

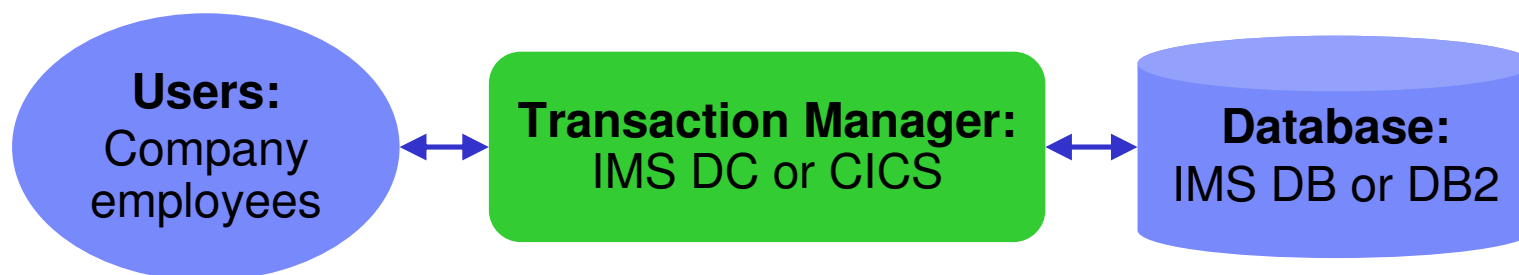


The Diagnostic Evolution for Transaction Analysis: Introducing the Transaction Analysis Workbench

