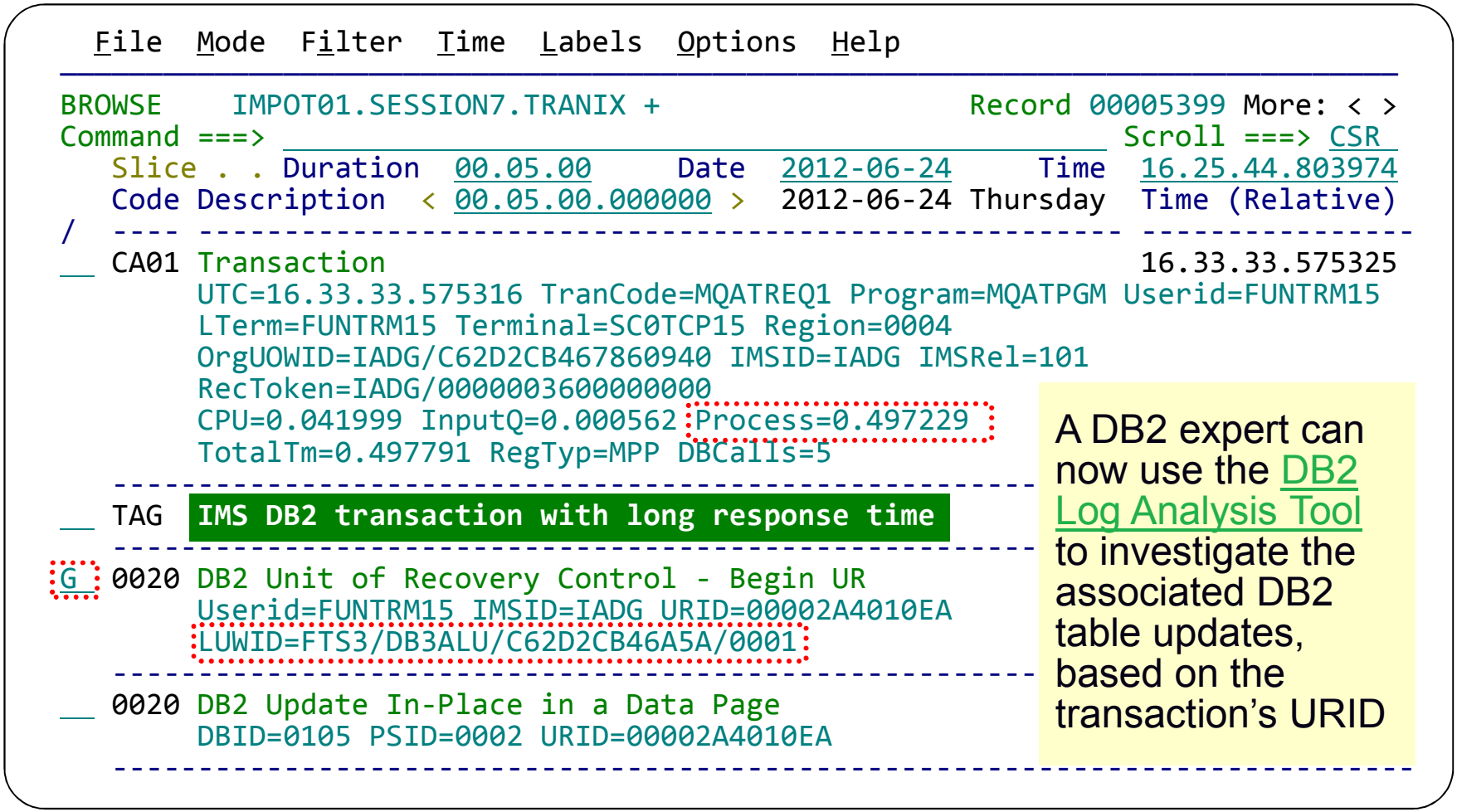
```
                    Field Zoom
  File  Menu  Help
BROWSE    JCH.FUW.P0000003.D130625.T094351.EXTRACT +         Line 00000000
Command ===>                                          Scroll ===> PAGE
******************************* Top of data ********************************
+007F  QW0065I.... 'U'  Isolation level of the SQL statement.

 Off   QW0065RR... 'R'  RR (repeatable read)
 Off   QW0065RS... 'T'  RS (read stability)
 Off   QW0065CS... 'S'  CS (cursor stability)
 On    QW0065UR... 'U'  UR (uncommitted read)
 Off   QW0065XR... 'X'  XR (Repeatable read with X lock)
 Off   QW0065XS... 'L'  XS (Read stability with X lock)
******************************* End of data ********************************
```

Life cycle events: expanded summary view

```
  File  Mode  Filter  Time  Labels  Options  Help
BROWSE    JCH.FUW.P0000003.D130625.T094351.EXTRACT   Record 00003251 More: < >
Command ===> _____________________________________________ Scroll ===> CSR
        Navigate < 00.00.01.000000 >      Date/Time 2013-06-22 14.57.57.969312
/  ____ Tracking ____________________________  Saturday 2013-06-22 Time (Elapsed
__ 380  SP entry FBOSPM3C                                  DBA6 15.18.02.907449
        TranCode=FBOIAP42 Userid=FUNTRM06 ClientID=ICDG
        LUWID=FTS3/DBA6LU/CB8C9439E347/0001
   ------------------------------------------------------------------------------
__ 380  SP exit  FBOSPM3C                    SQLCODE=0000 DBA6        0.444391
        TranCode=FBOIAP42 Userid=FUNTRM06 ClientID=ICDG
        LUWID=FTS3/DBA6LU/CB8C9439E347/0001
   ------------------------------------------------------------------------------
__ 003  Thread accounting                                  DBA6        0.003521
        TranCode=FBOIAP42 Program=FBOIAP42 Userid=FUNTRM06 Region=0001
        RecToken=ICDG/0000000100000000 ClientID=ICDG
        RESP=0.448242 CPU1=0.324230 CPU2=0.000791 I/O3=0.003360 Source=IMS_MPP
        GtPgRq=284 SyPgUp=6 Suspnd=0 DeadLk=0 TimOut=0 MxPgLk=2
        Sel=4 Ins=0 Upd=0 Del=1 LUWID=FTS3/DBA6LU/CB8C9439E347/0002
   ------------------------------------------------------------------------------
****************************** Bottom of Data ********************************
```

Scroll right to show the records in expanded view with elapsed or relative times:
Elapsed – time between log record events
Relative – time since start of transaction (or other selected event)

Identifying events for review or collaboration



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 2012-06-24 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
```

Problem resolution: 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
- Automatically locates log files for the problem time range for supported subsystems
  - SMF
  - IMS logs
  - DB2 recovery log
- Enables a collaborative problem analysis:
  - Between first responders and subject-matter experts
  - Between experts in different areas