End to End Analysis on System z
IBM Transaction Analysis
Workbench for z/OS

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IBM Tools Product SME
August 10, 2015
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Performance is based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput or performance that any user will experience will vary depending upon many factors, including considerations such as the amount of multiprogramming in the user’s job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve results similar to those stated here.
Agenda

• Mainframe Transaction Facts
• What is Transaction Analysis Workbench? (TAW)
• The Transaction Index
• Workbench and Big Data
• Workbench for Application Teams
• Summary
Facts about mainframe transactions

• More than half of enterprise applications call upon the mainframe to complete transactions
  – Workloads are increasing and getting more varied
  – MIPS consumption has increased by over a quarter since interaction with mobile application workloads began

• Complexity is creating new risks in relation to application performance

• High customer expectations are increasing the pressure on the mainframe to perform
Pain points – what CIOs are saying

• Key findings:
  – 74% think that the added complexity of applications is making problem resolution take longer
  – 75% are being pressured to reduce Mean-Time-To-Resolution
  – 79% have no visibility of the actual end-user experience are often unaware of performance problems until calls start coming in to the help desk
  – 79% say there is a ‘war room’ situation in their organisation on a monthly basis

• Compuware published a 350-strong CIO survey
z/OS: the heart of the transaction record

User’s perspective

Request architecture

- Transactions follow complex paths
- Each component leaves disparate artefacts about its internal activity
- The “heart” of the transaction record is in z/OS

z/OS subsystems

Machine data sources

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Workbench solution

- **A single platform for z/OS transactional problem management**
  - Comprehensive performance analysis with a pedigree in *benchmark* CICS and IMS performance tools adding IBM MQ, z/OS Connect, WAS, and DB2
  - Tracing and profiling of transactions, even across subsystems

- **Minimal overhead**
  - Uses the logs and traces generated by z/OS and the various subsystems during normal transaction processing

- **Simplifies collection and analysis**
  - Automatically selects the required log data from each subsystem
  - Instantly combine and slice information sources in real time
  - Automate problem determination steps and disseminate knowledge through workflows

- **Exposes logs and other z/OS traces to off-host analysis**
  - ETL for Hadoop or using Logstash
  - Input for mobile workload pricing calculation
The Workbench architecture

- Logs and traces including SMF, CICS, IMS, DB2 and MQ

- Log selection
- Exception index and extract

- Knowledge base
- Interpreting and tracking

- ISPF dialog
- Eclipse GUI

Batch
Data processing engine
User interfaces

- Daily and ad-hoc batch reporting
- Transaction lifecycle: Interactive analysis
- Analytics: JSON/CSV ETL

Insights

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# Extensive and growing coverage

<table>
<thead>
<tr>
<th>IMS</th>
<th>CICS</th>
<th>DB2</th>
<th>MQ, WAS, and z/OS Connect</th>
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<td>IMS log and trace</td>
<td>CMF performance class (SMF 110)</td>
<td>DB2 log</td>
<td>MQ log extract</td>
<td>SMF</td>
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<td>IMS monitor</td>
<td>CICS trace (Auxiliary or GTF)</td>
<td>DB2 accounting</td>
<td>MQ statistics (SMF 115-1, -2)</td>
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<td>IRLM long lock detection</td>
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**Breadth and depth of coverage**

- Formatting
- Interpreting
- Relating
- Selecting
- Reducing
- ETL
The Transaction Index record

• Transaction indexes are a specialized type of extract that contain a single record type, where each record contains information about a single transaction (or thread), sorted in time sequence
  – Each record in a transaction index contains summarized information about the performance of a transaction and the resources that it consumed
  – You can use criteria that refer to field values in transaction index records to quickly identify problem transactions
Exception processing for CICS, DB2, and IMS

1. Transaction indexes are created by the workbench (a session workflow will create them).
2. They are used to identify all the transaction and UOR workloads in IMS, DB2 and CICS.
3. The transaction index is a special extract - one record per transaction in time sequence.
5. Can be filtered to include exception transactions only.
6. Can be used for reporting and to identify problem transactions.
Making z/OS performance data available