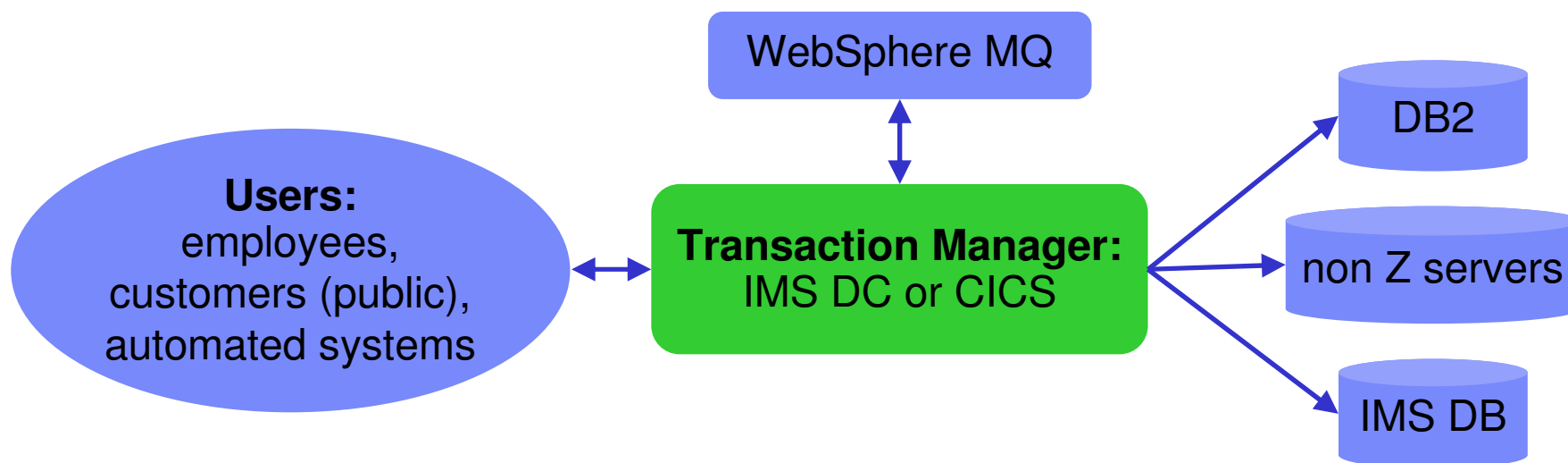
Jim Martin,
Fundi Software

It's all about evolution

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

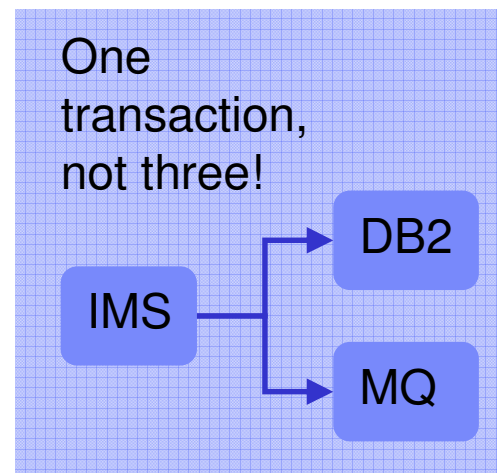
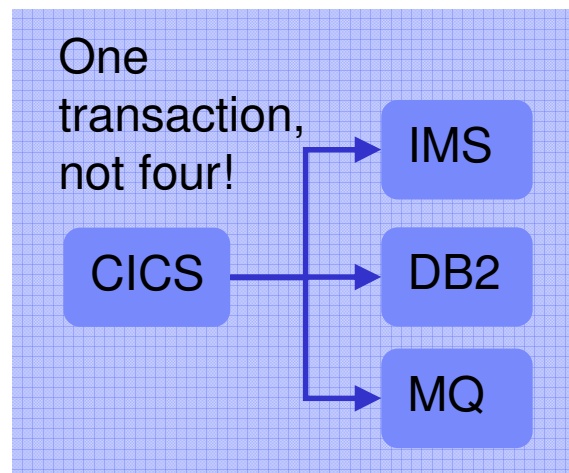
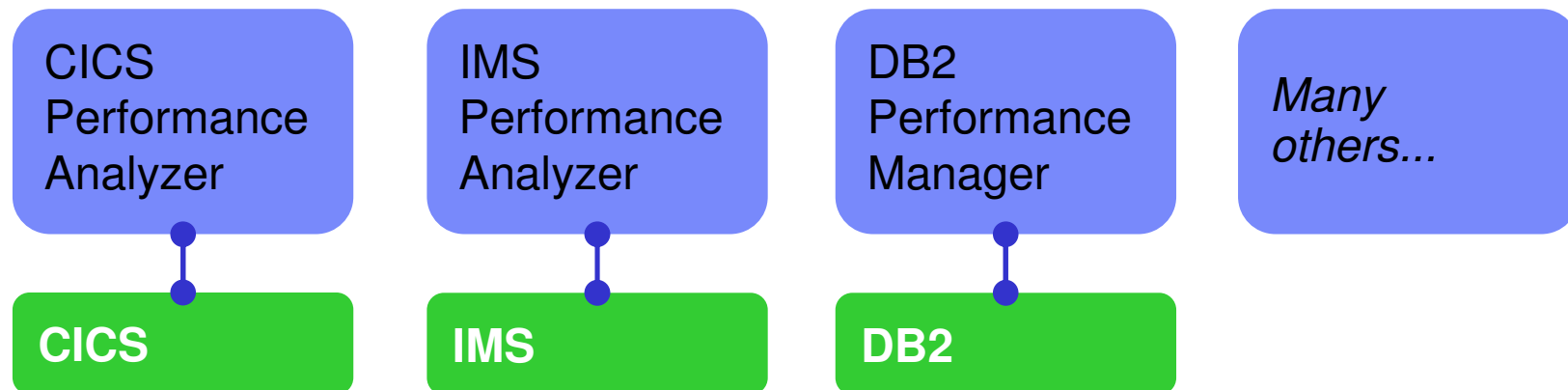


