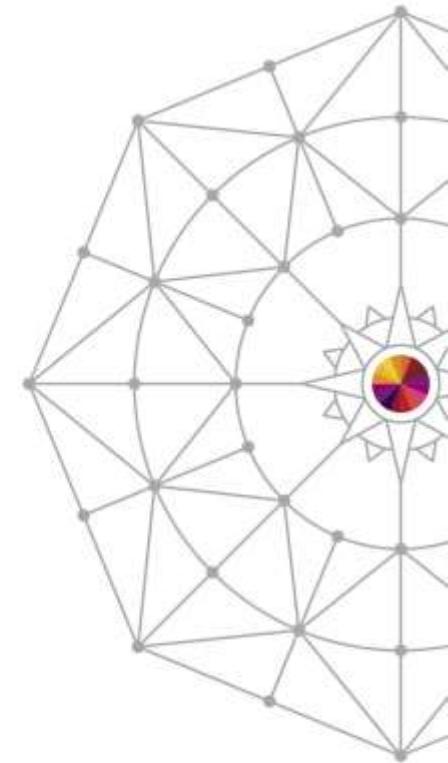


Introducing Version 1.2 of the Transaction Analysis Workbench for System z

See the big picture from end-to-end

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Fundи Software*

*Wednesday, August 6, 2014
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

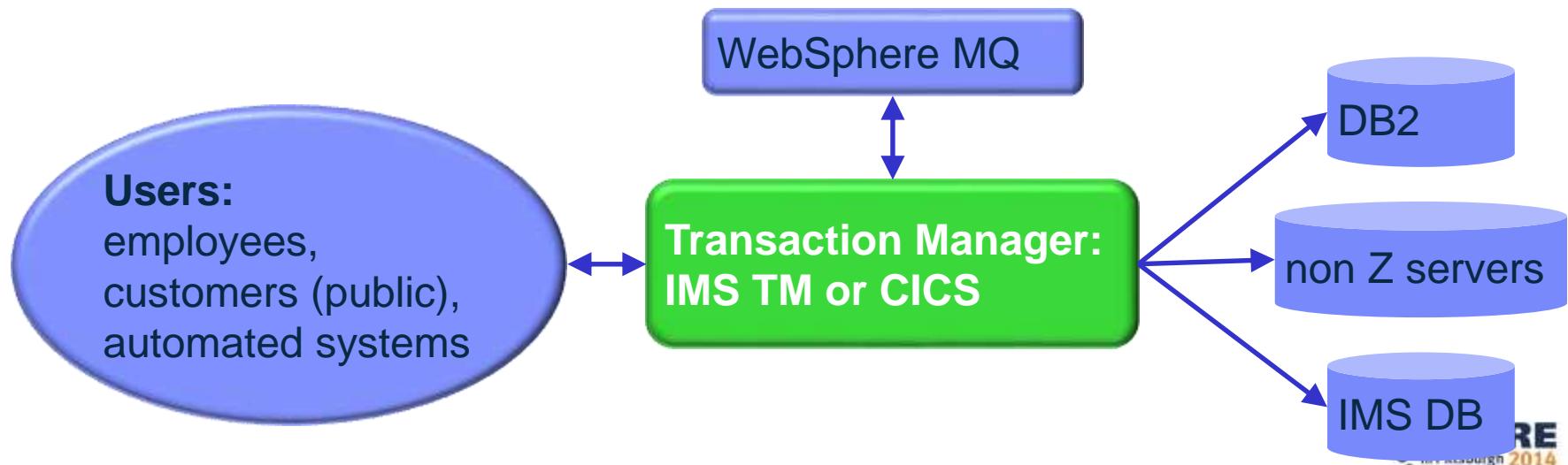
1980s application:

in-house users only; **simple** data, single data store



Today:

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



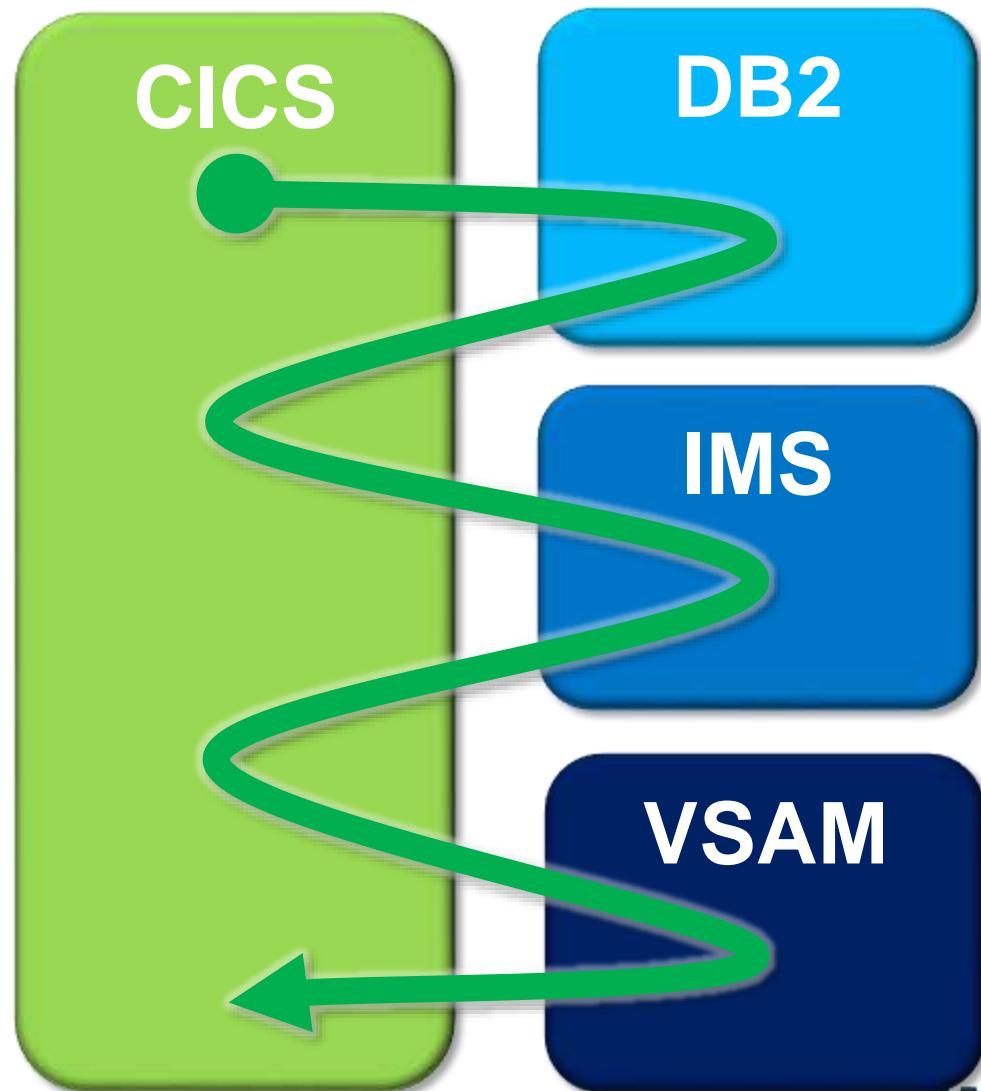
Where is the problem in my z/OS transaction?

