Introducing Version 1.2 of the Transaction Analysis Workbench for System z

See the big picture from end-to-end

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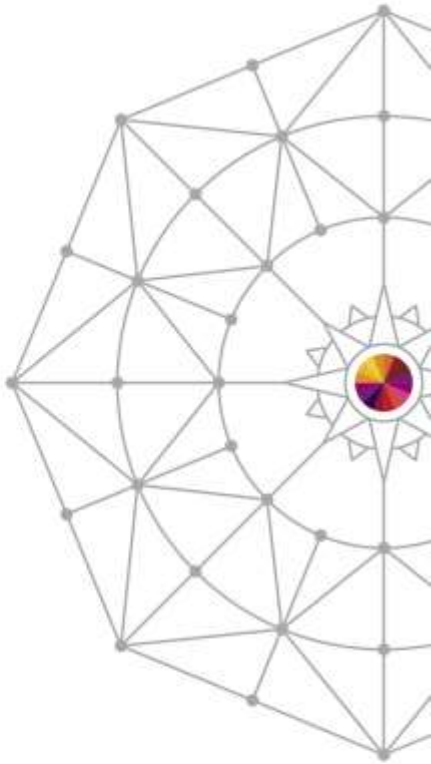
Session 16098



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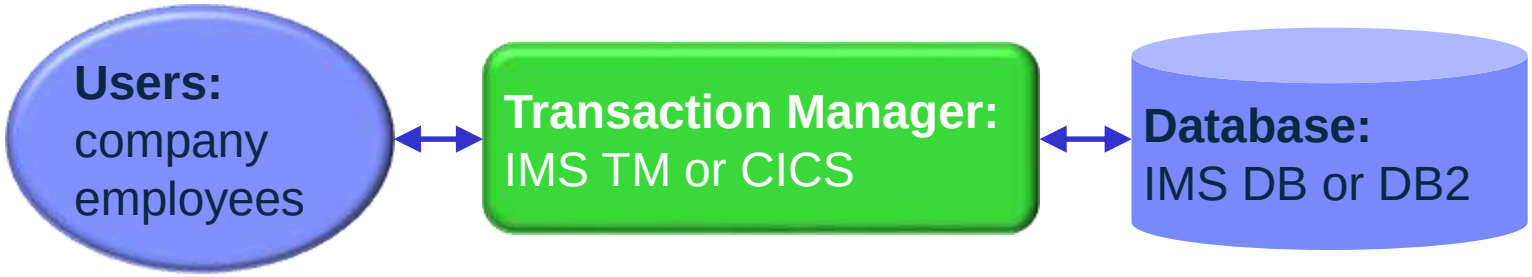
Agenda

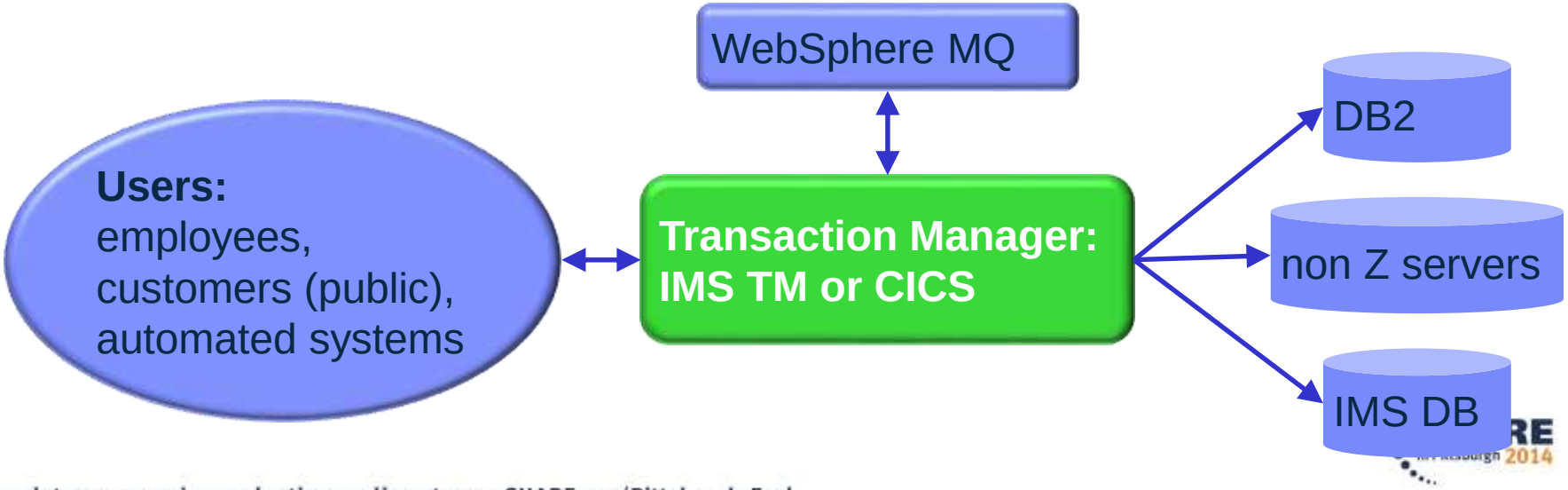
- The big picture of modern z/OS transactions
- Common questions asked when analyzing transactions
- Introducing IBM Transaction Analysis Workbench for z – Version 1.2
- Exception processing: Workbench and BigData
- How using Workbench can help application development teams
- Workbench 1.2 – recent features and possible futures
- IMS/DB2 scenario (for reference; not presented)
- SMF records handled by Workbench 1.2 (for reference; not presented)

The big picture of modern z/OS transactions

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



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

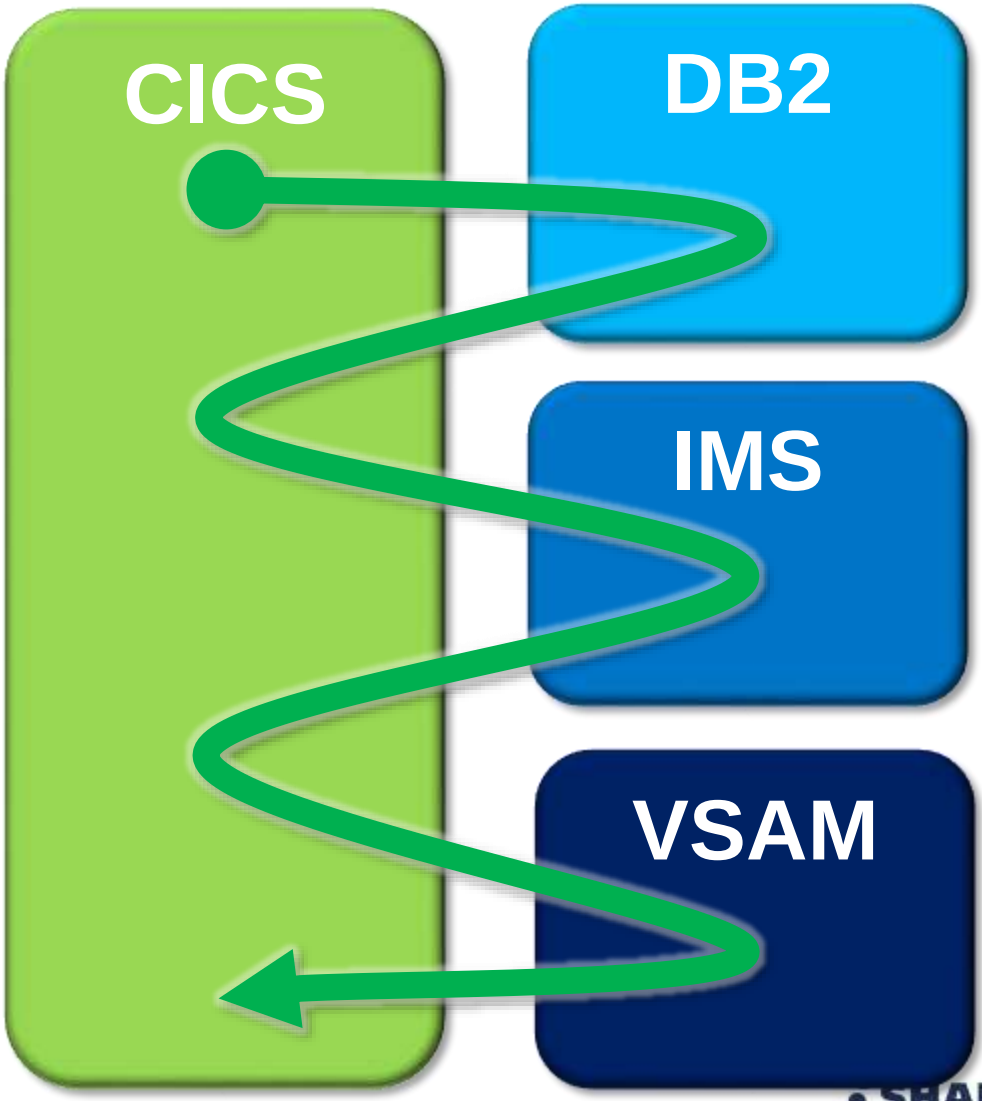


Where is the problem in my z/OS transaction?

- When a performance issue is reported, it immediately generates some questions:
  - Who's fault is it anyway?
    - Is a subsystem responsible?
      - *IMS, DB2, CICS, WebSphere MQ, etc.*
    - Is z/OS the culprit?
  - What instrumentation data is required for problem determination?
    - What is available?
    - Where/how is it collected?
    - Is it accessible?
  - Who is the best person to work on this problem?
    - How is this determined today?

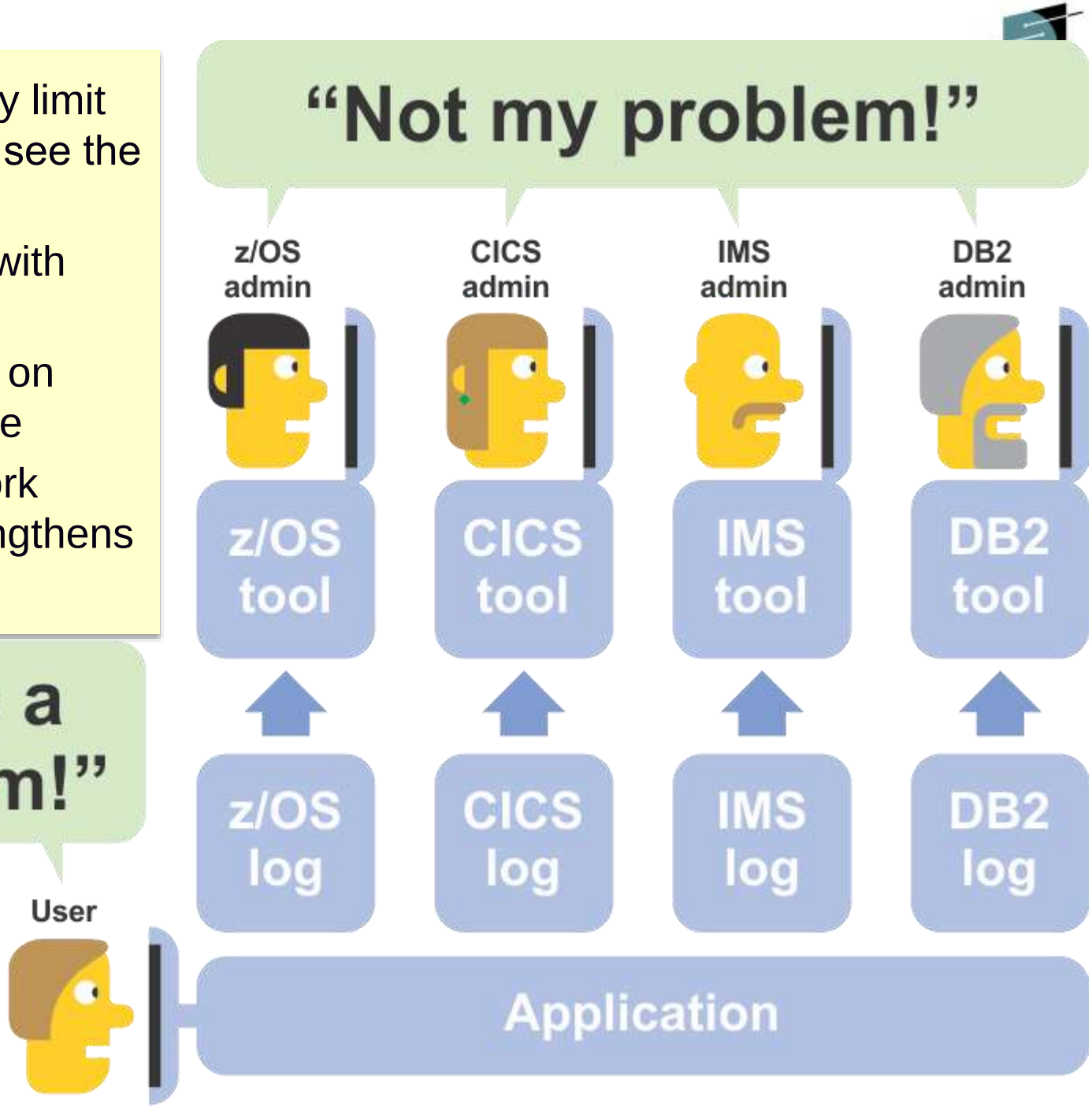
Why identifying performance issues can be difficult?