2010: users are customers; data is complex, often distributed



Analysis tools have not kept pace

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

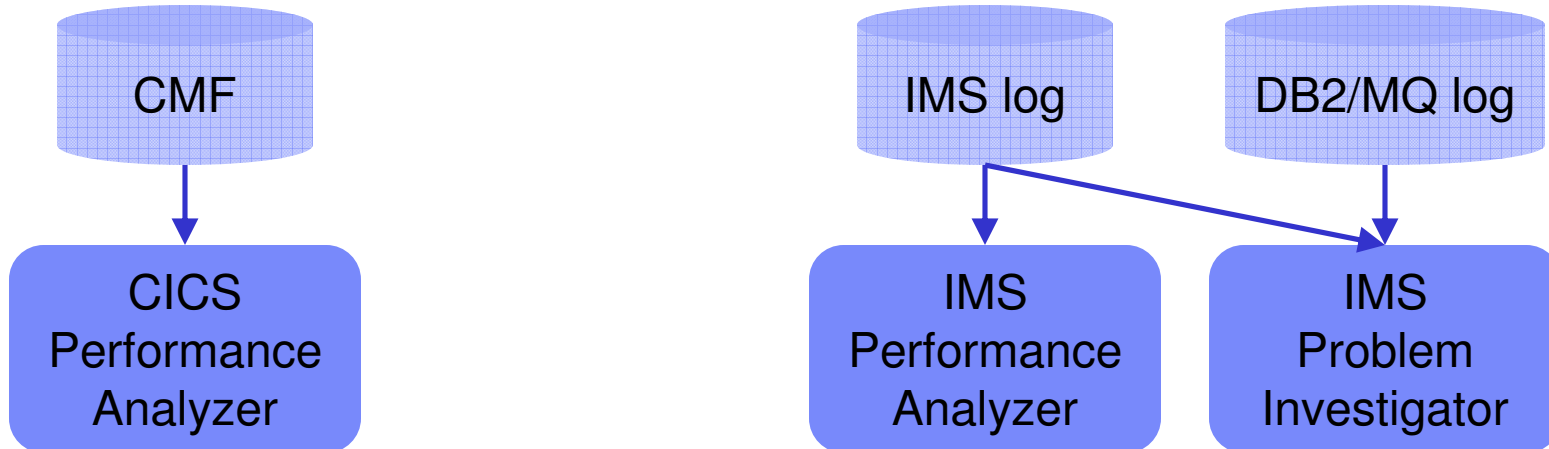
Transaction Analysis Workbench: the product

- A transaction analysis framework for System z
 - Not transaction manager specific
 - Leverages current IBM tools for transaction analysis
- Not IMS or CICS specific, but first release provides more synergy with the existing tools for those transaction managers
- Automates collection of data needed for problem analysis
- Provides a session manager to manage problem analysis through its lifecycle
- In this presentation, it might look like the Workbench is IMS or CICS centric but that is not the case
 - The tools for IMS and CICS are the first to be engaged

Transaction Analysis Workbench: Goals

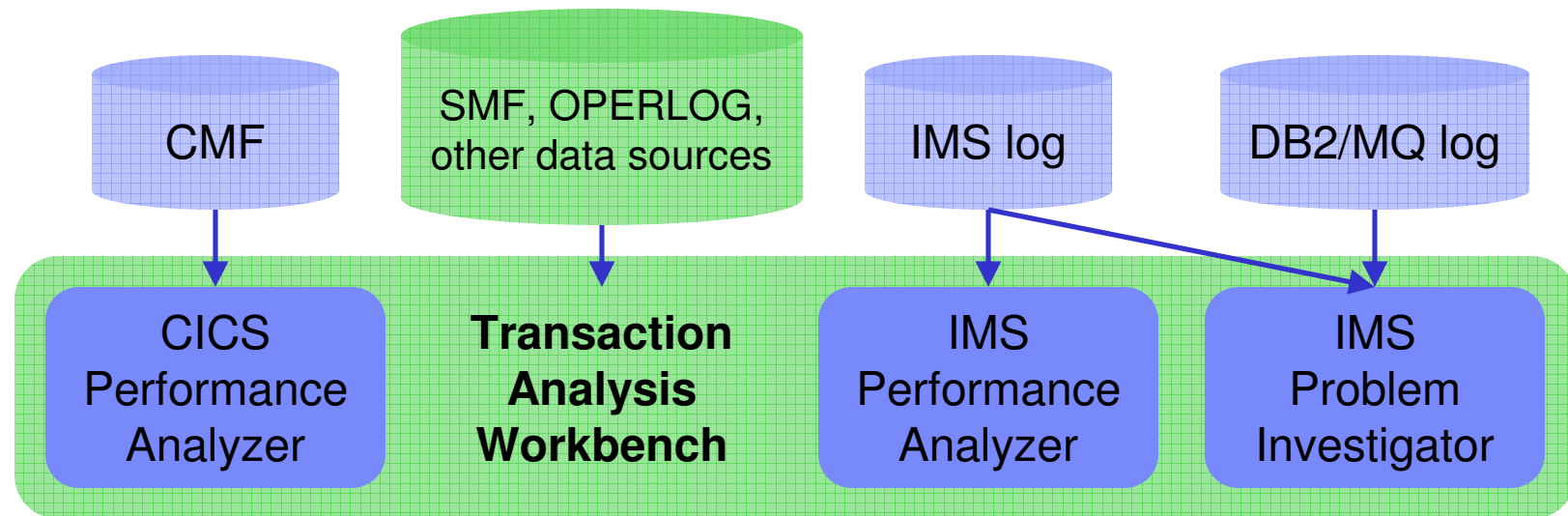
1. Enable higher productivity by lower skilled staff, reduce problem analysis time, and serve as a training tool for new support staff
2. Allow the 'First Responder' to determine the most likely source of the problem so that the right subject matter expert can work on the problem
3. Allow for 'Deep dive' problem determination via synergy with other IBM tools
 - Subject matter experts may also use tools not supported by the Workbench