- 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?



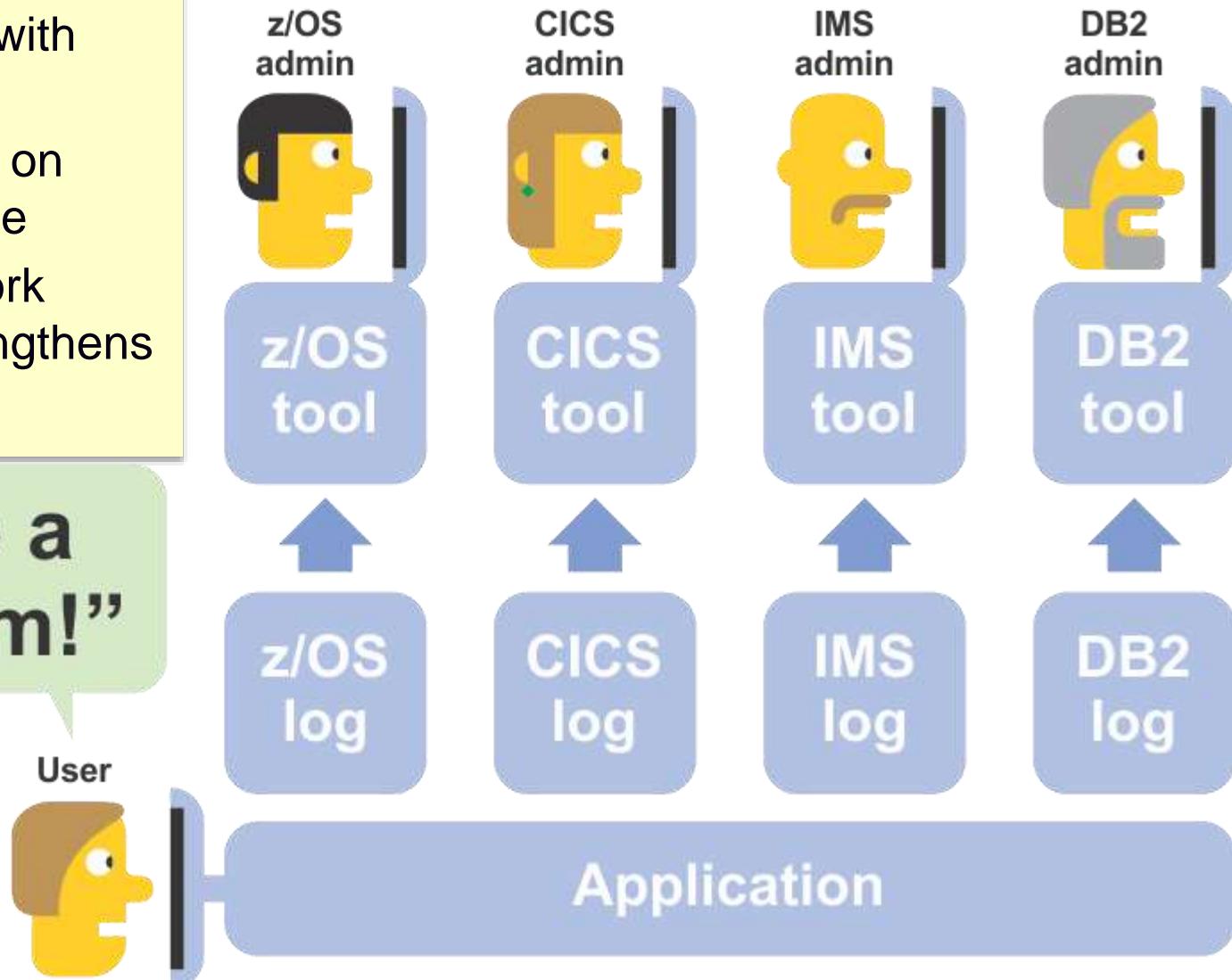
- Today's complex transaction workloads may span multiple subsystems
- Each subsystem has its own instrumentation data; data collection can be difficult
- Complex environments increase number of possible points of failure



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

“Not my problem!”



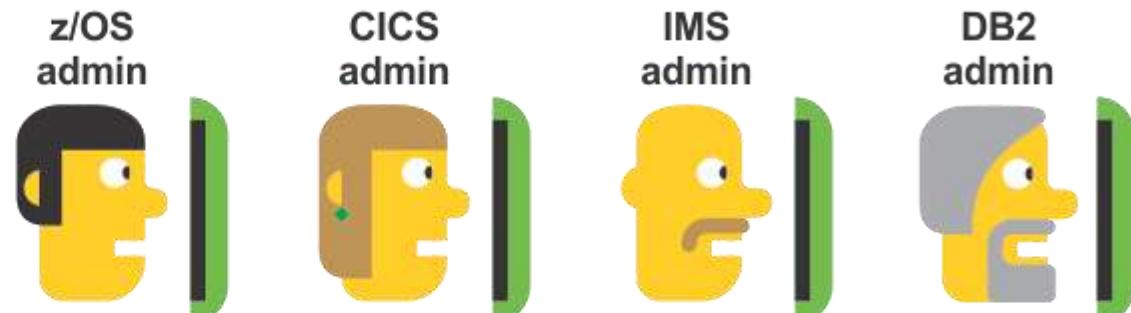
What should a end-to-end tool achieve?

