Solving IMS Problems when IMS is Not the Problem: Analysis, Diagnosis, and Resolution _ Virtual Users Group

Jim Martin, Fundi Software
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It’s all about evolution

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

Transaction Manager: IMS DC or CICS
Database: IMS DB or DB2

Users: Company employees

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

WebSphere MQ

Transaction Manager: IMS DC or CICS

Users: employees, customers (public), automated systems

Database: IMS DB or DB2, non Z servers, IMS DB
Analysis tools have not kept pace

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

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

One transaction, not four!

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

- Enable higher productivity by lower skilled staff, reduce problem analysis time, and serve as a training tool for new support staff.
- 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.
- 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

- SMF and other data sources
  - CICS-DBCTL transaction performance
  - IMS address space resource consumption
  - WebSphere address space performance
  - MQ and DB2 external subsystem (ESAF) performance
  - APPC transaction performance
  - IRLM long-lock activity

Window into other subsystems that impact CICS and IMS performance

System-wide information relevant to IMS and CICS

Transaction Analysis Workbench
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

<table>
<thead>
<tr>
<th>Transact</th>
<th>Count</th>
<th>Response</th>
<th>MPPtime</th>
<th>Ltime</th>
<th>CPU</th>
<th>DBcalls</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORDER</td>
<td>1234</td>
<td>1.5</td>
<td>1.4</td>
<td>0.5</td>
<td>0.8</td>
<td>24</td>
</tr>
</tbody>
</table>

### CICS PA

<table>
<thead>
<tr>
<th>Transact</th>
<th>Count</th>
<th>Response</th>
<th>IOWait</th>
<th>DB2wait</th>
<th>CPU</th>
<th>FileCall</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORDR</td>
<td>2451</td>
<td>1.8</td>
<td>0.5</td>
<td>0.6</td>
<td>1.2</td>
<td>16</td>
</tr>
</tbody>
</table>

### Transaction Analysis Workbench

**DB2**

<table>
<thead>
<tr>
<th>SSI D</th>
<th>Thread</th>
<th>Transact</th>
<th>Count</th>
<th>Elaps</th>
<th>CPU</th>
<th>Elaps</th>
<th>CPU</th>
<th>Time</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB2P</td>
<td>IMS1</td>
<td>ORDER</td>
<td>1234</td>
<td>0.5</td>
<td>0.1</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>DB2P</td>
<td>CICSP1</td>
<td>ORDR</td>
<td>2451</td>
<td>0.6</td>
<td>0.1</td>
<td>0.3</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
</tr>
</tbody>
</table>

**MQ**

<table>
<thead>
<tr>
<th>SSI D</th>
<th>Thread</th>
<th>Transact</th>
<th>Count</th>
<th>Get</th>
<th>Puts</th>
<th>CPU</th>
<th>Suspend</th>
</tr>
</thead>
<tbody>
<tr>
<td>MQP1</td>
<td>IMS1</td>
<td>ORDER</td>
<td>1234</td>
<td>12</td>
<td>5</td>
<td>0.2</td>
<td>0.3</td>
</tr>
<tr>
<td>MQP1</td>
<td>CICSP1</td>
<td>ORDR</td>
<td>2451</td>
<td>15</td>
<td>6</td>
<td>0.3</td>
<td>0.4</td>
</tr>
</tbody>
</table>

**WebSphere**

<table>
<thead>
<tr>
<th>Server</th>
<th>Count</th>
<th>Received</th>
<th>Sent</th>
</tr>
</thead>
<tbody>
<tr>
<td>WASPROD</td>
<td>3685</td>
<td>189M</td>
<td>145M</td>
</tr>
</tbody>
</table>

**Critical system Address Spaces**

- IMSCTL: 40.2 4.0 256M 1782
- DLISAS: 12.6 0.0 1G 565758
- IMSMP1: 34.7 0.0 365M 4591
- DB2P: 98.4 8.4 13G 4849455

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High-level job accounting information can be reconciled against more detailed transaction performance metrics.

Bad response time in IMS or CICS?
Signatures: Performance is worse than yesterday – why?

IMS PA

<table>
<thead>
<tr>
<th>Transact</th>
<th>Count</th>
<th>Response</th>
<th>Response &gt; 1.0</th>
<th>CPU</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORDER</td>
<td>1234</td>
<td>1.5</td>
<td>2%</td>
<td>0.8</td>
</tr>
<tr>
<td>ORDER</td>
<td>1256</td>
<td>2.7</td>
<td><strong>25%</strong></td>
<td>0.8</td>
</tr>
</tbody>
</table>

CICS PA

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

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.

25% of transactions had a response time greater than 1 second. But this is not normal and did not happen yesterday!
Problem: How are DB2 threads performing in my IMS transactions?