- Today's complex transaction workloads may span multiple subsystems
- Each subsystem has its own instrumentation data; data collection can be difficult
- Complex environments increase number of possible points of failure



The problem

- Existing tools may limit experts' ability to see the big picture
- Everyone works with their own data
- Analysis focused on proving innocence
- Reluctance to work together often lengthens time to resolution

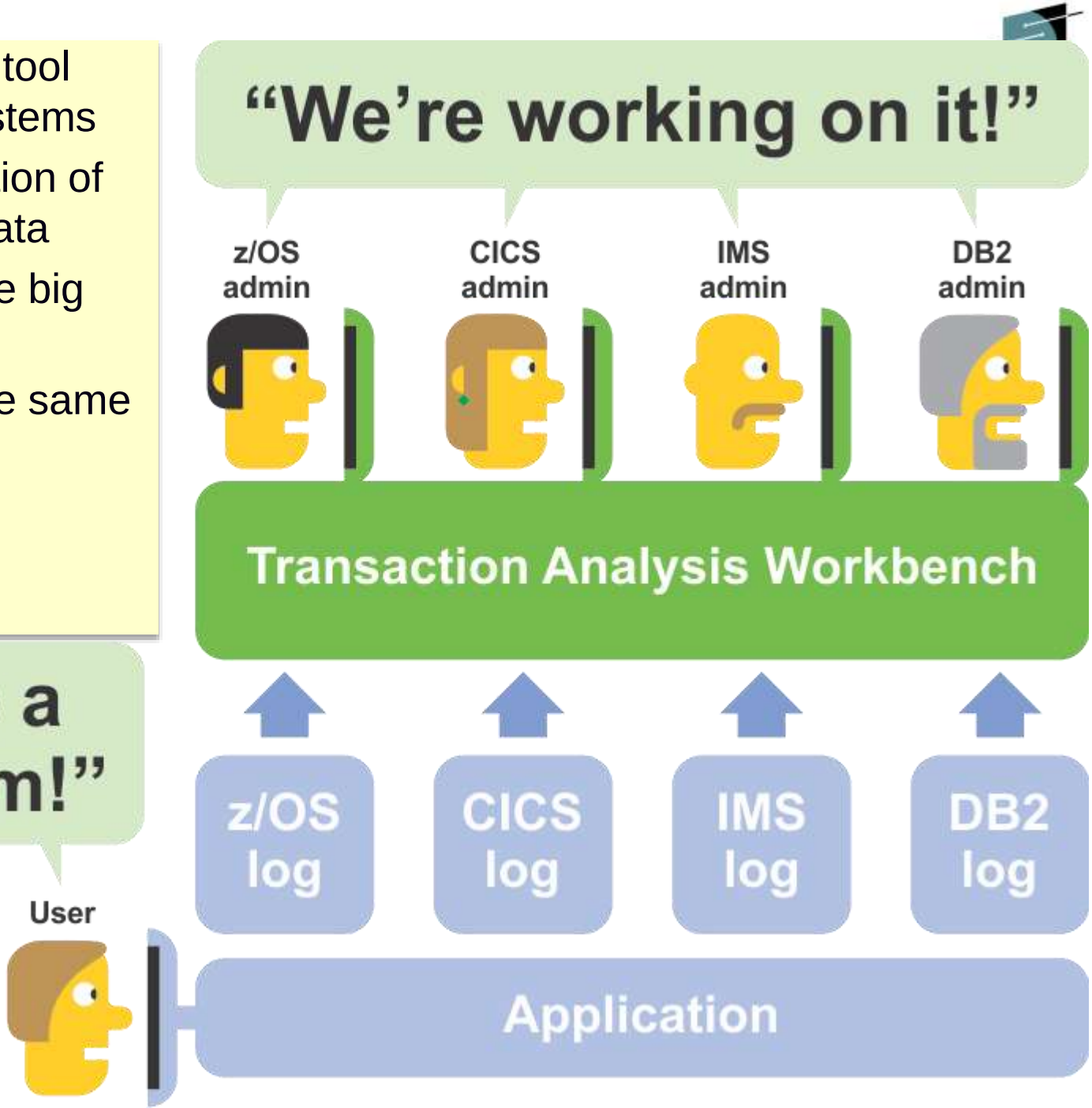


What should a end-to-end tool achieve?

- Create a common approach to transaction problem resolution
- Enable first responders to perform basic tasks that allow the SME to focus on resolving the problem
  - Conserve SME time (a valuable, limited resource)
  - Educate SME on multiple subsystems
- Provide transparency of information
  - Gather instrumentation data
  - Ensure everyone uses the same data
- Identify transaction exceptions across multiple subsystems
- Allow SME to see the big picture
  - Reduce time to resolve problems

The solution

- A comprehensive tool that spans subsystems
- Automates collection of instrumentation data
- Everyone sees the big picture
- Everyone sees the same data
- Experts can work together to solve problems



Workbench: What is it?

- A tool for cross-subsystem problem analysis:
- For first responders and SMEs
- Locates and extracts instrumentation data
- Set thresholds and identify exceptions across subsystems
- Provides a life cycle view of end-to-end transaction activity
- Better assignment of problems to the correct group

Workbench: ISPF dialog

- Log browser provides a consistent view of log types from all subsystems
- Automated file selection for IMS and DB2 logs, and SMF
- Batch Reporting:
  - Specific batch reports for CICS, IMS, DB2, SMF, and OPERLOG
  - Combined CICS-DBCTL and IMS-DB2 Exception reporting
- Transaction Index Processing:
  - Create full or exception indexes for IMS, DB2, CICS and WebSphere MQ
- Merge Instrumentation Data from multiple subsystems to present a consolidated transaction lifecycle view

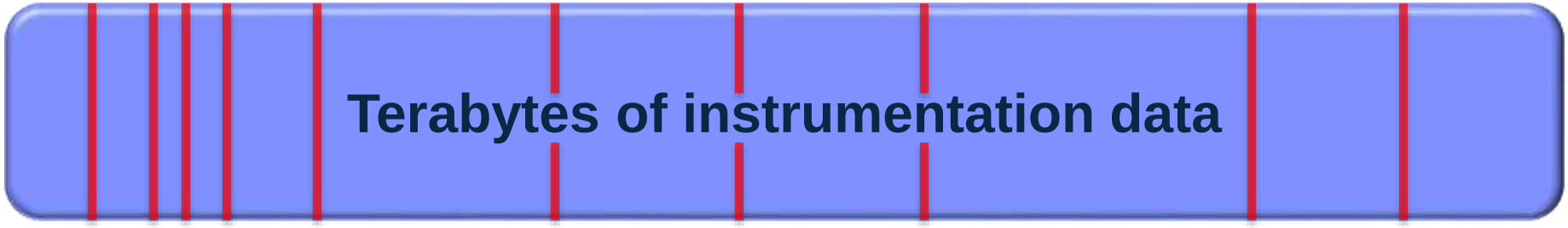
Workbench: Session Manager (ISPF and GUI)

- Problem analysis information maintained using Workbench repository:
  - Problem registration details
  - Workflows and session templates
  - Extracted subsystem and z/OS instrumentation data
  - Reports run
  - Interactive analysis sessions (**ISPF only**)
  - Notes
  - Analysis history (**ISPF only**)

Workbench: Instrumentation data sources

IMS	CICS	DB2	**WebSphere** MQ, App Server	z/OS
IMS log and trace	CMF performance class (SMF 110)	DB2 log	MQ log extract	SMF
IMS monitor	CICS trace	DB2 accounting	MQ statistics (SMF 115-1, -2)	OPERLOG
CQS log stream		DB2 performance trace (IFCIDs)	MQ accounting (SMF 116)	
IMS Connect event data (collected by IMS Connect Extensions)			WAS request activity performance statistics (SMF 120-9)	
OMEGAMON ATF				
IRLM long lock detection (SMF 79-15)				

Problem: Instrumentation data can be a BigData problem

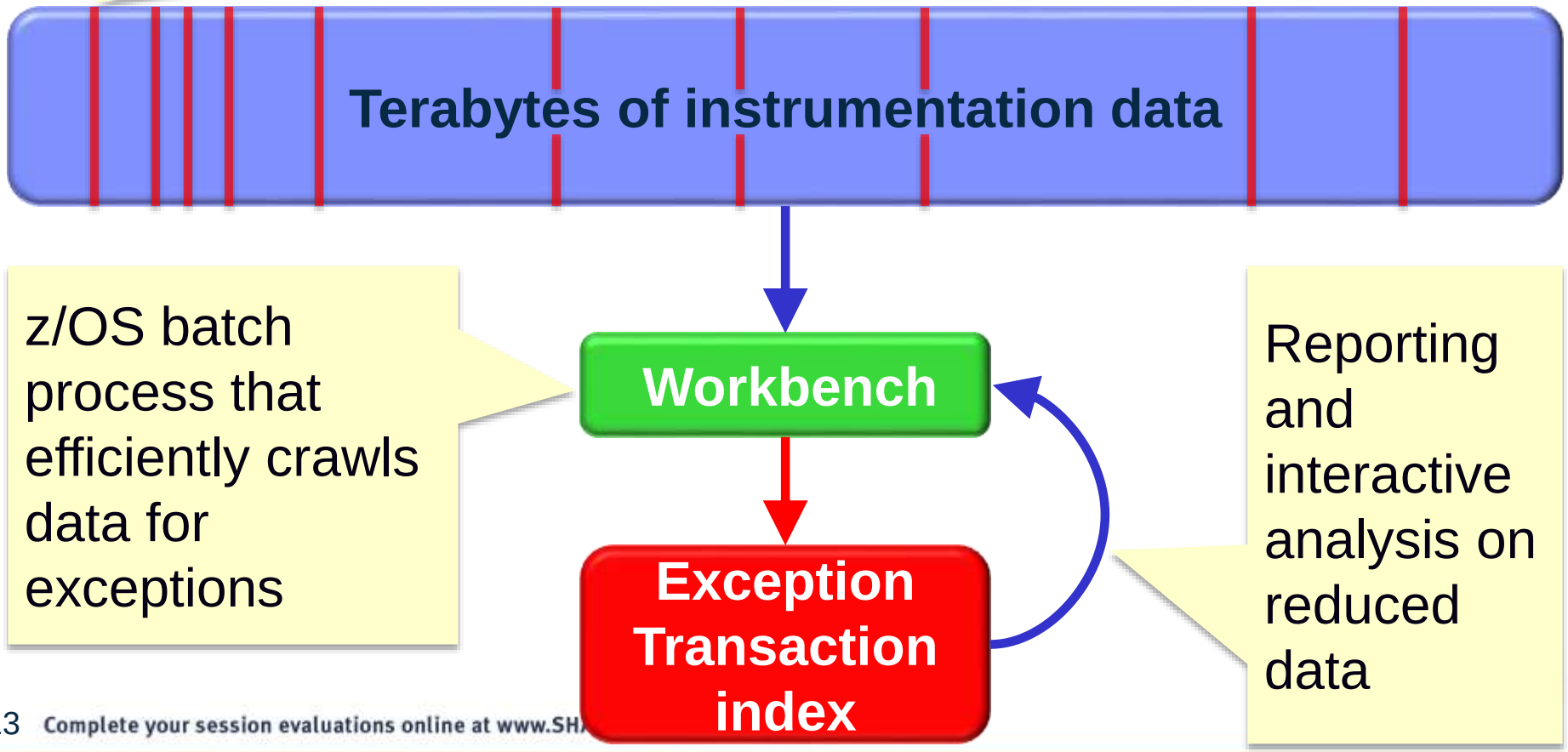


To optimize transaction performance analysis, we need to specify which performance metrics constitute an "***exception***", and quickly separate them from the bulk of "normal" instrumentation data.