- 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

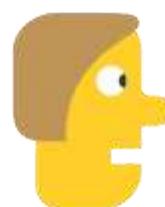
“We’re working on it!”



Transaction Analysis Workbench

“I have a problem!”

User



z/OS log

CICS log

IMS log

DB2 log

Application

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

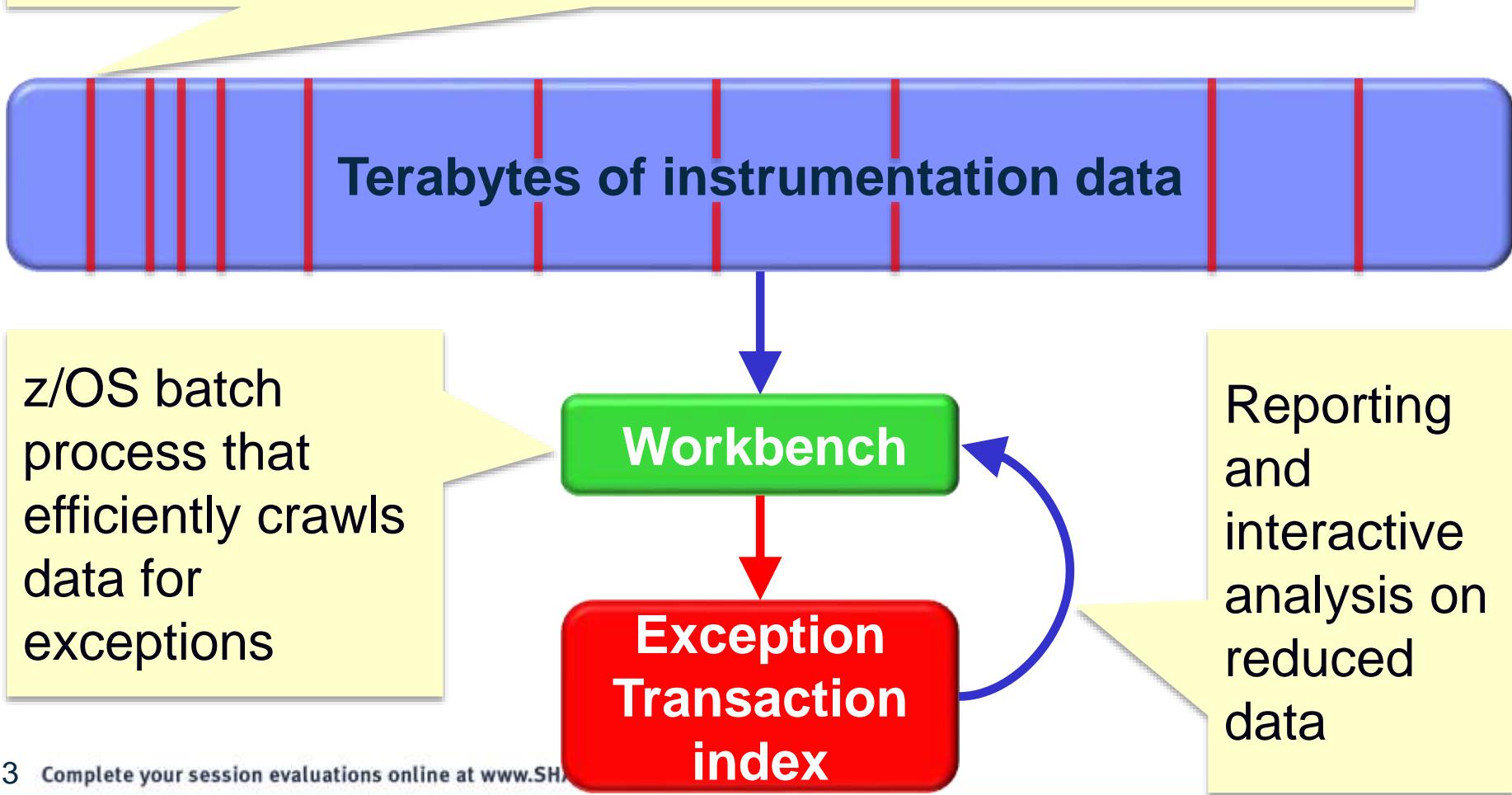
Terabytes of instrumentation data

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.