Before Transaction Analysis Workbench



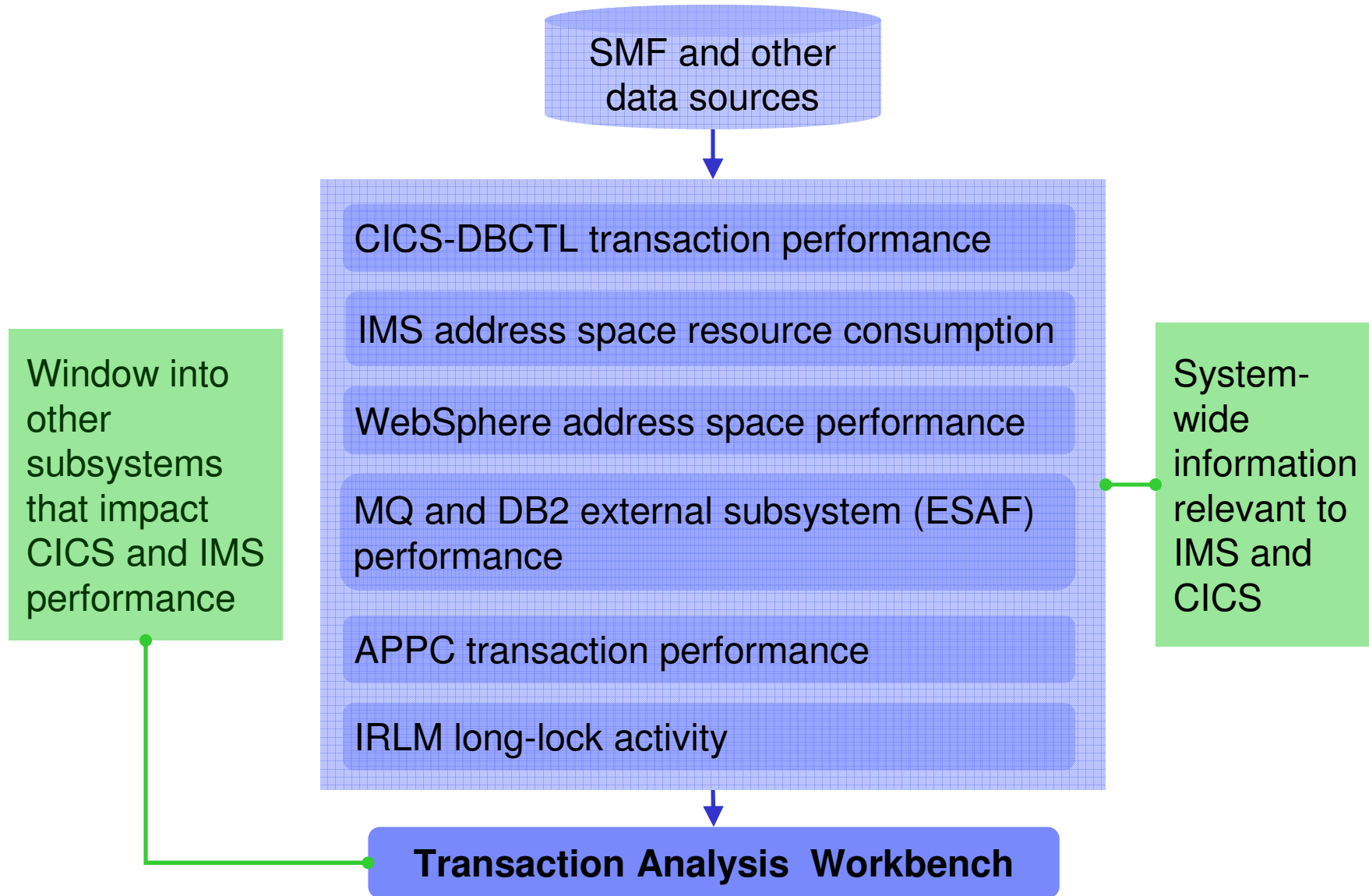
- Separate reporting for CICS and IMS: no integration