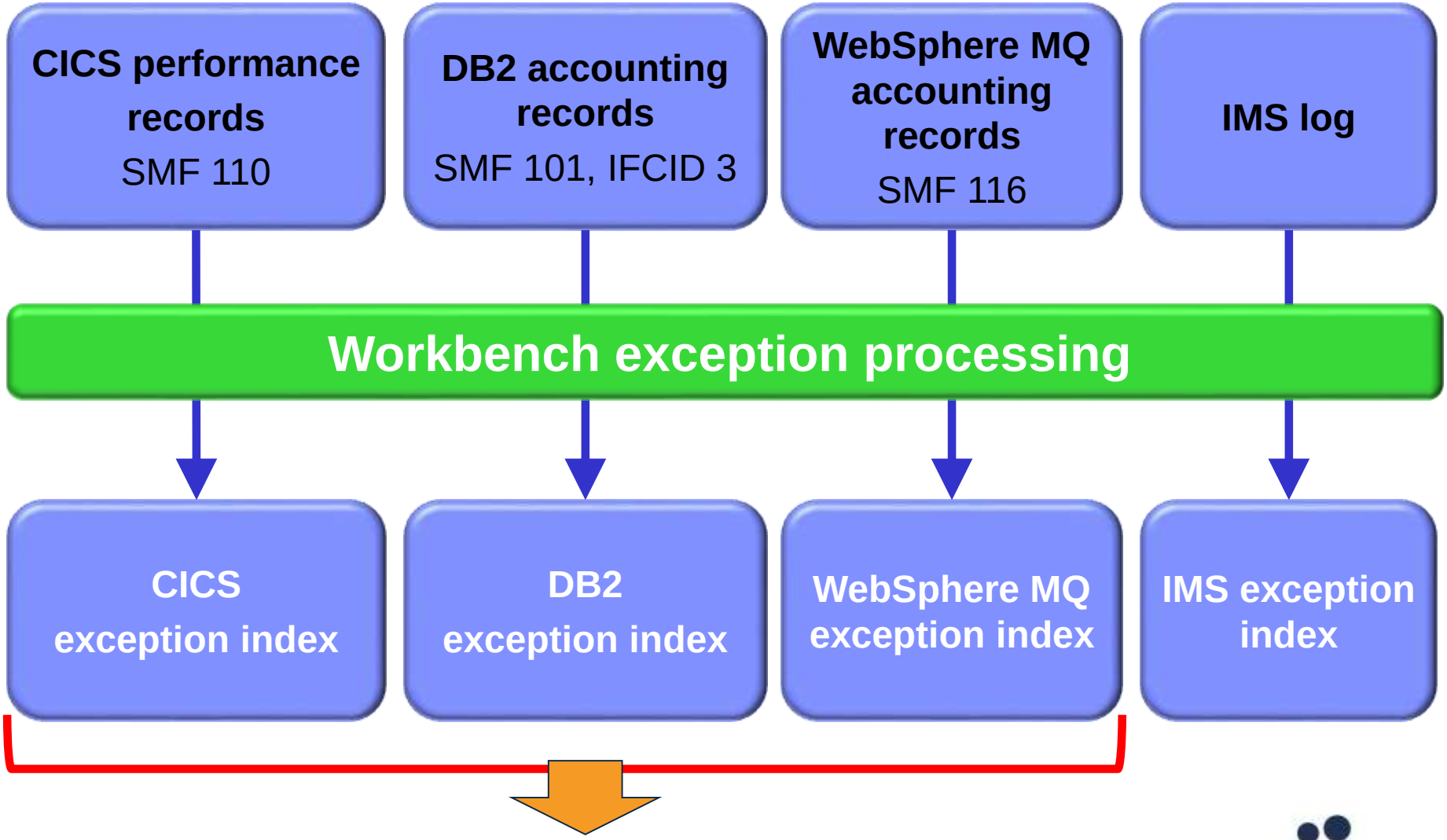
- Today's z systems create vast amounts of instrumentation data
- Good transaction performance monitoring may identify possible issues before they become critical and regardless of where they execute

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, MQ, and IMS



Application performance testing

- Can the application team do it?
- What tools are available?
- Is performance a part of validation testing?
- Does the evaluation occur at the transaction level?
- What is the cost of a failed application roll-out due to poor performance?
- Does system programmer or DBA have time to help?

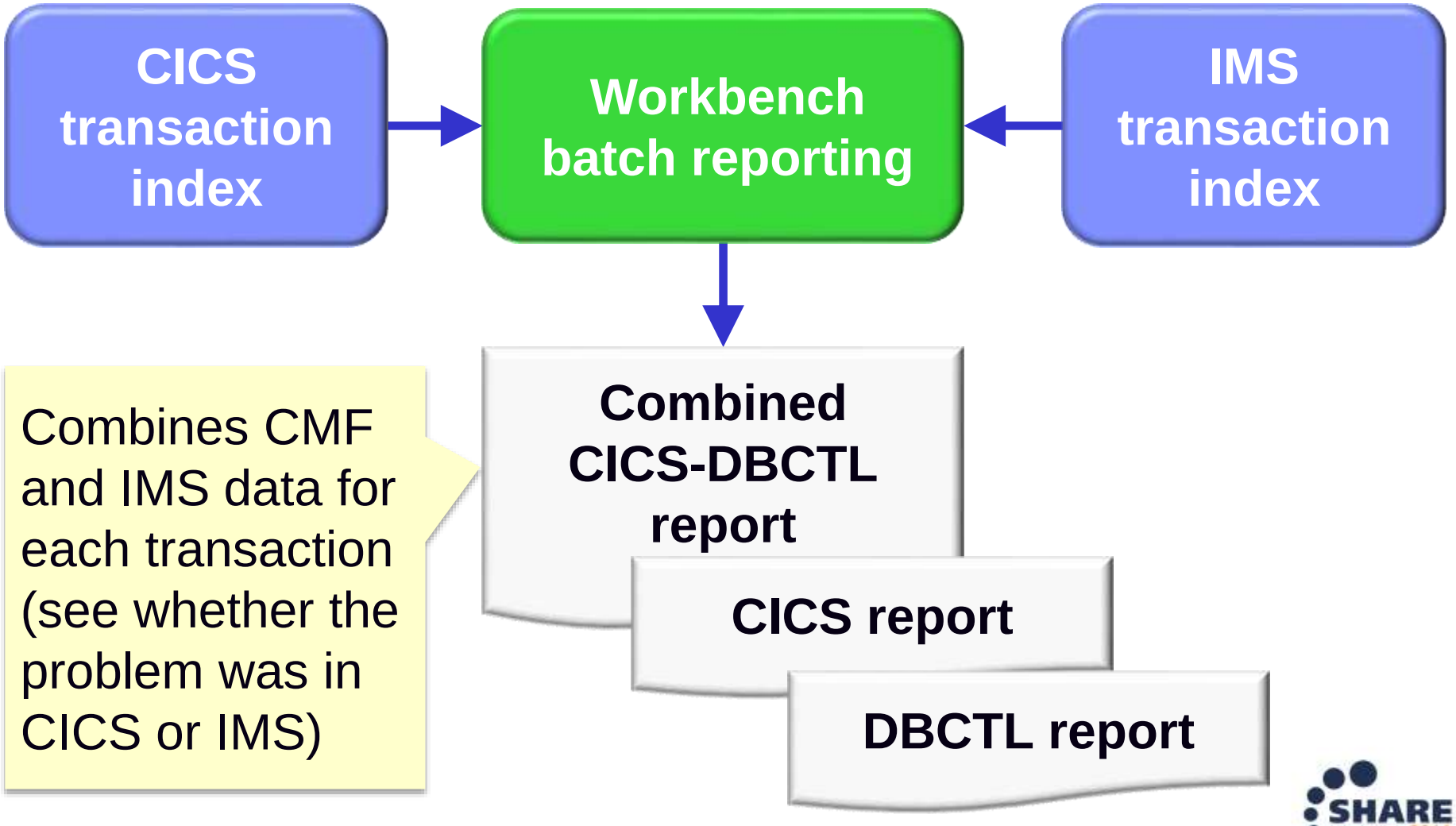
Application team and instrumentation data usage

- Value of data may not be known
- If value is know, how to gain access or collect data is not
- Limited or no knowledge of tools that use the data
  - Not traditional development tools
- Staffing reductions can limit access to system programmers and DBAs

How Workbench helps

- Automated collection of instrumentation data
- Automated reporting for validation testing
- Exception Analysis to identify performance problems
- Transaction life cycle views of transaction exceptions
- Save results of each validation testing run for comparison
- System programmers and/or DBAs less reluctant to help

Combined CICS-DBCTL exception reporting



Example CICS-DBCTL summary report

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

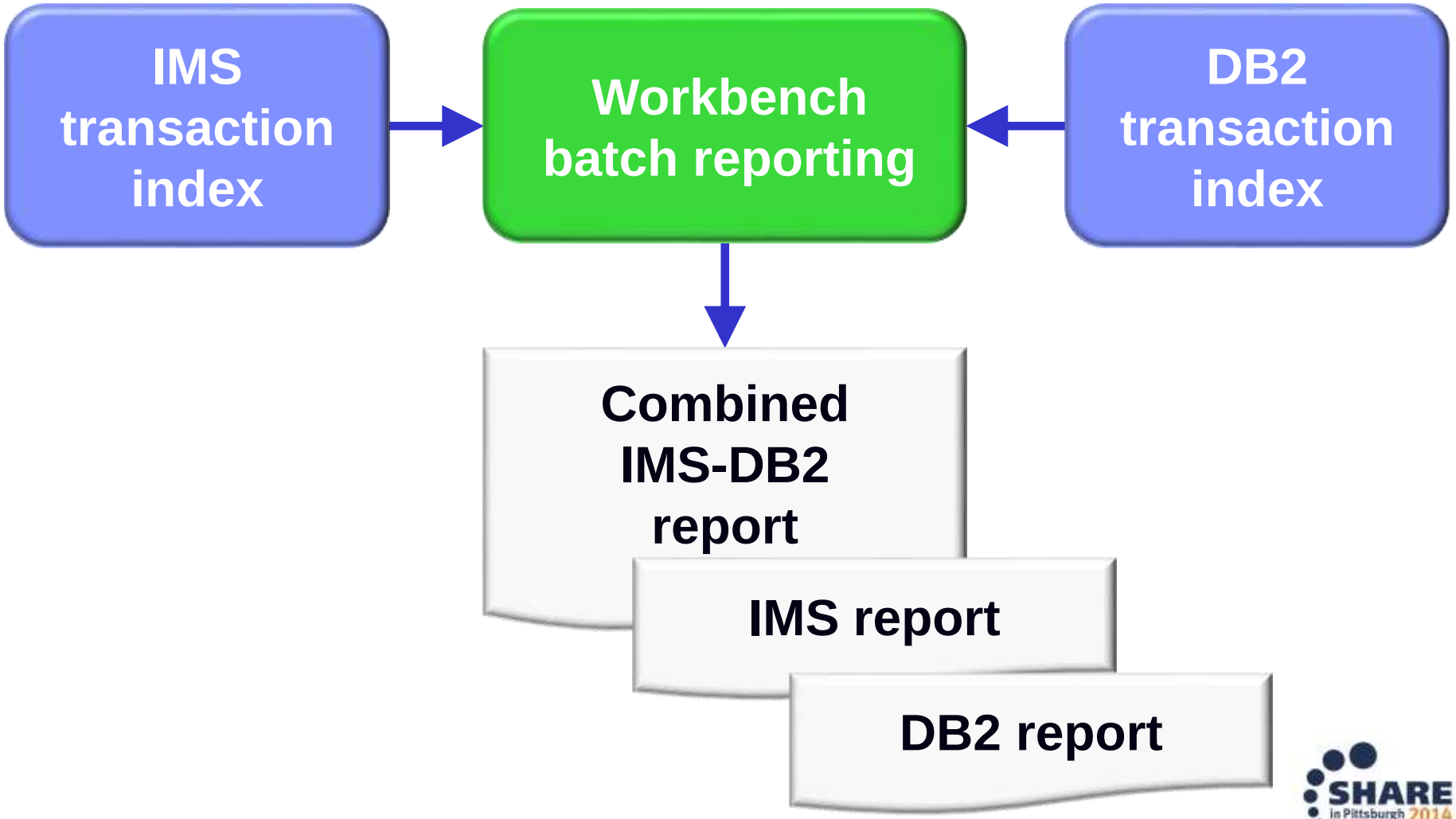
08 Count	Elapsed	CPU Time	StaDelay	Schedule	IC Wait	PS Wait
42	10.94999	0.004092	0.011668	0.000183	0	0

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

Combined IMS-DB2 exception reporting



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)

```
  File  Mode  Filter  Time  Labels  Options  Help
BROWSE    FUW000.QADATA.FBOSP007.IMS.D131008.INDEX   Record 00000207 More: < >
Command ===> ____________________________________________ Scroll ===> CSR
        Navigate < 00.00.01.000000 >      Date/Time 2013-10-08 17.10.09.284086
/  ——— Tracking ————————————————————   Tuesday 2013-10-08 Time (Elapsed)
__ 5616 Start of protected UOW Region=0002                    17.10.09.284579
__ 5600 Sign-on to ESAF Region=0002 SSID=DBA6                        0.005896
__ 5600 Thread created for ESAF SSID=DBA6                            0.000012
__ 112  Thread allocate FBOIAP41                        DBA6         0.000572
__ 073  Create thread end                               DBA6         0.000068
__ 177  Package allocation FBOIAP41                     DBA6         0.000227
__ 233  SP entry FBOSP007                 STMT=001031   DBA6         0.000234
__ 380  SP entry FBOSP007                 STMT=001031   DBA6         0.000023
__ 177  Package allocation FBOSP007                     DBA6         0.000184
__ 061  SQL UPDATE                        STMT=000001   DBA6         0.000141
__ 0020 Begin UR                                                     0.001034
__ 0600 Savepoint                                                    0.000000
__ 0600 Update in-place in a data page                               0.000000
__ s058 SQL UPDATE              SQLCODE=0 STMT=000001   DBA6         0.000338
__ 065  SQL OPEN C1                       STMT=000001   DBA6         0.000090
__ 058  SQL OPEN                SQLCODE=0 STMT=000001   DBA6         0.000021
__ 499  SP statement execution detail                   DBA6         0.000039
__ 233  SP exit  FBOSP007       SQLCODE=0 STMT=001031   DBA6         0.000016
__ 380  SP exit  FBOSP007       SQLCODE=0 STMT=001031   DBA6         0.000012
```

Enhanced support for DB2 trace records (cont.)