<table>
<thead>
<tr>
<th>Class</th>
<th>Thread</th>
<th>Avg: Elapsed= .5509   CPU= .002450</th>
<th>Max: Elapsed= .5509   CPU= .002450</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td>In-DB2</td>
<td>Avg: Elapsed= .0145   CPU= .001930</td>
<td>Max: Elapsed= .0145   CPU= .001930</td>
</tr>
<tr>
<td>Class</td>
<td>Suspend</td>
<td>Avg: Total = .003368   I/O= .003368   Lock/Latch= .000000   Other= .000000</td>
<td>Max: Total = .003368   I/O= .003368   Lock/Latch= .000000   Other= .000000</td>
</tr>
<tr>
<td>Buffer</td>
<td>Avg: Get Page= 10.0  System Page Update= 3.0</td>
<td>Max: Get Page= 19  System Page Update= 7</td>
<td></td>
</tr>
<tr>
<td>Locking</td>
<td>Avg: Suspend = 0.1  DeadLock= 0.0  TimeOut = 0.0</td>
<td>Max: Suspend = 3  DeadLock= 1  TimeOut = 4</td>
<td></td>
</tr>
<tr>
<td>SQL Query/ Update</td>
<td>Avg: Select = 5.1  Insert = 1.2  Update = 2.0  Delete = 0.2</td>
<td>Max: Select = 201  Insert = 41  Update = 62  Delete = 7</td>
<td></td>
</tr>
<tr>
<td>SQL DML 'Other'</td>
<td>Avg: Describe= .0  Prepare = .0  Open = 1.2  Fetch = 13.8  Close= 1.2</td>
<td>Max: Describe= 0  Prepare = 0  Open = 2  Fetch = 30  Close= 2</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Date</th>
<th>Time (Relative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Input Message TranCode=MQATREQ1</td>
<td>12.26.20.360736</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Input Message Enqueue TranCode=MQATREQ1</td>
<td>+0.000025</td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>Application Start TranCode=MQATREQ1 Region=0002</td>
<td>+0.000458</td>
<td></td>
</tr>
<tr>
<td>5607</td>
<td>Start of UOR Program=MQATPFGM Region=0002</td>
<td>+0.000459</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>DLI GU TranCode=MQATREQ1 Region=0002</td>
<td>+0.000491</td>
<td></td>
</tr>
<tr>
<td>5616</td>
<td>Start of protected UOW Region=0002</td>
<td>+0.000761</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Database Update Database=DI21PART Region=0002</td>
<td>+0.004958</td>
<td></td>
</tr>
<tr>
<td>5600</td>
<td>Sign-on to ESAF Region=0002 SSID=DB3A</td>
<td>+0.005662</td>
<td></td>
</tr>
<tr>
<td>5600</td>
<td>Thread created for ESAF SSID=DB3A</td>
<td>+0.005690</td>
<td></td>
</tr>
</tbody>
</table>

| 66   | DB2 Performance 073 Create thread exit | +0.006672 |
| 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 TRM suspend exit | +0.001089 |

| SYS   | DSNJ002I - FULL ACTIVE LOG DATA SET 385 | +0.022817 |
|       | DSNNAME=DB2P_LOGCPY1.DS01, STARTRBA=000EFD3B000, ENDRBA=000F00E0A00F | |
|       | DSNJ001I - DSNJW007 CURRENT COPY 1 ACTIVE LOG DATA SET 386 | |
|       | SET IS DSNNAME=DB2P_LOGCPY1.DS02, STARTRBA=000F00E0B000, ENDRBA=000F030BFFFF | |

| 5600 | Sign-on to ESAF Region=0002 SSID=CQ6 | +0.037987 |
| 5600 | Thread created for ESAF SSID=CQ6 | +0.038013 |
| 5600 | Commit Prepare starting Region=0002 SSID=CQ6 | +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=CQ6 | +0.403674 |
| 5600 | Commit Continue completed Region=0002 SSID=DB3A | +0.406559 |
| 5612 | End of Phase 2 Syncpoint Program=MQATPFGM 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