With Transaction Analysis Workbench



- Integrated CICS and IMS performance management and problem determination
- System and subsystem performance that directly affects CICS and IMS
- Integrated CICS-DBCTL performance reporting using both CICS and IMS performance data

SMF: additional IMS, CICS performance data



Session Manager (ISPF dialog)

- Session Manager approach to problem management:
 - Register the problem
 - Automatically locate the files required to diagnose the problem: IMS, DB2, CICS, SMF, OPERLOG etc.
 - Resume from where you left off, or from a previous save-point
 - Write reminder notes and information as you go
 - Re-assign the problem to the appropriate subject-matter-expert
 - Use PI-style interactive analysis to look at related logs and other subsystem events via SMF, OPERLOG etc.
 - Run reports that are specific to the problem

Collecting the required data for problem analysis

Fixing any problem means gathering the data required to understand the cause of the problem:

- Need to remember what was collected
- Need to view the data in transaction lifecycle sequence
- Is most enlightening if all data merged into a single view

Remember:

- We need to view the data as one transaction, not three or four

Problem: What is the impact of other systems on transaction performance?

IMS PA	Transact ORDER	Count 1234	Response 1.5	MPPtime 1.4	IOtime 0.5	CPU 0.8	DBcalls 24	Bad response time in IMS or CICS?
CICS PA	Transact ORDR	Count 2451	Response 1.8	IOwait 0.5	DB2wait 0.6	CPU 1.2	FileCall 16	

Transaction Analysis Workbench

DB2	DB2	Thread	Transact	Count	--Thread-- Elaps	CPU	--In DB2-- Elaps	CPU	IO Time	Lock Time
DB2P	IMS1	ORDER	1234	0.5	0.1	0.2	0.1	0.1	0.2	
DB2P	CICSP1	ORDR	2451	0.6	0.1	0.3	0.1	0.1	0.2	

MQ	MQ	Thread	Transact	Count	Gets	Puts	CPU	Suspend	DB2 or MQ may be the culprit!
MQP1	IMS1	ORDER	1234	12	5	0.2	0.3		
MQP1	CICSP1	ORDR	2451	15	6	0.3	0.4		

WebSphere	WAS	Server	Count	---- Bytes ---- Received	Sent
	WASPROD		3685	189M	145M

Critical system Address Spaces	JobName	CPU	ZIIP	Storage	IO	High-level job accounting information can be reconciled against more detailed transaction performance metrics
	IMSCTL	40.2	0.0	256M	1782	
	DLISAS	12.6	0.0	1G	565758	
	IMSMPP1	34.7	0.0	365M	4591	
	DB2P	98.4	8.4	13G	4849455	

Signatures: Performance is worse than yesterday – why?

1

25% of transactions had a response time greater than 1 second. But this is not normal and did not happen yesterday!

IMS PA		Transact	Count	Response	Response > 1.0	CPU
Yesterday	ORDER		1234	1.5	2%	0.8
Today	ORDER		1256	2.7	25%	0.8

CICS PA		Transact	Count	Response	Response > 1.0	CPU
Yesterday	ORDR		2451	1.8	3%	1.2
Today	ORDR		2519	3.1	28%	1.2

2

IMS and CICS response times are a problem today. CPU and database usage are normal. What is causing the problem?

Workbench		MQ	SSID	Thread	Transact	Count	Gets	Puts	CPU
MQ/IMS	Yesterday	MQP1	IMS1	ORDER		1234	12	5	0.2
	Today	MQP1	IMS1	ORDER		1256	18	9	0.4
						+0%	+49%	+79%	+94%
MQ/CICS	Yesterday	MQP1	CICSP1	ORDR		2451	15	8	0.5
	Today	MQP1	CICSP1	ORDR		2519	21	12	0.9
						+1%	+51%	+81%	+95%

3

Comparing MQ usage today with yesterday (when performance was normal) reveals increased levels of MQ activity, accounting for bad response time in IMS and CICS.

Problem: How are DB2 threads performing in my IMS transactions?