- Detailed formatting of IFCID-specific fields

```
+0120  QW0058ID... Scan information
+0120  Scan type.... 'SEQD'    Rows processed... +24069
+0130  Rows examined.... +24069
+0138  Rows qualified after stage 1... +24069
+0140  Rows qualified after stage 2... +1
+0148  Rows inserted.... +0
+0150  Rows updated... +0
+0158  Rows deleted... +0
+0160  Pages scanned.... +428
+0164  Pages scanned (RI)... +
+0168  Rows deleted (RI).... +
+0170  Pages scanned (LOB).... +0
+0174  Pages updated (LOB).... +0

+01A0  QW0058TY... Statement-level information
+01A0  SQL statement type... 4000
+01A8  Statement ID... +28917
+01B0  Sync reads... +0        Getpages... +428
+01C0  Rows examined.... +24069
+01C8  Rows processed... +0                    Sorts..... +0
+01D8  Index scans.... +0
+01E0  Table space scans.... +1
+01E8  Buffer writes.... +0
+01F0  Parallel groups.... +0
+01F8  In-DB2 elapsed... 0.008537
```

```
+0120  QW0058ID... 'SEQD'   Scan type

 Off   QW0058IX... 'INDX'   Index
 On    QW0058SD... 'SEQD'   Sequential data
 Off   QW0058SW... 'SEQW'   Sequential data workfile
```

Enhanced support for DB2 trace records (cont.)

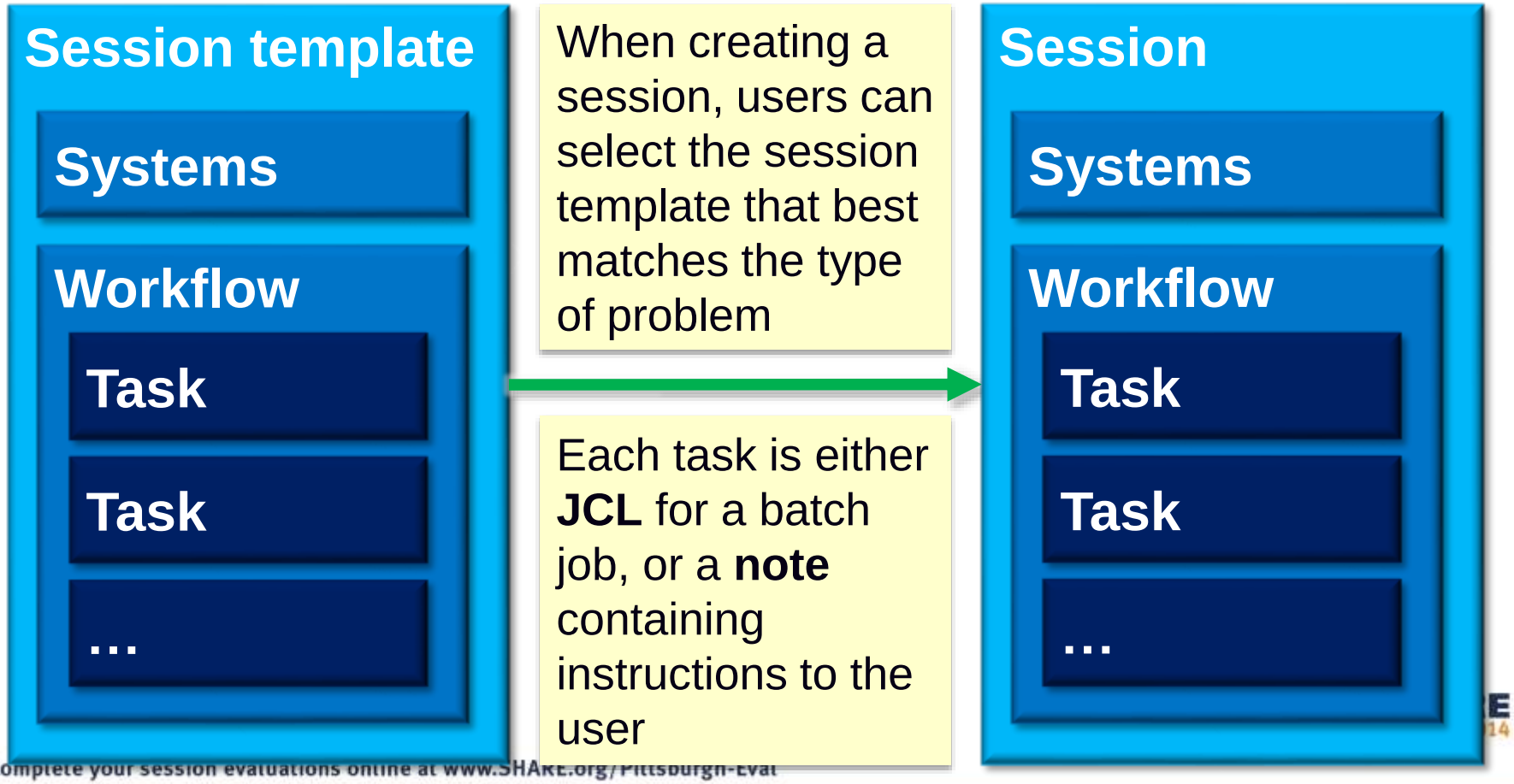
- Generating DB2 trace records can be expensive, and can result in very large log files: you do not want to simply start all traces.
- Workbench introduces the concept of trace “levels” (1 - 4) that categorize IFCIDs based on their usefulness (for transaction analysis) and cost overhead:
  - Program invocation
  - SQL
  - I/O
  - All (caution: may result in high volumes of data)
- In the ISPF dialog, enter the command:

  TRACE n

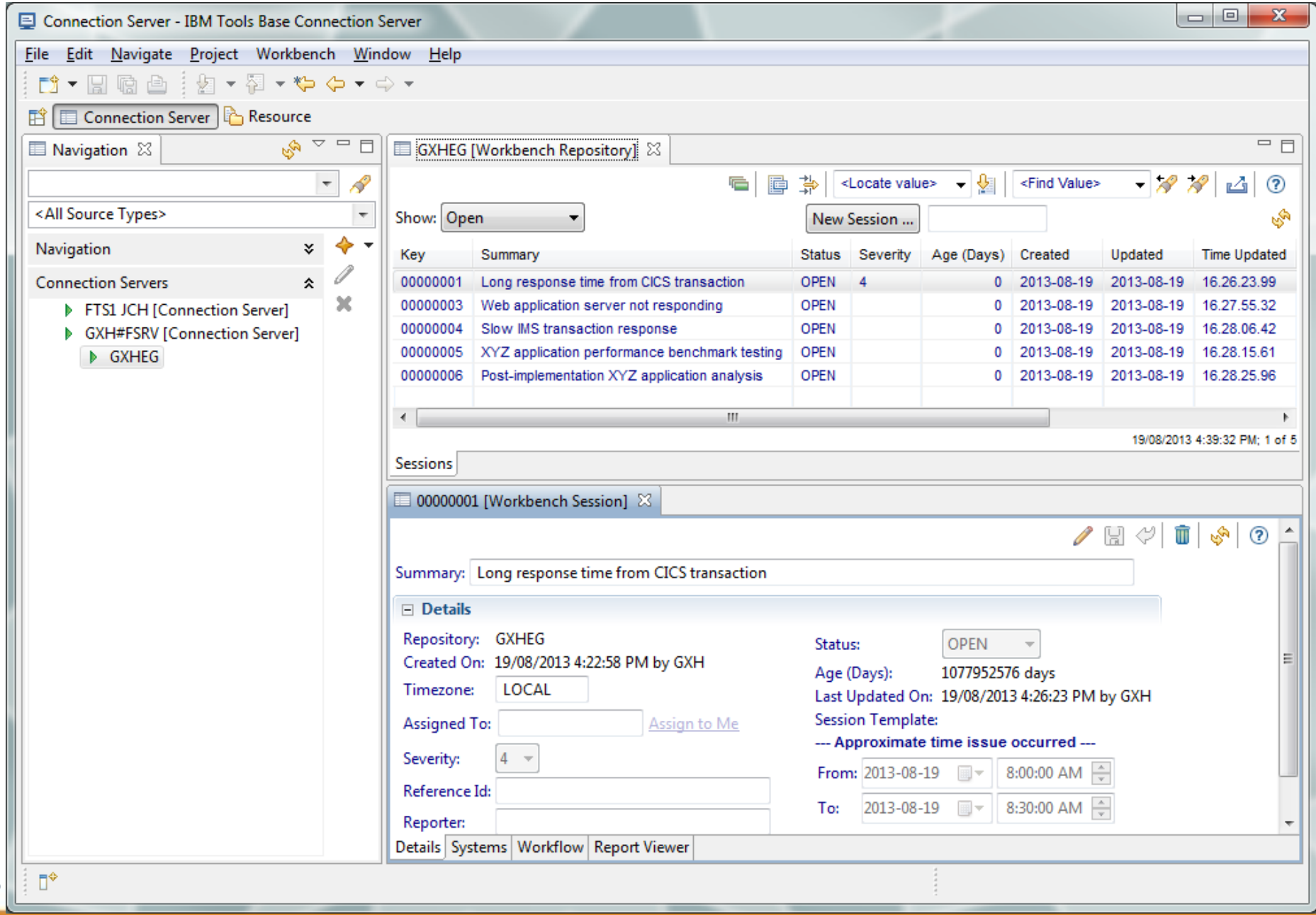
  (n: 1 - 4) to show progressively more detail. TRACE 4 shows all available trace records.

Workflows and session templates

- SMEs can use **session templates** to populate new sessions with the tasks needed to prepare the problem for evaluation
  - Created sessions include: systems involved and a sequence of tasks (workflow) for analyzing the problem