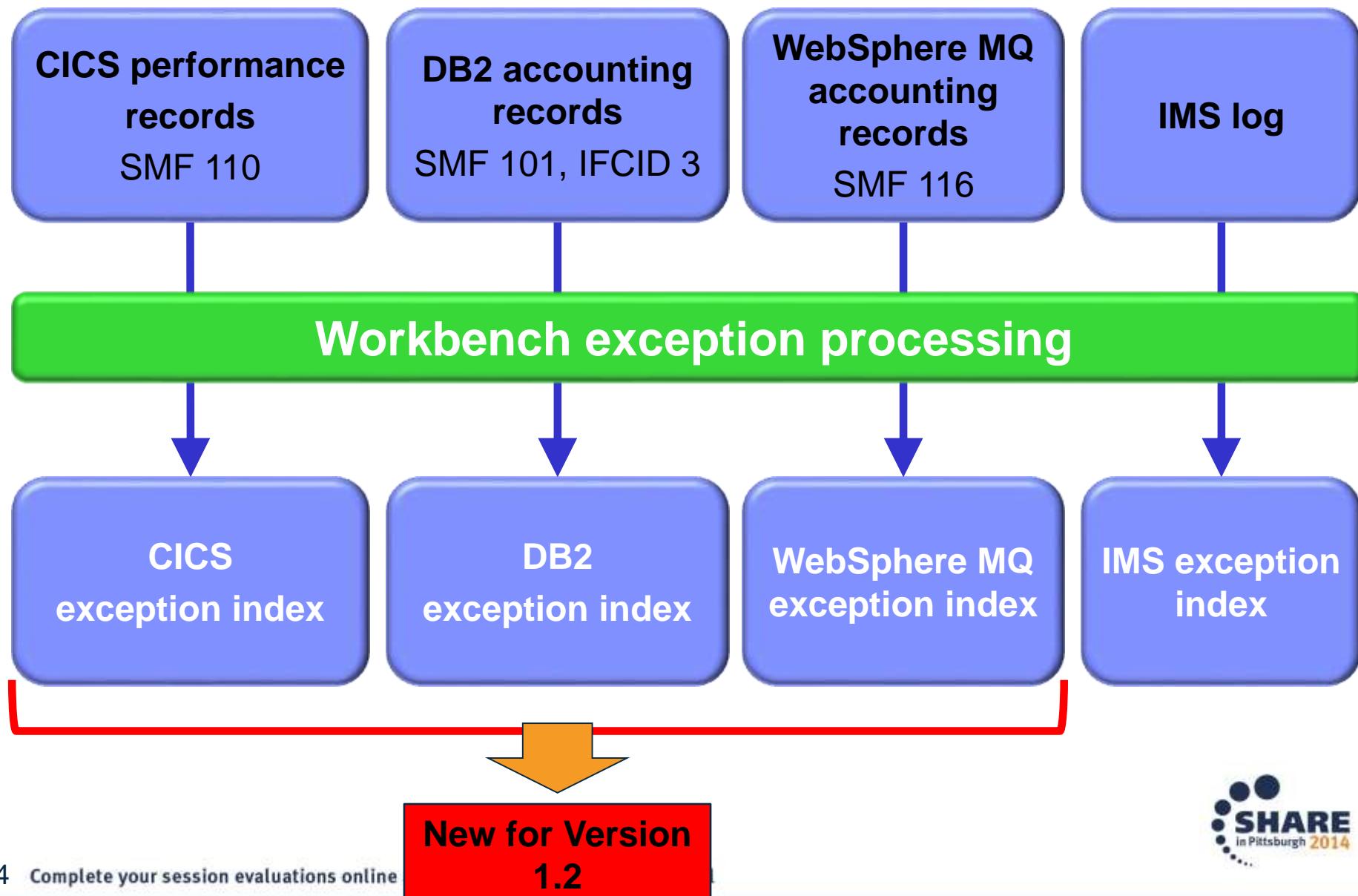
- Today's z systems create vast amounts of instrumentation data
- Good transaction performance monitoring may identify possible issues before they become critical and regardless of where they execute

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?

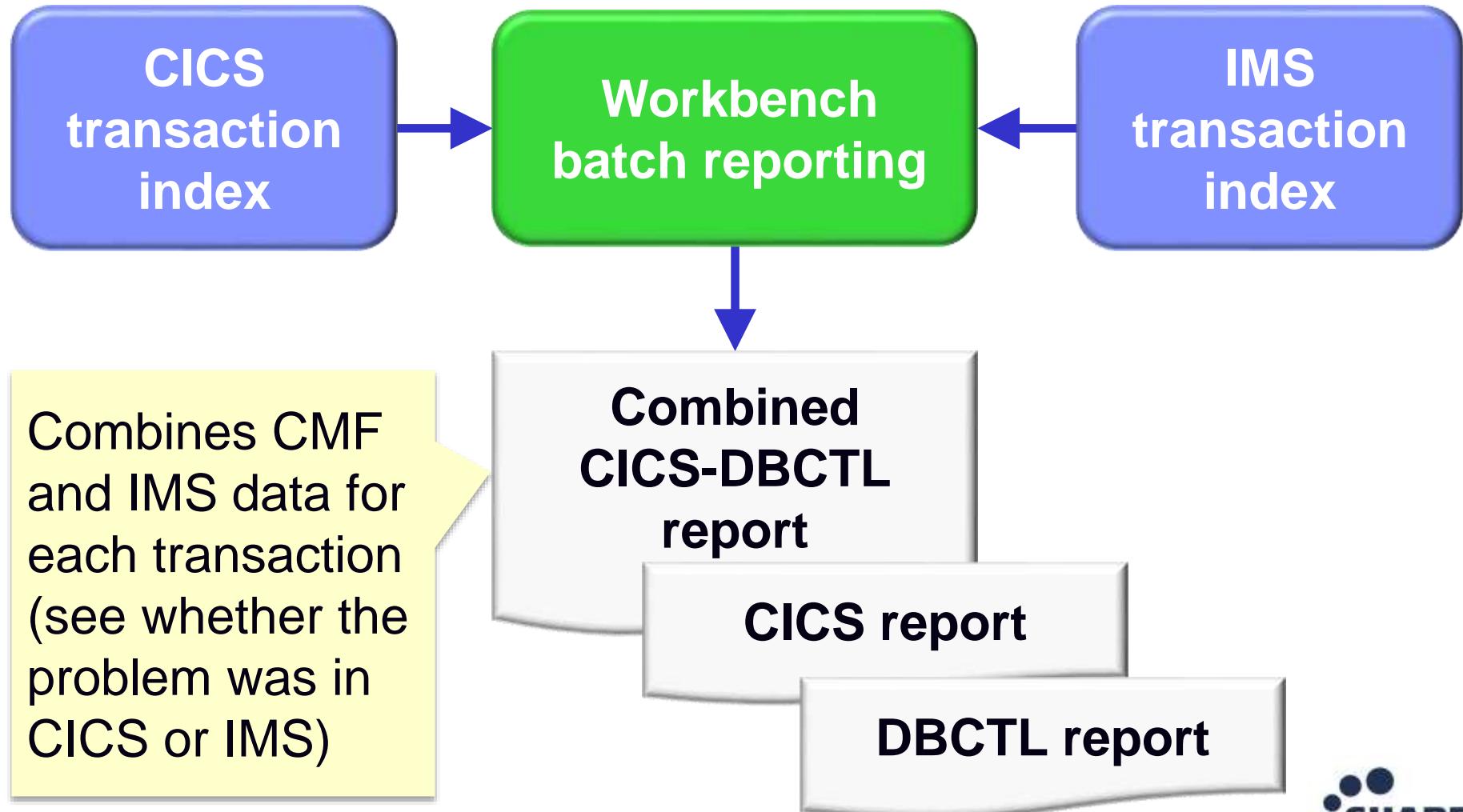
Application team and instrumentation data usage

- Value of data may not be known
- If value is known, 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