SSID	Plan	Connect Type	TranCode	Thread Count								
DB2P	DB2ORDER	IMS MPP	ORDERP01	127								
Class1: Thread		Avg: Elapsed=		.5509	CPU=		.002450					
		Max: Elapsed=		.5509	CPU=		.002450					
Class2: In-DB2		Avg: Elapsed=		.0145	CPU=		.001930					
		Max: Elapsed=		.0145	CPU=		.001930					
Class3: Suspend		Avg: Total =		.003368	I/O=	.003368	Lock/Latch=	.000000	other=	.000000		
		Max: Total =		.003368	I/O=	.003368	Lock/Latch=	.000000	other=	.000000		
Buffer Manager		Avg: Get Page=		10.0	System Page Update=		3.0					
		Max: Get Page=		19	System Page Update=		7					
Locking		Avg: Suspend =		0.1	DeadLock=	0.0	TimeOut=	0.0	Max Page Locks=	1.0		
		Max: Suspend =		3	DeadLock=	1	TimeOut=	4	Max Page Locks=	1		
SQL Query/Update		Avg: Select =		5.1	Insert =	1.2	Update =	2.0	Delete=	0.2		
		Max: Select =		201	Insert =	41	Update =	62	Delete=	7		
SQL DML 'Other'		Avg: Describe=		.0	Prepare =	.0	Open =	1.2	Fetch =	13.8	Close=	1.2
		Max: Describe=		0	Prepare =	0	Open =	2	Fetch =	30	Close=	2

Excessive deadlocks and time-outs may be the cause of transaction failures

PI-style interactive diagnosis: Extending the reach beyond IMS

- MVS OPERLOG
 - Directly accesses the live OPERLOG log stream
- SMF (including direct access to SMF log stream)
 - CICS – DBCTL
 - DB2 – Thread accounting
 - DB2 – IFCID performance trace
 - Directly accesses the live SMF log stream
- IMS PI is also improving with new data sources
 - OMEGAMON for IMS Application Trace Facility (ATF)
 - Synchronous Call-out

IMS-DB2 problem determination

IMS log

DB2 IFCID
trace (SMF)

MVS
OPERLOG

```

BROWSE      IMS.SLDS + DB2 Trace + MVS SYSLOG      Record 00001478

Code Description                               Date 2008-05-08 Thursday  Time (Relative)
-----
/
01  Input Message TranCode=MQATREQ1             12.26.20.360736
35  Input Message Enqueue TranCode=MQATREQ1      +0.000025
08  Application Start TranCode=MQATREQ1 Region=0002 +0.000458
5607 Start of UOR Program=MQATPGM Region=0002    +0.000459
31  DLI GU TranCode=MQATREQ1 Region=0002        +0.000491
5616 Start of protected UOW Region=0002         +0.000761
50  Database Update Database=DI21PART Region=0002 +0.004958
5600 Sign-on to ESAF Region=0002 SSID=DB3A      +0.005662
5600 Thread created for ESAF SSID=DB3A          +0.005690
-----
66  DB2 Performance 073 Create thread exit       +0.006672
    Program=MQATPGM Userid=FUNTRM37 Region=0002
    SSID=DB3A SYSID=FTS3 ConType=MPP Plan=MQATPGM CpuTime=0.596249
    LUWID=FTS3/DB3ALU/C25C0C4734A9/0001
66  DB2 Performance 065 SQL open cursor          +0.006884
66  DB2 Performance 058 SQL call completion     +0.006945
66  DB2 Performance 059 SQL fetch              +0.007055
66  DB2 Performance 045 IRLM suspend exit       +0.010890
-----
SYS  DSNJ002I - FULL ACTIVE LOG DATA SET 385   +0.022817
    DSNNAME=DB2P.LOGCOPY1.DS01, STARTRBA=000EFED3B000, ENDRBA=000F00EFAFFF
    DSNJ001I - DSNJW307 CURRENT COPY 1 ACTIVE LOG DATA 386
    SET IS DSNNAME=DB2P.LOGCOPY1.DS02,
    STARTRBA=000F00EFB000, ENDRBA=000F030BAFFF
-----
5600 Sign-on to ESAF Region=0002 SSID=CSQ6     +0.037987
5600 Thread created for ESAF SSID=CSQ6         +0.038013
5600 Commit Prepare starting Region=0002 SSID=CSQ6 +0.340471
03  Output Message Response LTerm=FUNTRM37     +0.374508
35  Output Message Enqueue LTerm=FUNTRM37 Region=0002 +0.374531
37  Syncpoint message transfer Region=0002     +0.374586
31  Communications GU LTerm=FUNTRM37           +0.374851
5600 Commit Continue completed Region=0002 SSID=CSQ6 +0.403674
5600 Commit Continue completed Region=0002 SSID=DB3A +0.406559
5612 End of Phase 2 Syncpoint Program=MQATPGM Region=0002 +0.406577
07  Application Terminate TranCode=MQATREQ1 Region=0002 +0.407344
36  Output Message Dequeue LTerm=FUNTRM37     +0.433355