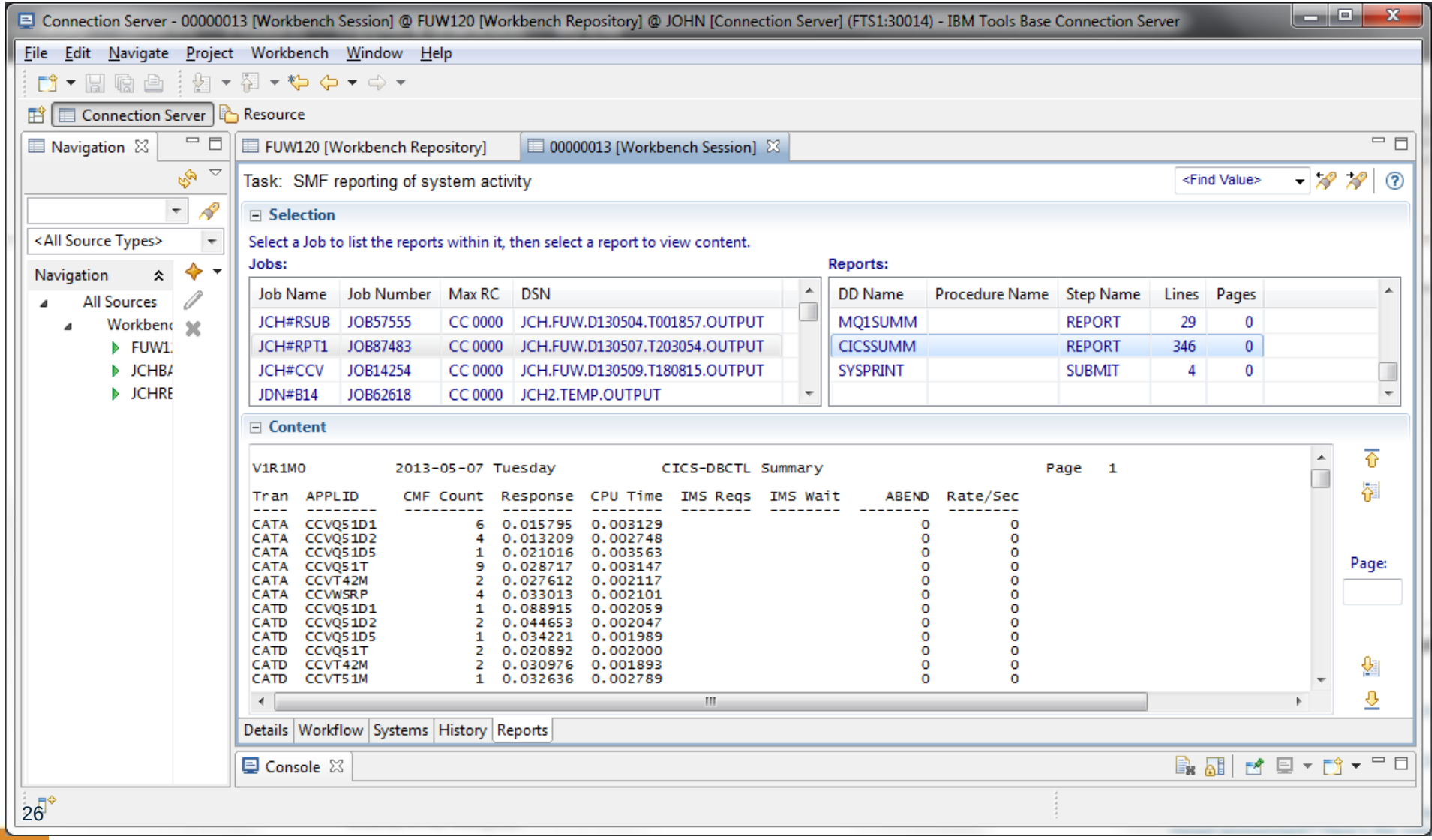


Eclipse-based rich client platform (RCP) UI



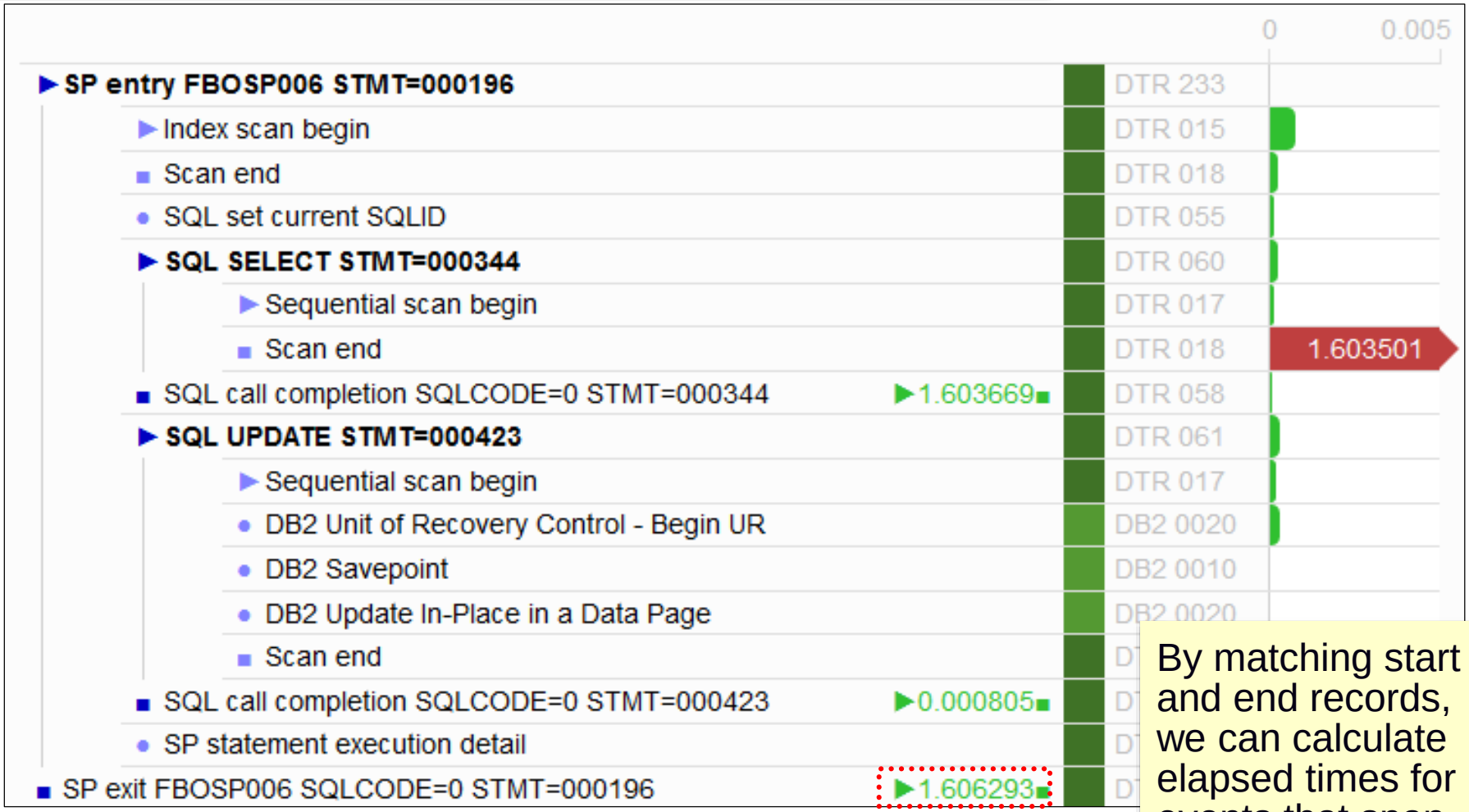
Eclipse-based GUI

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



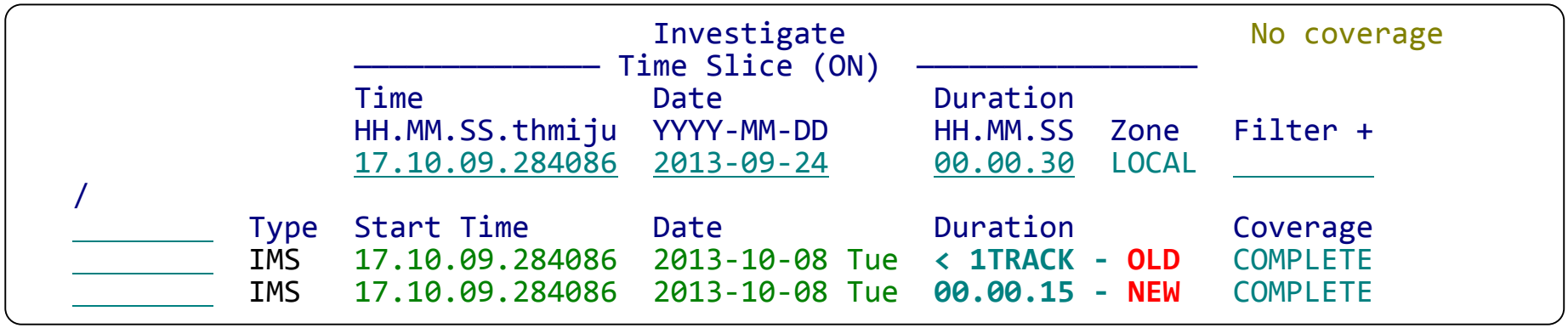
Interactive analysis using TAW GUI: TAW Future

Possible future: TAW GUI could present DB2 trace records as a nested hierarchy, rather than a flat list



By matching start and end records, we can calculate elapsed times for events that span records (such as stored procedures)

ISPF dialog usability enhancements



- Improved file duration calculation for small log files.
  - If the size of a log file was less than one complete disk track, the old Investigate panel displayed the file duration as **<1 TRACK**.
  - The new panel displays this value as a time.

Browser enhancements:
New reasons for not reaching “Bottom of Data”

```
BROWSE    IPI000.QADATA.WGNIMS01.VC10.ICDE001 +              FINDLIM Reached
Command ===> ____________________________________________ Scroll ===> CSR
        Navigate < 00.00.01.000000 >      Date/Time 2011-06-01 12.04.23.008757
/  ——— Tracking ——————————————————— Wednesday 2011-06-01 Time (LOCAL)
__ 01   Input Message TranCode=CEXTCONV                        12.04.27.144920
__ 35   Input Message Enqueue TranCode=CEXTCONV                12.04.27.145964
__ 31   DLI GU TranCode=CEXTCONV Region=0002                   12.04.27.146473
```

- If the log browser does not reach the end of the selected files, the label now offers one of the following reasons:
  - FINDLIM reached (find limit)
  - ATTN interrupt
  - TIMEOUT reached (timeout value)
  - DURATION reached (time slice duration)

Browser enhancements: HILITE
Set color and highlighting according to log type

```
BROWSE    FUW000.QADATA.FBOSP007.IMS.D131008.INDEX   Record 00000201 More: < >
Command ===> ____________________________________________ Scroll ===> CSR
        Navigate < 00.00.01.000000 >      Date/Time 2013-10-08 17.10.09.284086
/  ---- Tracking ------------------------   Tuesday 2013-10-08 Time (Elapsed)
__ CA01 IMS Transaction TranCode=FBOIAT41 Region=0002                 0.000000
__ 01   Input Message TranCode=FBOIAT41                               0.000000
__ 35   Input Message Enqueue TranCode=FBOIAT41                       0.000023
__ 08   Application Start TranCode=FBOIAT41 Region=0002               0.000256
__ 5607 Start of UOR Program=FBOIAP41 Region=0002                     0.000000
__ 31   DLI GU TranCode=FBOIAT41 Region=0002                          0.000022
__ 5616 Start of protected UOW Region=0002                            0.000189
__ 5600 Sign-on to ESAF Region=0002                                   0.005896
__ 5600 Thread created for ESAF                                       0.000012
__ 112  Thread allocate FBOIAP41                          DBA6        0.000572
__ 073  Create thread end                                 DBA6        0.000068
__ 177  Package allocation FBOIAP41                       DBA6        0.000227
__ 233  SP entry FBOSP007                  STMT=001031    DBA6        0.000234
__ 380  SP entry FBOSP007                  STMT=001031    DBA6        0.000023
__ 177  Package allocation FBOSP007                       DBA6        0.000184
__ 061  SQL UPDATE                         STMT=000001    DBA6        0.000141
__ 0020 Begin UR                                                      0.001034
__ 0600 Savepoint                                                     0.000000
__ 0600 Update in-place in a data page                                0.000000
__ 058  SQL UPDATE                SQLCODE=0 STMT=000001    DBA6        0.000338
__ 065  SQL OPEN C1                         STMT=000001    DBA6        0.000090
__ 058  SQL OPEN                  SQLCODE=0 STMT=000001    DBA6        0.000021
__ 499  SP statement execution detail                     DBA6        0.000039
__ 233  SP exit  FBOSP007         SQLCODE=0 STMT=001031    DBA6        0.000016
__ 380  SP exit  FBOSP007         SQLCODE=0 STMT=001031    DBA6        0.000012
__ 053  SQL request              SQLCODE=466 STMT=001031    DBA6        0.000083
__ 053  SQL request               SQLCODE=0 STMT=001082    DBA6        0.000824
__ 053  SQL request               SQLCODE=0 STMT=001085    DBA6        0.000119
__ 059  SQL FETCH C1                        STMT=001090    DBA6        0.000107
```

Browser enhancement: Prepend log sequence number (LSN) with log type

```
__ 31   DLI GU TranCode=FBOIAT41 Region=0002                          -00000000014D
__ 5616 Start of protected UOW Region=0002                            -00000000014E
__ 5600 Sign-on to ESAF Region=0002 SSID=DBA6                         -00000000014F
__ 5600 Thread created for ESAF SSID=DBA6                             -000000000150
__ 112  Thread allocate FBOIAP41                              DBA6 DTR-000000000004
__ 073  Create thread end                                     DBA6 DTR-000000000005
__ 177  Package allocation FBOIAP41                           DBA6 DTR-000000000006
__ 233  SP entry FBOSP007                      STMT=001031    DBA6 DTR-000000000007
__ 380  SP entry FBOSP007                      STMT=001031    DBA6 DTR-000000000008
__ 177  Package allocation FBOSP007                           DBA6 DTR-000000000009
__ 061  SQL UPDATE                             STMT=000001    DBA6 DTR-00000000000A
__ 0020 Begin UR                                                   DB2-00006A997B4C
__ 0600 Savepoint                                                  DB2-00006A997BDC
```

- To prepend the LSN with the log record type, enter DISPLAY or select **Options > Display**, and then set the **Display LSN** option.


Questions?