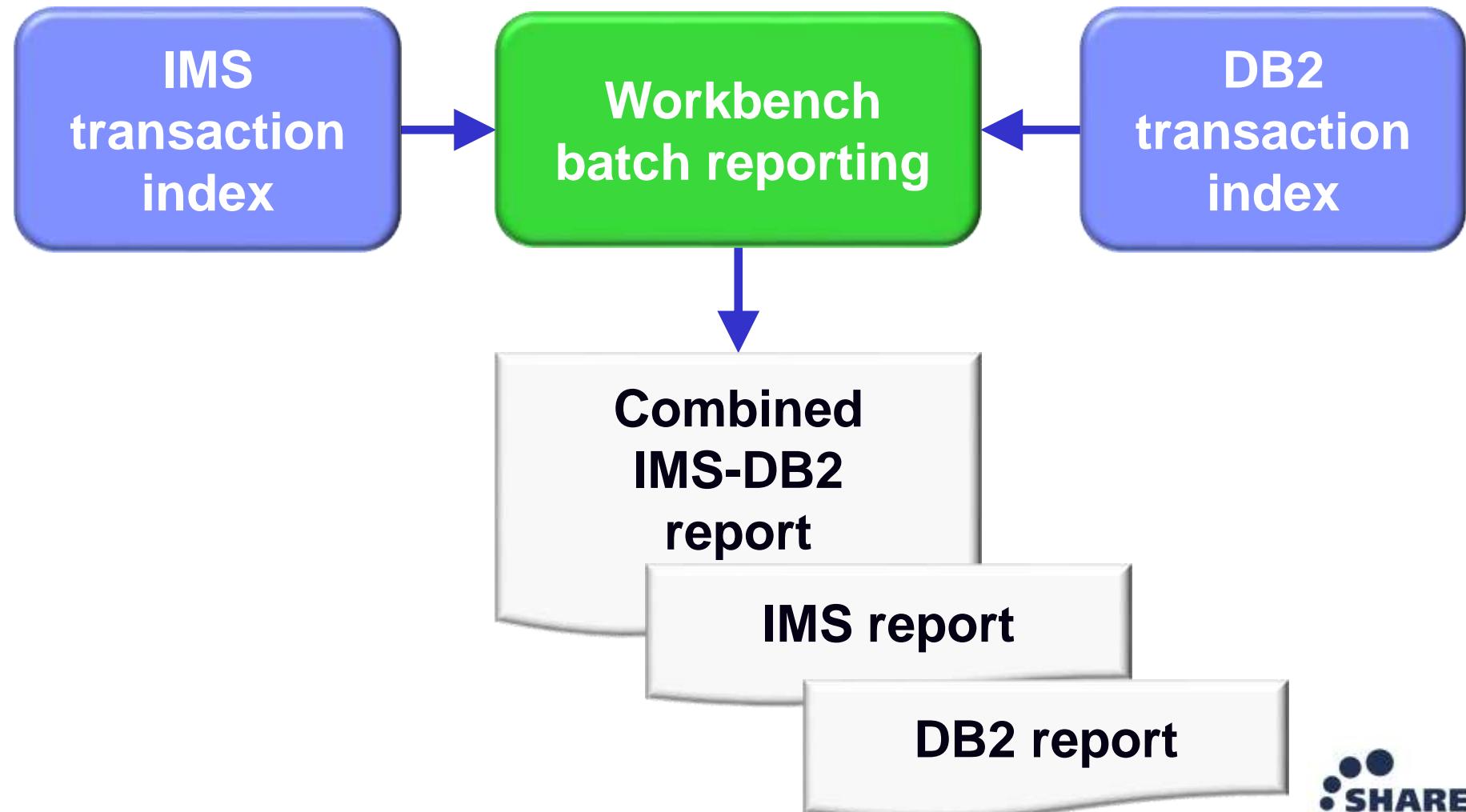
Tran	APPLID	CMF Count	Response	CPU Time	IMS Reqs	IMS Wait	ABEND	Rate/Sec
BANK	CICSP1	60	11.12982	0.008967	35	4.256977	10	0

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		

in Pittsburgh 2014

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)

<u>File</u>	<u>Mode</u>	<u>Filter</u>	<u>Time</u>	<u>Labels</u>	<u>Options</u>	<u>Help</u>
BROWSE	FUW000.QADATA.FBOSP007.IMS.D131008.INDEX			Record 00000207 More: < >		
Command	====>			Scroll ==> CSR		
/	Tracking	Navigate < 00.00.01.000000 >	Date/Time 2013-10-08	17.10.09.284086		
			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	
→	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