```

IMS-DB2-MQ problem determination

IMS log

DB2 IFCID
trace (SMF)

MQ adapter

SMF

```

BROWSE      JCH.IMSPI.MQ.ADAPTER.INDEX      Record 00006389 More: < >
Command ==>  Scroll ==> CSR
Forwards / Backwards . . . Time of Day . . . 15.32.57.059817
Code Description                      Date 2008-01-25 Friday      Time (Elapsed)
-----
/
01  Input Message TranCode=MQATREQ1      11.21.24.890736
35  Input Message Enqueue TranCode=MQATREQ1      0.000025
31  DLI GU TranCode=MQATREQ1 Region=0001      0.000117
50  Database Update Database=DI21PART Region=0001      0.000375
50  Database Update Database=DI21PART Region=0001      0.000114
50  Database Update Database=DI21PART Region=0001      0.000032
50  Database Update Database=DI21PART Region=0001      0.000077
50  Database Update Database=DI21PART Region=0001      0.000047
5600 Sign-on to ESAF Region=0001 SSID=DB3A      0.000800
0020 DB2 Unit of Recovery Control - Begin UR      0.004200
0020 DB2 Update In-Place in a Data Page      0.000032
0010 DB2 Savepoint      0.000192
0020 DB2 Delete from a Data Page      0.000096
0020 DB2 Insert into a Data Page      0.000256
5600 Sign-on to ESAF Region=0001 SSID=CSQ6      0.037829
0002 MQ Get Region=0001      0.000619
0002 MQ Get Region=0001      0.003858
0002 MQ Get Region=0001      0.002093
0001 MQ Put Region=0001      0.361708
74  WebSphere MQ Accounting Class 1 SSID=CSQ6 SYSID=FTS3      0.016786
74  WebSphere MQ Accounting Class 3 SSID=CSQ6 SYSID=FTS3      0.000000
5600 Commit Prepare starting Region=0001 SSID=CSQ6      0.007340
0020 DB2 Unit of Recovery Control - End Commit Phase 1      0.040051
03  Output Message Response LTerm=FUNTRM78      0.003724
35  Output Message Enqueue LTerm=FUNTRM78 Region=0001      0.000026
37  Syncpoint Region=0001      0.000027
37  Syncpoint message transfer Region=0001      0.000029
31  Communications GU LTerm=FUNTRM78      0.000134
5600 Commit Continue completed Region=0001 SSID=CSQ6      0.043579
0020 DB2 Unit of Recovery Control - Begin Commit Phase 2      0.000189
0020 DB2 Unit of Recovery Control - End Commit Phase 2      0.002432
5600 Commit Continue completed Region=0001 SSID=DB3A      0.000264
5612 End of Phase 2 Syncpoint Program=MQATPGM Region=0001      0.000018
36  Output Message Dequeue LTerm=FUNTRM78      0.003602

```


CICS-DBCTL problem determination

- CICS Performance Analyser
 - Comprehensive solution for CICS CMF and DB2 accounting

- Workbench
 - Extends CICS PA for DBCTL
 - Track problems from CICS and into IMS
 - Interactive problem determination using IMS PI-style log browser