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

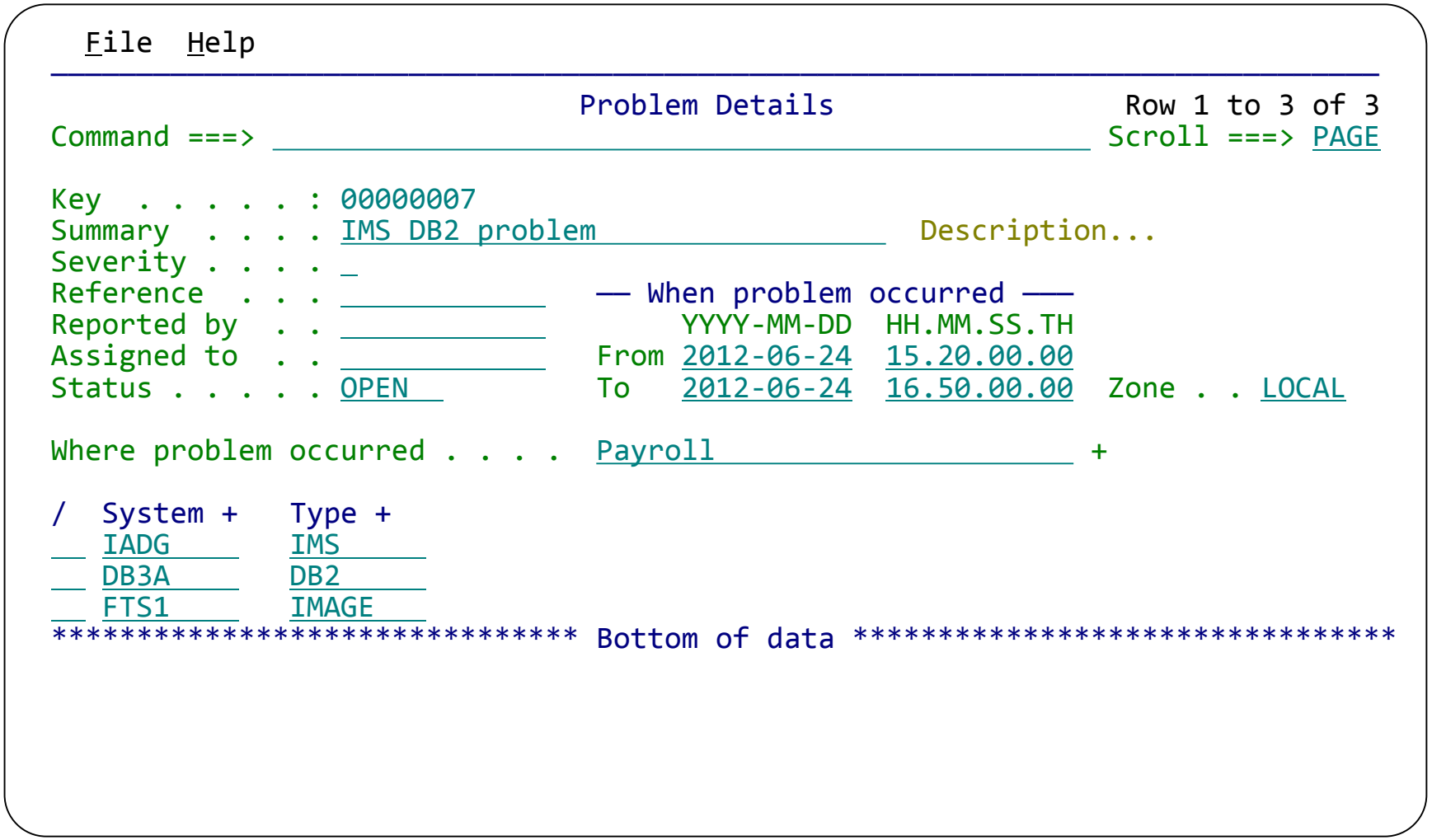
Scenario: IMS-DB2 problem

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

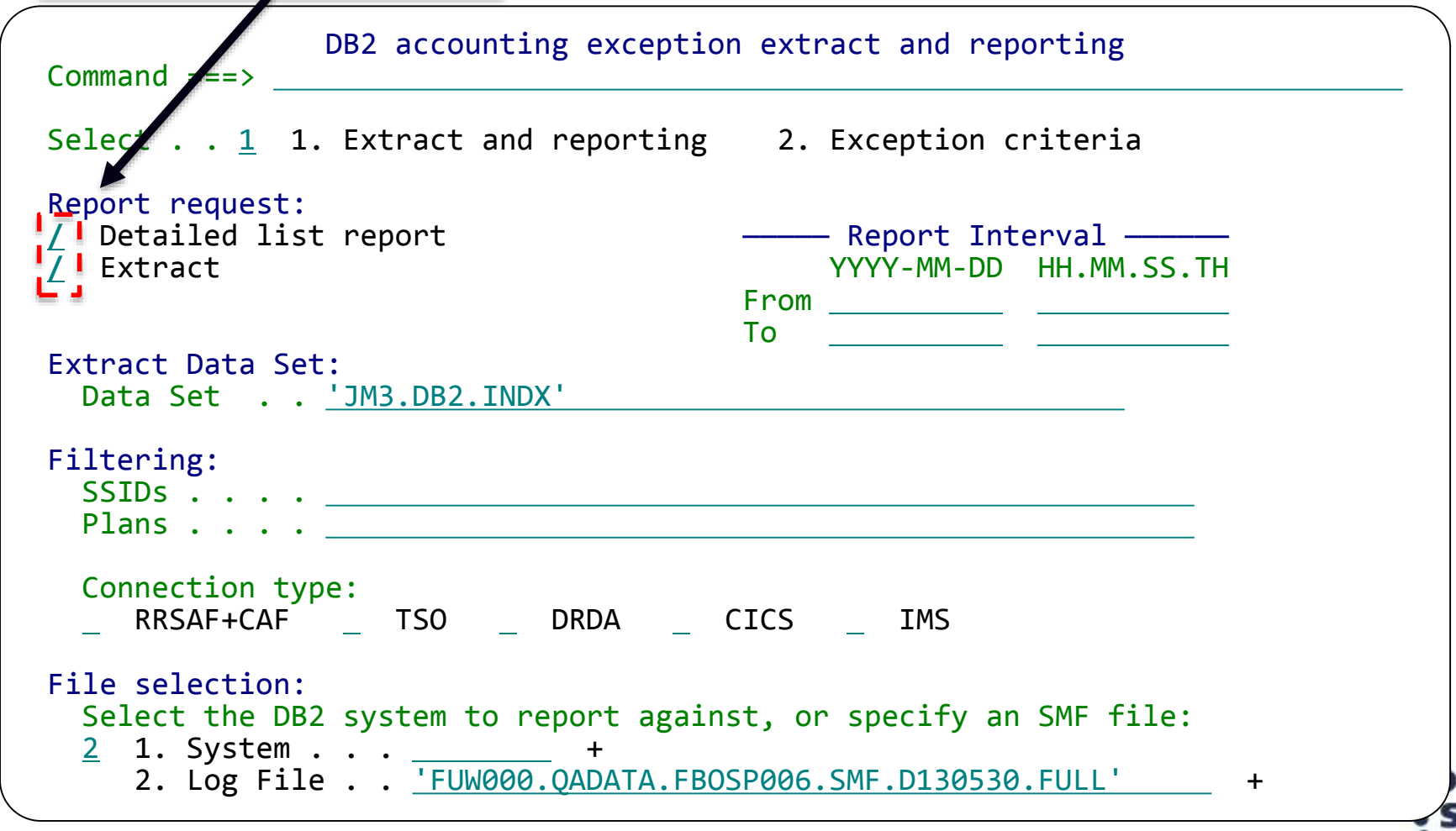
Creating a session



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

Building a DB2 Exception Candidate Index and Report

Detailed List report or Exception Index Extract available



DB2X: Specify exception thresholds

```
Response and CPU time:                                  /  Apportion rollup
  Response time  . . 0.5        (0.000001-99 seconds)
  CPU class 1  . . . 0.1
  In-DB2 elapsed . . 0.2
  CPU class 2  . . . 0.05
  Database I/O . . . 0.05
  Lock suspend . . . 0.05

Stored Procedure:
  Elapsed  . . . . . 0.1        (0.000001-99 seconds)
  CPU  . . . . . . . 0.05

Row activity:
  Fetched  . . . . . 1000       (0 to 999999)
  Inserted . . . . . 100
  Updated  . . . . . 100
  Deleted  . . . . . 100

Locking:
  Deadlocks  . . . . 1          (0 to 999999)
  Suspends . . . . . 20
  Timeouts . . . . . 1
  Lock requests  . . 50

Buffering:
  Get pages  . . . . 50         (0 to 999999)
  Update pages . . . 30

Logging:
  Log records  . . . 100        (0 to 999999)

Abnormal conditions:
  Abort  . . . . . . 1          (1=check for condition)
  Check pending  . . 1
```

DB2 threads that exceed one of more of these thresholds are considered exceptions

List report of DB2 exceptions

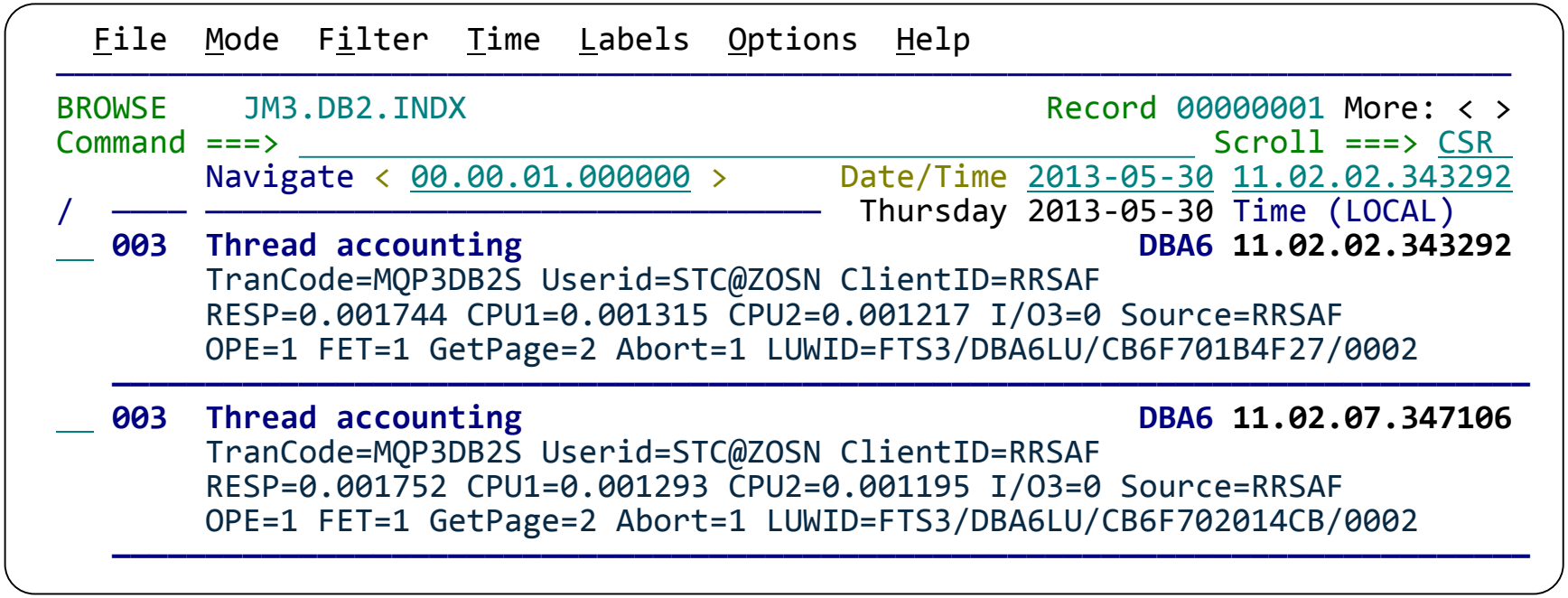
For each exception that was triggered, the thread and exception details are listed