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Time (Elapsed)</th>
<th>Date</th>
<th>Time of Day</th>
<th>Region</th>
<th>SSID</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Input MessageTrancode=MQATREQ1</td>
<td>11.21.24.890736</td>
<td>2008-01-25</td>
<td>Friday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>DB2 Unit of Recovery Control - Begin UR</td>
<td>0.000029</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>DB2 Update In-Place in a Data Page</td>
<td>0.000032</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>001</td>
<td>MQ Get Region=0001</td>
<td>0.000192</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>002</td>
<td>MQ Get Region=0001</td>
<td>0.000192</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0002</td>
<td>MQ Get Region=0001</td>
<td>0.000192</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0001</td>
<td>MQ Get Region=0001</td>
<td>0.000192</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0001</td>
<td>MQ Get Region=0001</td>
<td>0.000192</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>WebSphere MQ Accounting Class 1 SSID=CSQ6 SYSID=FTS3</td>
<td>0.016786</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>WebSphere MQ Accounting Class 3 SSID=CSQ6 SYSID=FTS3</td>
<td>0.016786</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5600</td>
<td>Commit Prepare starting Region=0001 SSID=CSQ6</td>
<td>0.003724</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0020</td>
<td>DB2 Unit of Recovery Control - End Commit Phase 1</td>
<td>0.0040051</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Output Message Response LTerm=FUNTRM78</td>
<td>0.000026</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Syncpoint Region=0001</td>
<td>0.000027</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Syncpoint message transfer Region=0001</td>
<td>0.000027</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Communications GU LTerm=FUNTRM78</td>
<td>0.000029</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5600</td>
<td>Commit Continue completed Region=0001 SSID=CSQ6</td>
<td>0.004379</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0020</td>
<td>DB2 Unit of Recovery Control - Begin Commit Phase 2</td>
<td>0.004189</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0020</td>
<td>DB2 Unit of Recovery Control - End Commit Phase 2</td>
<td>0.004189</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5600</td>
<td>Commit Continue completed Region=0001 SSID=DB3A</td>
<td>0.004232</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5612</td>
<td>End of Phase 2 Syncpoint Program=MQATPGM Region=0001</td>
<td>0.000026</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Output Message Dequeue LTerm=FUNTRM78</td>
<td>0.003602</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CICS-DBCTL problem determination

• CICS Performance Analyzer
  – 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

1. CICS TOR
- TranCode=TCBB
- Program=###
- Userid=DFTCICS
- LTerm=LBPGE312
- Terminal=E312
- Resp=0.081780
- CPU=0.000419
- Task=25136

2. CICS AOR
- TranCode=TCBB
- Program=GCCBMMN
- Userid=DFTCICS
- LTerm=C1EBTE2
- Terminal=<A4V
- Resp=0.079890
- CPU=0.010231
- IMS=74
- Task=9129

3. Transaction Index
- Program=PSAOF0
- Userid=DFTCICS
- LTerm=C1EBAE4
- Region=0069
- OrgUOWID=IBA3/C3ED4F015D490D80
- IMSID=IBA3
- IMSReT=810
- RecToken=C1EBAE4/C3ED4F014ACBBAD8
- CPU=0.005755
- Process=0.075533
- TotalTm=0.075533
- RegTyp=DBC
- DBCalls=16
- FPCalls=56

4. FF & FP Database updates
- Database Update Database=SDMACA1 Region=0069
  +0.065073
- Database Update Database=SDMACA1 Region=0069
  +0.065443
- Start Phase 1 Syncpoint Region=0069
  +0.070249
- FP Database Update Database=BCMVOHD Region=0069
  +0.070373
- FP Database Update Database=BCMVOHD Region=0069
  +0.070374

5. IMS Syncpoint
- Syncpoint Region=0069
  +0.076501
- FP Syncpoint Program=PSAOF0 Region=0069
  +0.077535
- Application Terminate Region=0069
  +0.078847
- End of Phase 2 Syncpoint Program=PSAOF0
  +0.080010
CICS CMF transaction statistics: formatted

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

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

+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  ICTLTotal... +0  GroupID.... '...FTS3.SCOTCP29E0-f.5.......'
+0396  NETName.... 'FTS3.SCOTCP29 ......
+03AA  NETUOWID... D6608614F4E00001
+0366  Start...... C5D6608614E55B00
+036E  Stop........ C5D6608684798E883  Response... 2.304824

The CMF DBCTL event monitoring point contains IMS thread statistics

+0E1A  PSBName.... DFHTwM04'  PoolWait... 0  IntCWait... 0  DBCTL
+0E32  SchETElap... 0.000207  DBIOElap... 0.003543  PILockEl... 0
+0E4A  DBOCal1... +2  GUcall1.... +0  GNcall1.... +0
+0E56  GNPCal1... +0  GHUcall1.... +2  GHNCall1.... +0
+0E62  GNPcall1... +0  ISRTCall1... +1  DGETCall1... +1
+0E6E  REPLcall1... +1  DLICalls... +5  TestENQs... +0
+0E7A  TestENQW... +0  TestDEQs... +0  UpdtENQs... +0
+0E86  UpdtENQW... +0  UpdtDEQs... +0  ExclENQs... +0
+0E92  ExcLENQW... +0  ExcLEDEQs... +0  DEDBCall... +0
+0EAC  DEDBRdOp... +0  Oyf18frU... +0  UOWCtnts... +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
More information

- IBM DB2 and IMS Tools website: http://www.ibm.com/software/data/db2imstools/
- Jim Martin, US Representative, Fundi Software: jim_martin@fundi.com.au