CICS TOR – AOR – DBCTL: Tracking a transaction

```

BROWSE      IPI411.MAINT.PMR99999.BJCCB.PLEXBP1      Record 00045853 More: < >
Command ==>                                         Scroll ==> CSR
Forwards / Backwards . . 00.05.00.000000      Time of Day . . 16.10.27.281702
Code Description                               Date 2009-03-23 Monday      Time (Relative)
/----- Search limit reached (+10000) -----
6E01 CICS Transaction                               16.00.02.401746
      TranCode=TCCB Program=##### Userid=DFTCICS LTerm=LBPGE312
      Terminal=E312 RecToken=CI1EBTE2/C3ED4F014A5EFB8A
      Resp=0.081780 CPU=0.000419 Task=25136
-----
6E01 CICS Transaction                               +0.001671
      TranCode=TCCB Program=GCCBMMN Userid=DFTCICS LTerm=CI1EBTE2
      Terminal=<A4V RecToken=CI1EBAE4/C3ED4F014ACBBAD8
      Resp=0.079890 CPU=0.010231 IMS=74 Task=9129
-----
CA01 Transaction                               +0.003315
      Program=PSA0F0 Userid=DFTCICS LTerm=CI1EBAE4 Region=0069
      OrgUOWID=IBA3/C3ED4F015D490D80 IMSID=IBA3 IMSRel=810
      RecToken=CI1EBAE4/C3ED4F014ACBBAD8 CPU=0.005755 Process=0.075533
      TotalTm=0.075533 RegTyp=DBC DBCalls=16 FPCalls=56
-----
50 Database Update Database=SDMACA1 Region=0069 +0.065073
50 Database Update Database=SDMACA1 Region=0069 +0.065443
5610 Start Phase 1 Syncpoint Region=0069 +0.070249
5950 FP Database Update Database=BCMVOHD Region=0069 +0.070373
5950 FP Database Update Database=BCMVOHD Region=0069 +0.070374
-----
37 Syncpoint Region=0069 +0.076501
5937 FP Syncpoint Program=PSA0F0 Region=0069 +0.077535
07 Application Terminate Region=0069 +0.078847
5612 End of Phase 2 Syncpoint Program=PSA0F0 +0.080010

```

1. CICS TOR

2. CICS AOR

3. Transaction Index

4. FF & FP Database updates

5. IMS Syncpoint

CICS CMF transaction statistics: formatted

```
+0005 Code... 6E01 CICS Transaction
+0366 STCK... C5D6608614E55B00 LSN.... 000000000000002B
Date... 2010-04-16 Friday Time... 15.42.09.170005.687
```

Each CICS CMF group is formatted: Task, CICS control, VSAM File, DB2, IMS, Program, Storage etc.

```
+0352 DFHTASK.... Task Control
+0352 Tran..... 'TWMU' SC..... 'TO..'
+09E2 Dispatch... 2.206152/59
+09EE UserCPU... 0.425803/59
+09FA Suspend... 0.098672/59 TaskNo..... +109
+0802 ICSTART... +0 ErrFlag.... 00000000 ICSTACCT... +0
+0806 ICTotal... +0 GroupID.... '..FTS3.SCOTCP29EO-f.5.....'
+0396 NETName.... 'FTS3.SCOTCP29.....'
+03AA NETUOWID... D6608614F4E00001

DFHCICS.... CICS task information
+0366 Start..... C5D6608614E55B00
+036E Stop..... C5D660884798E883 Response... 2.304824
```

The CMF DBCTL event monitoring point contains IMS thread statistics

```
+0E1A DBCTL..... IMS DBCTL
+0E1A PSBName.... 'DFHTWM04' PoolWait... 0 IntCWait... 0
+0E32 SchTElap... 0.000207 DBIOElap... 0.003543 PILockEl... 0
+0E4A DBIOCall... +2 GUcall.... +0 GNcall.... +0
+0E56 GNPcall... +0 GHUcall... +2 GHNcall... +0
+0E62 GHNPcall... +0 ISRTcall... +1 DLETcall... +1
+0E6E REPLcall... +1 DLICalls... +5 TestENQs... +0
+0E7A TestENQW... +0 TestDEQs... +0 UpdtENQs... +0
+0E86 UpdtENQW... +0 UpdtDEQs... +0 ExclENQs... +0
+0E92 ExclENQW... +0 ExclDEQs... +0 DEDBcall... +0
+0EAC DEDBRdop... +0 ovflBfrU... +0 UOWConts... +0
+0EB4 DEDBBfrw... +0 USSN..... 00000028 ThredCPU... 0000002D
```

Summary

Transaction Analysis Workbench:

- Companion to the popular IMS and CICS Performance Analyzer tools, allowing systems programmers to look outside of IMS and CICS for the source of problems
- Exploits the wealth of system performance and activity information available in SMF, OPERLOG, and event traces
- Allows medium-skilled analysts to perform expert analysis of their enterprise