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
+01D8 Index scans.... +0
+01E0 Table space scans.... +1
+01E8 Buffer writes.... +0
+01F0 Parallel groups.... +0
+01F8 In-DB2 elapsed... 0.008537
```

Scan type

+0120	QW0058ID...	'SEQD'	Scan type
Off	QW0058IX...	'INDX'	Index
On	QW0058SD...	'SEQD'	Sequential data
Off	QW0058SW...	'SEQW'	Sequential data workfile

Sorts..... +0

Enhanced support for DB2 trace records (cont.)

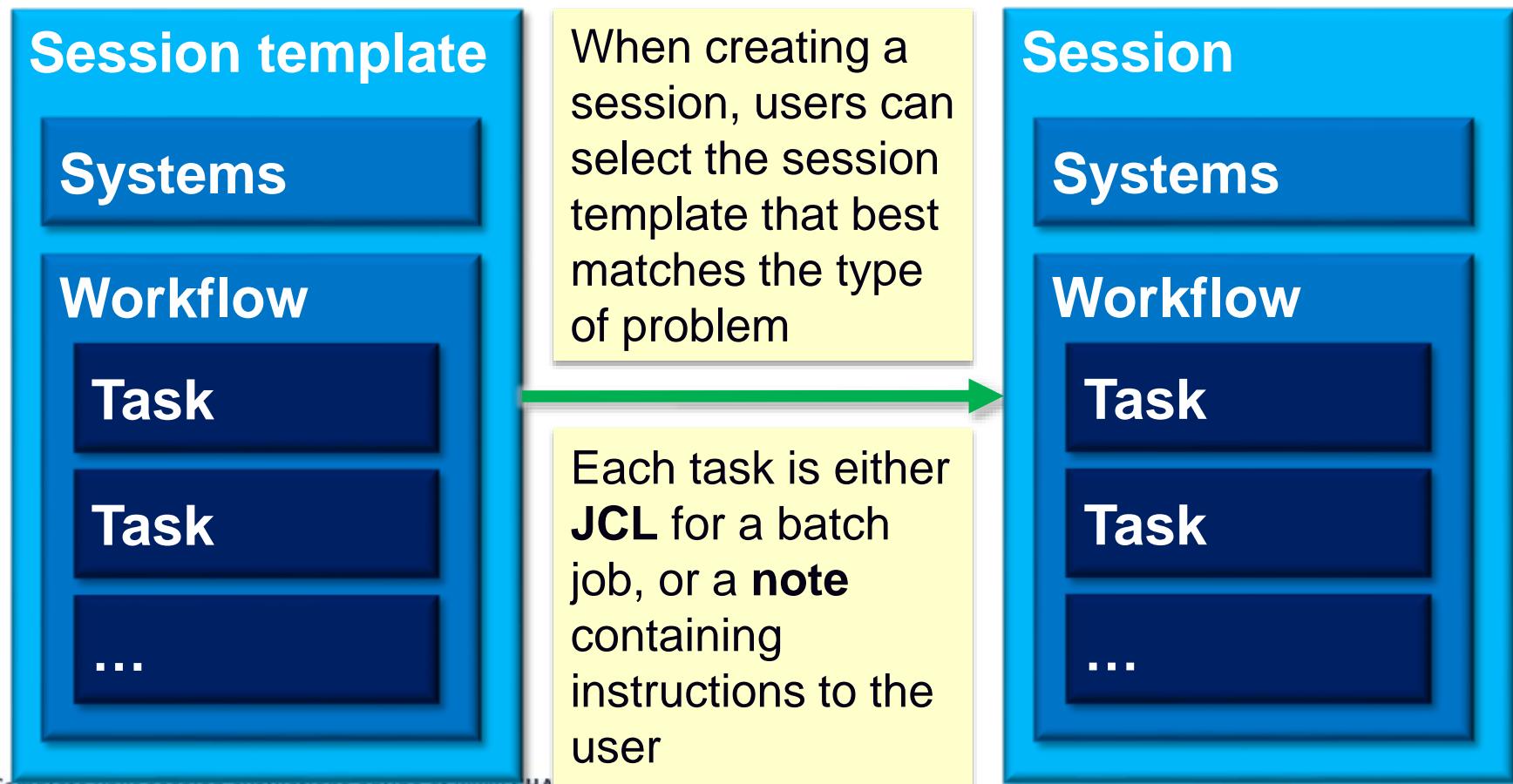
- Generating DB2 trace records can be expensive, and can result in very large log files: you do not want to simply start all traces.
- Workbench introduces the concept of trace “levels” (1 - 4) that categorize IFCIDs based on their usefulness (for transaction analysis) and cost overhead:
 - Program invocation
 - 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



Connection Server - IBM Tools Base Connection Server

File Edit Navigate Project Workbench Window Help

Connection Server Resource

Navigation <All Source Types>

Connection Servers

- FTS1 JCH [Connection Server]
- GXH#FSRV [Connection Server]
- GXHEG**

GXHEG [Workbench Repository] X

Show: Open New Session ...

Key	Summary	Status	Severity	Age (Days)	Created	Updated	Time Updated
00000001	Long response time from CICS transaction	OPEN	4	0	2013-08-19	2013-08-19	16.26.23.99
00000003	Web application server not responding	OPEN		0	2013-08-19	2013-08-19	16.27.55.32
00000004	Slow IMS transaction response	OPEN		0	2013-08-19	2013-08-19	16.28.06.42
00000005	XYZ application performance benchmark testing	OPEN		0	2013-08-19	2013-08-19	16.28.15.61
00000006	Post-implementation XYZ application analysis	OPEN		0	2013-08-19	2013-08-19	16.28.25.96

19/08/2013 4:39:32 PM; 1 of 5

Sessions

00000001 [Workbench Session] X

Summary: Long response time from CICS transaction

Details

Repository:	GXHEG	Status:	OPEN
Created On:	19/08/2013 4:22:58 PM by GXH	Age (Days):	1077952576 days
Timezone:	LOCAL	Last Updated On:	19/08/2013 4:26:23 PM by GXH
Assigned To:	<input type="text"/> Assign to Me	Session Template:	--- Approximate time issue occurred ---
Severity:	4	From:	2013-08-19 8:00:00 AM
Reference Id:	<input type="text"/>	To:	2013-08-19 8:30:00 AM
Reporter:	<input type="text"/>		

Details Systems Workflow Report Viewer

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

Connection Server - 00000013 [Workbench Session] @ FUW120 [Workbench Repository] @ JOHN [Connection Server] (FTS1:30014) - IBM Tools Base Connection Server

File Edit Navigate Project Workbench Window Help

Connection Server Resource

Navigation X

<All Source Types>

All Sources

- All Sources
- Workbenches
 - FUW120
 - JCHBA
 - JCHRE

Task: SMF reporting of system activity

<Find Value>

Selection
Select a Job to list the reports within it, then select a report to view content.

Jobs:

Job Name	Job Number	Max RC	DSN
JCH#RSUB	JOB57555	CC 0000	JCH.FUW.D130504.T001857.OUTPUT
JCH#RPT1	JOB87483	CC 0000	JCH.FUW.D130507.T203054.OUTPUT
JCH#CCV	JOB14254	CC 0000	JCH.FUW.D130509.T180815.OUTPUT
JDN#B14	JOB62618	CC 0000	JCH2 TEMP.OUTPUT

Reports:

DD Name	Procedure Name	Step Name	Lines	Pages
MQ1SUMM		REPORT	29	0
CICSSUMM		REPORT	346	0
SYSPRINT		SUBMIT	4	0

Content

V1R1MO		2013-05-07 Tuesday		CICS-DBCTL Summary				Page 1	
Tran	APPLID	CMF Count	Response	CPU Time	IMS Reqs	IMS Wait	ABEND	Rate/Sec	
CATA	CCVQ51D1	6	0.015795	0.003129			0	0	
CATA	CCVQ51D2	4	0.013209	0.002748			0	0	
CATA	CCVQ51D5	1	0.021016	0.003563			0	0	
CATA	CCVQ51T	9	0.028717	0.003147			0	0	
CATA	CCVT42M	2	0.027612	0.002117			0	0	
CATA	CCVWSRP	4	0.033013	0.002101			0	0	
CATD	CCVQ51D1	1	0.088915	0.002059			0	0	
CATD	CCVQ51D2	2	0.044653	0.002047			0	0	
CATD	CCVQ51D5	1	0.034221	0.001989			0	0	
CATD	CCVQ51T	2	0.020892	0.002000			0	0	
CATD	CCVT42M	2	0.030976	0.001893			0	0	
CATD	CCVT51M	1	0.032636	0.002789			0	0	

Page: 1

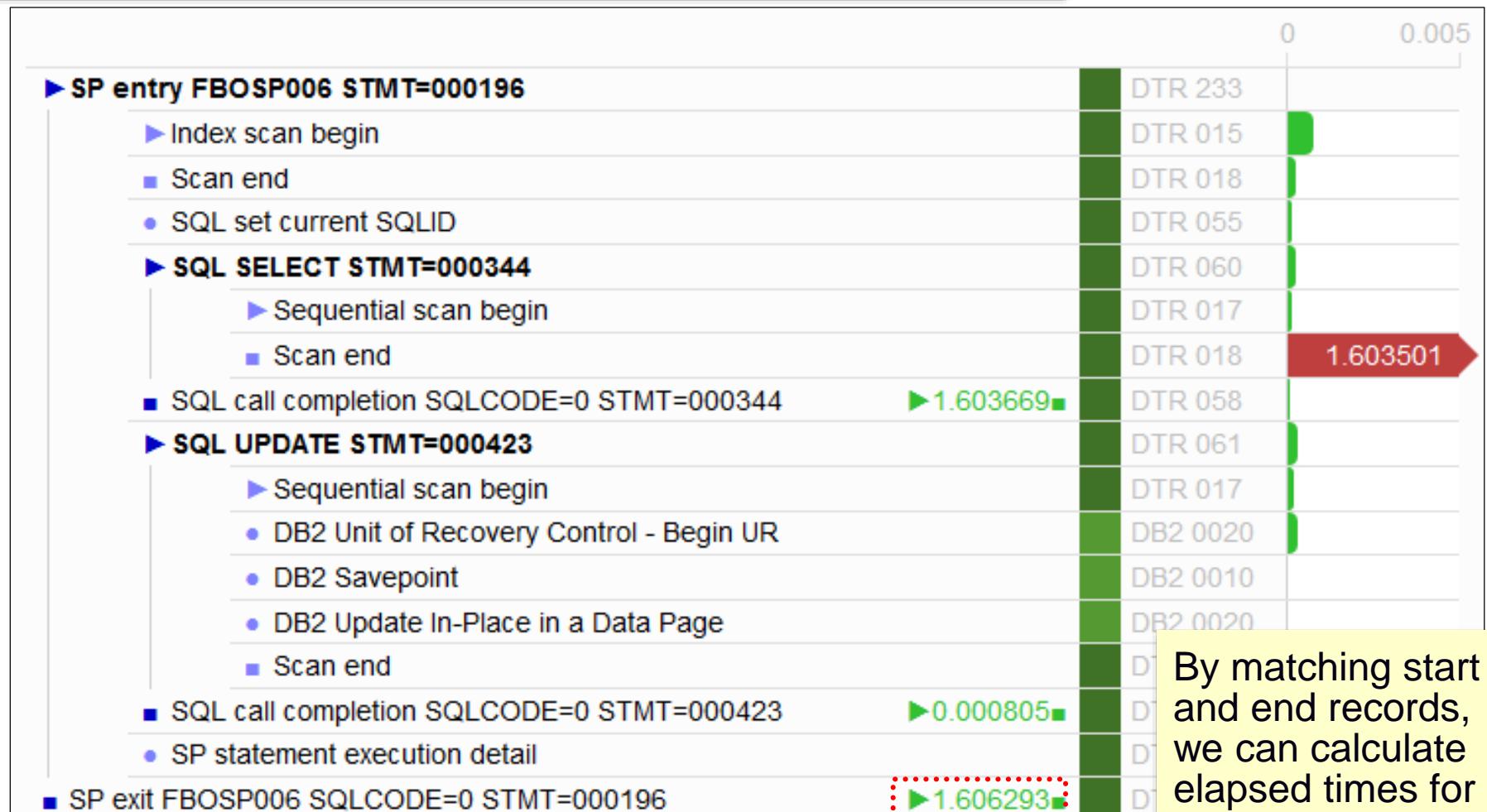
Details Workflow Systems History Reports

Console

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

Investigate				No coverage	
		Time Slice (ON)			
Time		Date		Duration	
HH.MM.SS.thmiju		YYYY-MM-DD		HH.MM.SS	Zone
<u>17.10.09.284086</u>		<u>2013-09-24</u>		<u>00.00.30</u>	<u>LOCAL</u>
/					Filter +
Type	Start Time	Date	Duration	Coverage	
IMS	<u>17.10.09.284086</u>	<u>2013-10-08 Tue</u>	< 1 TRACK - OLD	COMPLETE	
IMS	<u>17.10.09.284086</u>	<u>2013-10-08 Tue</u>	<u>00.00.15</u> - NEW	COMPLETE	

- 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	====>	ScrolII ==> 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
                           _____                         Tuesday 2013-10-08 Time (Elapsed)
/   _____ Tracking _____