V1R2M0 2014-02-20 Thursday DB2 Exception List Page 1

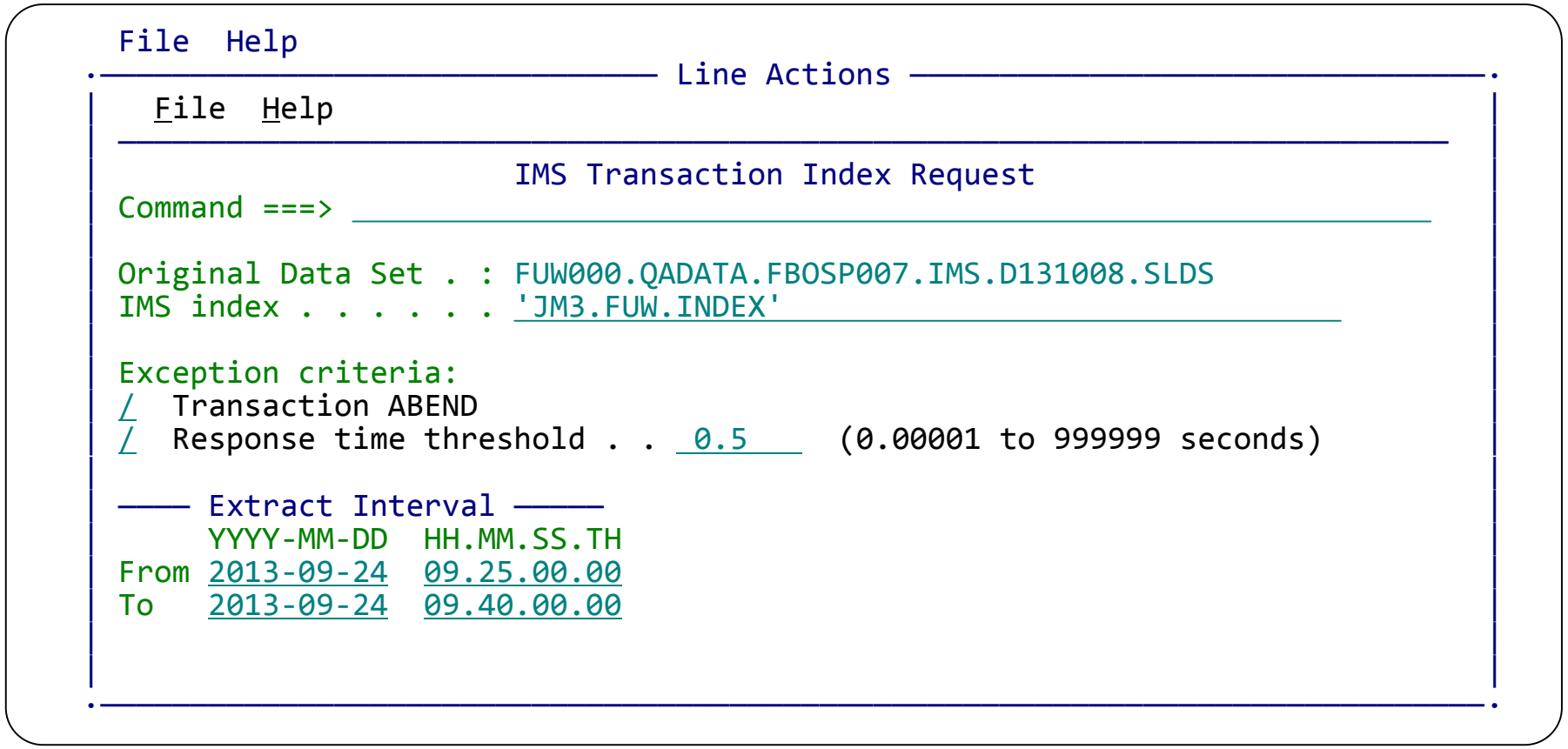
SSID	Correlation	Connect	Plan	Auth id	Time	Exception	Threshold	LUWID
DBA4	MQP1DB2SRV02	RRSAF	CSQ5L710	STC@ZOSN	10:02:04.512982	Abort	1	1	FTS1/DBA4LU/CCBDD2D0C2CD/0002
DBP4	AXSSIGNO	DB2CALL	PTS46	PROTEUS	10:02:07.263130	Response	1.402972	0.5	FTS1/DBP4LU/CCBDD2D20BE5/0005
DBP4	AXSSIGNO	DB2CALL	PTS46	PROTEUS	10:02:07.263130	Class 1 CPU	0.387519	0.1	FTS1/DBP4LU/CCBDD2D20BE5/0005
DBP4	AXSSIGNO	DB2CALL	PTS46	PROTEUS	10:02:07.263130	Rows fetched	6329	1000	FTS1/DBP4LU/CCBDD2D20BE5/0005
DBP4	AXSSIGNO	DB2CALL	PTS46	PROTEUS	10:02:07.263130	Lock requests	267	50	FTS1/DBP4LU/CCBDD2D20BE5/0005
DBP4	AXSSIGNO	DB2CALL	PTS46	PROTEUS	10:02:07.263130	Get pages	2264	50	FTS1/DBP4LU/CCBDD2D20BE5/0005
DBP4	AXSSIGNO	DB2CALL	PTS46	PROTEUS	10:02:07.263130	Update pages	483	30	FTS1/DBP4LU/CCBDD2D20BE5/0005
DBP4	AXSSIGNO	DB2CALL	PTS46	PROTEUS	10:02:07.263130	Log records	574	100	FTS1/DBP4LU/CCBDD2D20BE5/0005
DBP4	MXMSCHD	DB2CALL	DSNREXX	MXM	10:08:44.907535	Get pages	2668	50	FTS1/DBP4LU/CCBDD44E91C7/0002
DBP4	MXMSCHD	DB2CALL	DSNREXX	MXM	10:08:46.466276	Get pages	2668	50	FTS1/DBP4LU/CCBDD4500BE1/0002
DBA4	MQP1DB2SRV02	RRSAF	CSQ5L710	STC@ZOSN	10:10:04.877879	Abort	1	1	FTS1/DBA4LU/CCBDD49ADF64/0002
DBP4	AXS#GENE	DB2CALL	PTS46	PROTEUS	10:10:05.766411	Response	1.338092	0.5	FTS1/DBP4LU/CCBDD49A71E6/0011
DBP4	AXS#GENE	DB2CALL	PTS46	PROTEUS	10:10:05.766411	Class 1 CPU	0.361788	0.1	FTS1/DBP4LU/CCBDD49A71E6/0011
DBP4	AXS#GENE	DB2CALL	PTS46	PROTEUS	10:10:05.766411	Lock requests	135	50	FTS1/DBP4LU/CCBDD49A71E6/0011
DBP4	AXS#GENE	DB2CALL	PTS46	PROTEUS	10:10:05.766411	Get pages	223	50	FTS1/DBP4LU/CCBDD49A71E6/0011
DBP4	AXS#GENE	DB2CALL	PTS46	PROTEUS	10:10:05.766411	Update pages	72	30	FTS1/DBP4LU/CCBDD49A71E6/0011

SSID	DB2 subsystem id
Correlation	Correlation id
Connect	Connection name. If the name is not available then the connecting system type is substituted
Plan	Plan name
Auth id	Authorization id
Time	End of accounting interval stamp. This is not the thread start time. This time matches the record timestamp displayed in the ISPF dialog.
Exception	The exception event that was triggered – its description and value
Threshold	The exception threshold that was exceeded
LUWID	Logical unit of work id, used to uniquely identify the DB2 accounting record.

Exception Candidate DB2 Transaction Index



Building an IMS Exception Candidate Index



Subject-matter expert: Exception candidate investigation

```
BROWSE    FUW000.QADATA.FBOSP007.IMS.D131008.INDEX   Record 00000201 More: < >
Command ===> ____________________________________________ Scroll ===> CSR
        Navigate < 00.00.01.000000 >      Date/Time 2013-10-08 17.10.09.284086
/  ——— Filtering ————————————————————   Tuesday 2013-10-08 LSN
————————————————————————————————————————————————————————————————————————
TX CA01 IMS Transaction                                      IMS-000000000021
     UTC=17.10.09.284078 TranCode=FBOIAT41 Program=FBOIAP41 Userid=FUNTRM10
     LTerm=FUNTRM10 Terminal=SC0TCP10 Region=0002
     OrgUOWID=IDDG/CC1476B6713CB884 IMSRel=131
     RecToken=IDDG/0000000400000000
     CPU=45.699549 InputQ=0.000309 Process=72.612278 OutputQ=0.000356
     TotalTm=72.612943 RegTyp=MPP
————————————————————————————————————————————————————————————————————————
__ CA01 IMS Transaction                                      IMS-000000000025
     UTC=17.15.19.060177 TranCode=FBOIAT41 Program=FBOIAP41 Userid=FUNTRM10
     LTerm=FUNTRM10 Terminal=SC0TCP10 Region=0002
     OrgUOWID=IDDG/CC1477DDDE2AF104 IMSRel=131
     RecToken=IDDG/0000000600000000
     CPU=11.512388 InputQ=0.000354 Process=18.105197 OutputQ=0.000039
     TotalTm=18.105590 RegTyp=MPP
————————————————————————————————————————————————————————————————————————
```

This display has been filtered to show **IMS x'CA01' Exception index records** with excessive processing times. Use TX line command to show records related to a transaction

IMS/DB2 Transaction life cycle investigation

```
BROWSE    FUW000.QADATA.FBOSP007.IMS.D131008.INDEX   Record 00000201 More: < >
Command ===> ____________________________________________ Scroll ===> CSR
        Navigate < 00.00.01.000000 >      Date/Time 2013-10-08 17.10.09.284086
/  ____ Tracking ____________________________  Tuesday 2013-10-08 Time (Elapsed)
E  CA01 IMS Transaction TranCode=FBOIAT41 Region=0002                  0.000000
__ 01   Input Message TranCode=FBOIAT41                                0.000000
__ 35   Input Message Enqueue TranCode=FBOIAT41                        0.000023
__ 08   Application Start TranCode=FBOIAT41 Region=0002                0.000256
__ 5607 Start of UOR Program=FBOIAP41 Region=0002                      0.000000
__ 31   DLI GU TranCode=FBOIAT41 Region=0002                           0.000022
__ 5616 Start of protected UOW Region=0002                             0.000189
__ 5600 Sign-on to ESAF Region=0002                                    0.005896
__ 5600 Thread created for ESAF                                        0.000012
__ 112  Thread allocate FBOIAP41                          DBA6         0.000572
__ 073  Create thread end                                 DBA6         0.000068
__ 177  Package allocation FBOIAP41                       DBA6         0.000227
__ 233  SP entry FBOSP007                  STMT=001031    DBA6         0.000234
__ 380  SP entry FBOSP007                  STMT=001031    DBA6         0.000023
__ 177  Package allocation FBOSP007                       DBA6         0.000184
__ 061  SQL UPDATE                         STMT=000001    DBA6         0.000141
__ 0020 Begin UR                                                       0.001034
__ 0600 Savepoint                                                      0.000000
__ 0600 Update in-place in a data page                                 0.000000
__ 058  SQL UPDATE           SQLCODE=0     STMT=000001    DBA6         0.000338
__ 065  SQL OPEN C1                        STMT=000001    DBA6         0.000090
__ 058  SQL OPEN             SQLCODE=0     STMT=000001    DBA6         0.000021
__ 499  SP statement execution detail                     DBA6         0.000039
__ 233  SP exit  FBOSP007    SQLCODE=0     STMT=001031    DBA6         0.000016
__ 380  SP exit  FBOSP007    SQLCODE=0     STMT=001031    DBA6         0.000012
__ 053  SQL request        SQLCODE=466     STMT=001031    DBA6         0.000083
__ 053  SQL request          SQLCODE=0     STMT=001082    DBA6         0.000824
__ 053  SQL request          SQLCODE=0     STMT=001085    DBA6         0.000119
__ 059  SQL FETCH C1                       STMT=001090    DBA6         0.000107
__ 0600 Savepoint                                                      1.437546
__ 0600 Savepoint                                                      0.257680
__ 0600 Savepoint                                                      1.059456
```

1. Start tracking a transaction (here, a IMS transaction)
2. See the transaction life cycle events from the related logs (here, an IMS Index and log, SMF file, and a DB2 log), merged together with no preparation required
3. Notice the jump in elapsed time
4. In this case, the problem was caused by an inefficient table scan initiated by a DB2 stored procedure.