  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 FB0SP007	STMT=001031 DBA6 DTR-000000000007
380	SP entry FB0SP007	STMT=001031 DBA6 DTR-000000000008
177	Package allocation FB0SP007	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

File Help

Problem Details		Row 1 to 3 of 3
Command ==>	_____ 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 2012-06-24	15.20.00.00
Status : OPEN	To 2012-06-24	16.50.00.00
Status : OPEN	To 2012-06-24	Zone . . . LOCAL
Where problem occurred : Payroll	+ ***** Bottom of data *****	
/ System +	Type +	
IADG	IMS	
DB3A	DB2	
FTS1	IMAGE	

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

Command ==>

DB2 accounting exception extract and reporting

Select . . . 1 1. Extract and reporting 2. Exception criteria

Report request:

Detailed list report
 Extract

Report Interval _____
YYYY-MM-DD HH.MM.SS.TH
From _____
To _____

Extract Data Set:

Data Set . . . JM3.DB2.INDX'

Filtering:

SSIDs . . . : _____
Plans . . . : _____

Connection type:

RRSAF+CAF TSO DRDA CICS IMS

File selection:

Select the DB2 system to report against, or specify an SMF file:

1. System . . . : _____ +
 2. Log File . . . 'FUW000.QADATA.FBOSP006.SMF.D130530.FULL' +



DB2X: Specify exception thresholds

Response and CPU time:

Response time . . .	<u>0.5</u>	(0.000001-99 seconds)
CPU class 1 . . .	<u>0.1</u>	
In-DB2 elapsed . . .	<u>0.2</u>	
CPU class 2 . . .	<u>0.05</u>	
Database I/O . . .	<u>0.05</u>	
Lock suspend . . .	<u>0.05</u>	

 Apportion rollup

Stored Procedure:

Elapsed	<u>0.1</u>	(0.000001-99 seconds)
CPU	<u>0.05</u>	

Row activity:

Fetched	<u>1000</u>	(0 to 999999)
Inserted	<u>100</u>	
Updated	<u>100</u>	
Deleted	<u>100</u>	

Locking:

Deadlocks	<u>1</u>	(0 to 999999)
Suspends	<u>20</u>	
Timeouts	<u>1</u>	
Lock requests . . .	<u>50</u>	

Buffering:

Get pages	<u>50</u>	(0 to 999999)
Update pages . . .	<u>30</u>	

Logging:

Log records	<u>100</u>	(0 to 999999)
---------------------	------------	---------------

Abnormal conditions:

Abort	<u>1</u>	(1=check for condition)
Check pending . . .	<u>1</u>	

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

SHARE

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

File Mode Filter Time Labels Options Help

BROWSE JM3.DB2.INDX Record 0000001 More: < >
 Command ==> Scroll ==> CSR
 Navigate < 00.00.01.000000 > Date/Time 2013-05-30 11.02.02.343292
 / _____ Thursday 2013-05-30 Time (LOCAL)
 003 Thread accounting DBA6 11.02.02.343292
 TranCode=MQP3DB2S Userid=STC@ZOSN ClientID=RRSAF
 RESP=0.001744 CPU1=0.001315 CPU2=0.001217 I/O3=0 Source=RRSAF
 OPE=1 FET=1 GetPage=2 Abort=1 LUWID=FTS3/DBA6LU/CB6F701B4F27/0002
 003 Thread accounting DBA6 11.02.07.347106
 TranCode=MQP3DB2S Userid=STC@ZOSN ClientID=RRSAF
 RESP=0.001752 CPU1=0.001293 CPU2=0.001195 I/O3=0 Source=RRSAF
 OPE=1 FET=1 GetPage=2 Abort=1 LUWID=FTS3/DBA6LU/CB6F702014CB/0002

Building an IMS Exception Candidate Index

File Help

Line Actions

File Help

IMS Transaction Index Request

Command ==>

Original Data Set . . : FUW000.QADATA.FBOSP007.IMS.D131008.SLDS
IMS index : JM3.FUW.INDEX

Exception criteria:

/ Transaction ABEND
/ Response time threshold . . 0.5 (0.00001 to 999999 seconds)

Extract Interval

YYYY-MM-DD HH.MM.SS.TH
From 2013-09-24 09.25.00.00
To 2013-09-24 09.40.00.00

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 Command	FUW000.QADATA.FBOSP007.IMS.D131008.INDEX	Record 00000201 More: < > Scroll ===> CSR
/	Tracking	Date/Time 2013-10-08 17.10.09.284086
E	CA01 IMS Transaction TranCode=FBOIAT41 Region=0002	Tuesday 2013-10-08 Time (Elapsed)
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.... 'IDX'    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

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	SQLWA... : :	SQLWARN5... : :	SQLWARN6... : :
+00F1	SQLWA... : :	SQLWARN8... : :	SQLWARN9... : :
+00F4	SQLWA... : :	SQLSTATE... '00000'	

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

Select any field and
get more detailed
information or help

+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

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			
380	Tracking SP entry FBOSP007	Saturday	2013-06-22	Time (Elapsed		
	TranCode=FBOIAP42 Userid=FUNTRM06 ClientID=ICDG			DBA6	15.18.02.907449	
	LUWID=FTS3/DBA6LU/CB8C9439E347/0001					
380	SP exit FBOSP007	SQLCODE=0000	DBA6	0.444391		
	TranCode=FBOIAT41 Userid=FUNTRM06 ClientID=ICDG					
	LUWID=FTS3/DBA6LU/CB8C9439E347/0001					
003	Thread accounting	DBA6	0.003521			
	TranCode=FBOIAT41 Program=FBOIAP41 Userid=FUNTRM06 Region=0001					
	RecToken=ICDG/0000000100000000 ClientID=ICDG					
	RESP=0.448242 CPU1=0.324230 CPU2=0.000791 I/O=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 by other SMEs



```
File Mode Filter Time Labels Options Help
BROWSE IMPOT01.SESSION7.TRANIX + Record 00005399 More: < >
Command ==> Slice . . Duration 00.05.00 Date 2012-06-24 Time 16.25.44.803974
          Code Description < 00.05.00.000000 > 2012-06-24 Thursday Time (Relative)
/
CA01 Transaction 16.33.33.575325
  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 Ou
  TotalTm=72.612943 RegTyp=MPP
TAG IMS DB2 transaction with long response time
G 0020 DB2 Unit of Recovery Control - Begin UR
  Userid=FUNTRM10 IMSID=IDDG 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

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
<hr/>					
DATABASE	TABLESPACE	DBID	PSID	OBID	AUTHID
<hr/>					
HR_DB	HR_SPACE	00456	00002	00003	FUNTRM10
<hr/>					
CONNTYPE	LRSN				
<hr/>					
IMS	C62D2CB46CB3				
MEMID	CORRID	CONNID	LUW=NETID/LUNAME/UNIQUE/COMMIT		
<hr/>					
00000	0004MQATPGM	IMS	FTS3	/DB3ALU	/C62D2CB46A5A/0001 00000002/02
ROW STATUS	EMP_ID	EMP_NAME	EMP_PHONE	EMP_YEAR	EMP_SALARY
<hr/>					
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