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

Detail DB2 event data view using forms view

```
+029C  Code... 058   SQL FETCH                    SQLCODE=0 STMT=001090 DBA6
+02A8  STCK... CC1476FBAF617906      LSN.... 0000000000000049
       Date... 2013-10-08 Tuesday    Time... 17.11.21.890327.563

+0000  SM102LEN... 03A6        SM102FLG... 1E          SM102RTY... 66
+0006  SM102TME... 005E6C9D    SM102DTE... 0113281F    SM102SID... 'FTS3'
+0012  SM102SSI... 'DBA6'      SM102STF... 0000

+0034  QW0058..... IFCID data
       Package
+0034  Location... 'DB2ALOC'   Collection ID.... 'FUNBOX'
+0056  Package name... 'FBOSP007'
+0068  Consistency token.... 19718A5F136E9A24

+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... +4294967295
+00E2  SQLERRD5... +0          SQLERRD6... +0          SQLWARN0... ' '
+00EB  SQLWARN1... ' '         SQLWARN2... ' '         SQLWARN3... ' '
+00EE  SQLWARN4... ' '         SQLWARN5... ' '         SQLWARN6... ' '
+00F1  SQLWARN7... ' '         SQLWARN8... ' '         SQLWARN9... ' '
+00F4  SQLWARNA... ' '         SQLSTATE... '00000'

+00FC  Statement number... +1090
+0106  Query command ID... 00000000
+010E  Query instance ID.... 00000000
+0116  Type of SQL request.... 01

+0118  QW0058ID... Scan information
+0118  Scan type.... 'INDX'    Rows processed... +1280799
+0128  Rows examined.... +1595
+0130  Rows qualified after stage 1... +1275908
+0138  Rows qualified after stage 2... +1275908
+0140  Rows inserted.... +0
```

Program statement number 1090 caused an index scan that processed 1,280,799 rows in the table

Zoom to see more detail about log record fields

```
                                Field Zoom
  File  Menu  Help
BROWSE    FUW000.QADATA.FBOSP007.IMS.D131008.INDEX +         Line 00000000
Command ===> _____________________________________ Scroll ===> CSR
****************************** Top of data ******************************
+0116  QW0058TOS.... 01   Type of SQL request

 On    QW005801... 01   FETCH
 Off   QW005810... 10   INSERT
 Off   QW005811... 11   SELECT
 Off   QW005820... 20   UPDATE
 Off   QW005821... 21   UPDATE CURSOR
 Off   QW005830... 30   MERGE
 Off   QW005840... 40   DELETE
 Off   QW005841... 41   DELETE CURSOR
 Off   QW005850... 50   TRUNCATE
 Off   QW005880... 80   PREPARE
 Off   QW005881... 81   PREPARE CURSOR
 Off   QW005891... 91   OPEN
 Off   QW0058A1... A1   CLOSE
 Off   QW0058A0... A0   ALTER SEQUENCES
 Off   QW0058A2... A2   ALTER JAR
```

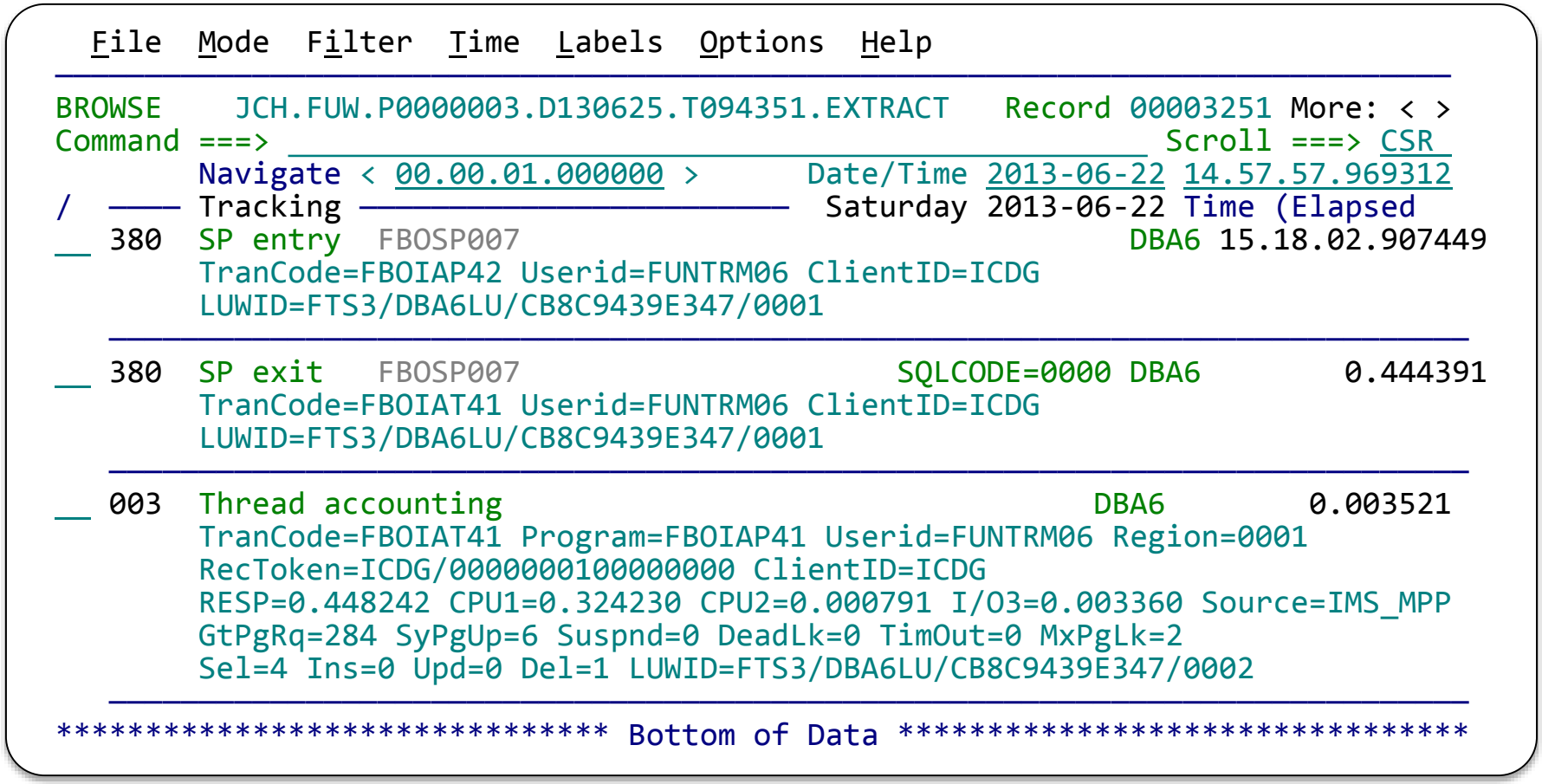
```
+00E2  SQLERRD5...  +0          SQLERRD6... +0          SQLWARN0... ' '
+00EB  SQLWARN...   ' '         SQLWARN2... ' '         SQLWARN3... ' '
+00EE  SQLW...                  SQLWARN5... ' '         SQLWARN6... ' '
+00F1  SQ...                    SQLWARN8... ' '         SQLWARN9... ' '
+00F4  SQLWA...                 SQLSTATE... '00000'

+00FC  State...             ... +1090
+0106  Query...             ... 00000000
+010E  Query-instance-ID... ... 00000000
+0116  Type of SQL request.... 01

+0118  QW0058ID... Scan information
+0118  Scan type.... 'INDX'    Rows processed... +1280799
+0128  Rows examined.... +1595
+0130  Rows qualified after stage 1... +1275908
+0138  Rows qualified after stage 2... +1275908
+0140  Rows inserted.... +0
```

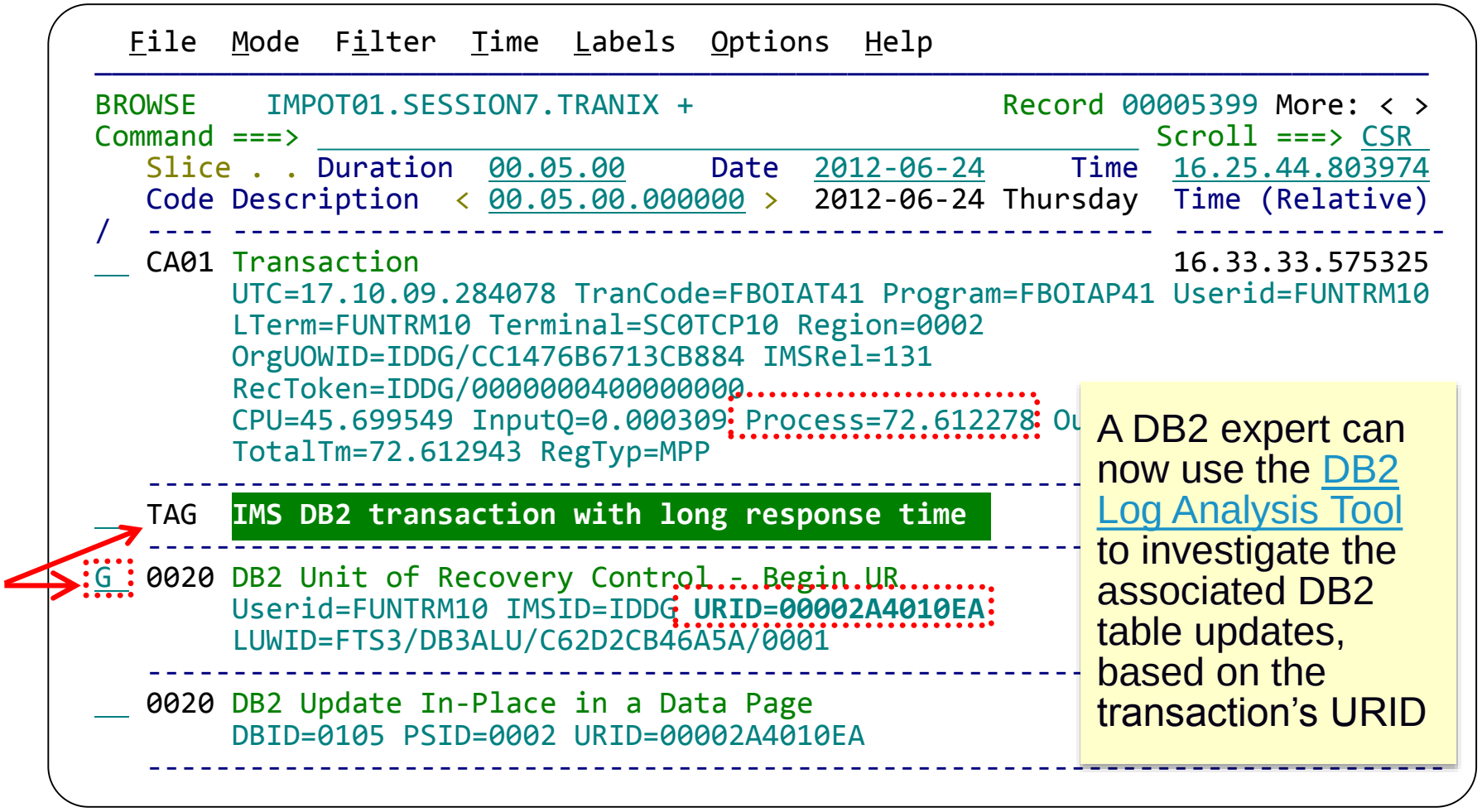
Select any field and get more detailed information or help

Life cycle events: expanded summary view



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 by other SMEs



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

Correlate **URID** with **DB2 Log Analysis** tool for deep dive analysis.
Enter **G** to "tag" (bookmark) this DB2 record to quickly return to it.

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 FUNTRM10 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
```

URID field correlated from Workbench allows expert to leverage his subsystem specific tools for **Deep-Dive** investigation

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
  - SMF
  - IMS log
  - DB2 log
- A common problem analysis approach:
  - First responders collect data and perform initial analysis
  - SMEs in different areas see the big picture and work towards problem resolution

SMF records handled by Workbench 1.2

z/OS SMF records for transactions -1

SMF record type (decimal)	Log code (hexadecimal)	Description	Contents relevant to analyzing transactions
30	**1E**	Common address space work	Address space accounting: IMS and CICS address space resource usage, including CPU, I/O activity by ddname, paging activity, and virtual storage usage
33	**21**	APPC/MVS transaction program (TP) accounting	APPC transaction response time
42-6	**2A06**	**DFSMS**	DASD data set level I/O statistics
64	**40**	**VSAM cluster status**	VSAM data set read and update activity, CI-CA splits
70-1	**4601**	RMF processor activity	System CPU usage
71	**47**	RMF paging activity	System paging and page data set activity
72-3	**4803**	RMF workload activity	Service class response time analysis
74-1	**4A01**	RMF device activity	DASD device I/O activity and performance

z/OS SMF records for transactions -2

SMF record type (decimal)	Log code (hexadecimal)	Description	Contents relevant to analyzing transactions
74-2	**4A02**	RMF cross-system coupling facility (XCF) activity	Message traffic flow between systems in the sysplex
75	**4B**	RMF page data set activity	Auxiliary storage usage and page data set I/O activity
77	**4D**	RMF enqueue activity	Identify resources where enqueue/dequeue contention occurred
78-2	**4E02**	RMF virtual storage activity	Common storage (CSA, SQA) usage and Job private storage usage
79-15	**4F0F**	Internal resource lock manager (IRLM) long lock detection	Identify IMS database locks held for a long time
88-1	**58**	System logger data	Log stream activity and performance degradation events
100	**64**	DB2 statistics	Transaction data collected at event monitoring points
101	**65**	DB2 accounting	Depending on which classes are active

z/OS SMF records for transactions -3

SMF record type (decimal)	Log code (hexadecimal)	Description	Contents relevant to analyzing transactions
102	**66**	DB2 performance	DB2 response times
110-1.3	**6E13**	CICS monitoring facility (CMF) performance class data	CICS transaction performance
115-1	**7301**	WebSphere MQ statistics	Log manager
115-2	**7302**	WebSphere MQ statistics	Message counts, buffer and paging information
116-0	**7401**	WebSphere MQ class 1 Accounting	Thread (including IMS and CICS) GET-PUT activity, CPU time for MQ calls
116-1 & 116-2	7401 and 7402	WebSphere MQ class 3 Accounting	Thread (including IMS and CICS) GET-PUT activity, CPU time for MQ calls
120-9	**7809**	WebSphere Application Server for z/OS	Request activity performance statistics