• Big data tooling provides an opportunity to take analysis to the next level
  – Perform analyses that were previously not feasible
  – Valuable new insights into system performance and security
• Standardized and unified approach to all operational analysis
• Combining z/OS operational data with data from other platforms
• Reduced cost of analysis and storage making long term historical trend analysis cost effective

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Open and scalable performance analysis

- Build composite log index
- CSV/JSON
- HCatalog and Logstash
- End-to-end workflow

- Capture and synthesize detailed transaction indices
- Provide metadata to assist analysis
- Improve access to the data

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Workbench enables z/OS performance data Analytics

On z/OS
- Workbench
- HCatalog
- CSV
- Logstash Cfg
- Machine data sources (logs, traces, etc)

Push: log forwarding
- Co:Z
- sftp

Analysis platform
- Push: log forwarding
- Hive
- Logstash
- Flume
- Pull: HFS+NFS/FTP
- Hadoop
- Other

Flexible
Integrated
Quick setup

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### Workbench Big Data Panel

**Generate JCL to import log data to analysis platform**

Determines the intended target:
- **Hadoop**: Generates HCatalog
- **Logstash**: Generates logstash config

**Help interpret the data:**
- timestamps, float, string, etc

**Set what information you can export**
- Covers CICS, IMS, DB2, MQ, WAS

**Identify relevant fields in the data**
- These are just the most common.
  - Use any supported data source/field

**Parameterization of key variables makes reuse simple**
- The JCL is ready for use and can be easily adapted into scheduler (e.g. as part of archiving job)

**Support push and pull methods; direct offload**

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**File Help**

**Big Data menu**

Command ===>

Enter SUB to create and edit JCL.

Meta data for . 1 1. Hadoop 2. Logstash

**Record types:**
- CICS CMF performance class (SMF 110)
- DB2 accounting (SMF 101)
- DB2 system statistics IFCID 001 (SMF 100)
- Address space accounting class 1 (SMF 30)
- WebSphere MQ accounting class 1 (SMF 116)
- WebSphere Application Server inbound requests (SMF 120.9)
- IMS Transaction Index (IMS log)

**Input files:**
- SMF . . . . . . . SMF.DATA.SET
- IMS log . . . . . . IMS.DATA.SET

**Output sequential data sets or z/OS UNIX files:**
- Home directory .
- CSV . . . . . . . %RTYP-data.csv
- HCatalog . . . . . .
- Table . . . . . . .
- Location . . . .

**Log forwarding**
- 1. None
- 2. SFTP
- 3. Co:Z

Target . . . . .
Batch script . .
Remote directory .

Delete files after successful transfer

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Complete your session evaluations online at www.SHARE.org/Orlando-Eval
IBM InfoSphere BigInsights: **BigSheets**

- CICS-DB2 transactions with performance metrics from both subsystems

### CICS-DB2 Transactions Performance Metrics

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</tbody>
</table>
Here we use Logstash to feed data into Elasticsearch and view in Kibana (all open source).

Kibana offers interactive charts and helps build and identify useful JSON queries.
Kibana (ELK)

- Here we use Logstash to feed data into Elasticsearch and view in Kibana (all open source)
- Kibana offers interactive charts and helps build and identify useful JSON queries
Advantages of the solution

- **Minimal barrier to entry** for proof-of-concept implementations. All that is needed:
  - Existing logging on z/OS (no agents to configure)
  - A Hadoop implementation on the network
  Or:
  - Supported Logstash output (e.g. Elasticsearch/Kibana)
  - Dialog-configured JCL accelerates implementation

- **Comprehensive**: covers most transactional information sources

- **Flexible**: Direct offload with Co:Z or sftp or any preferred file transfer mechanism

- **Scalable**: rely on the inherent capabilities of big data platforms to grow your historical database and identify trends and exceptions
Workbench for Application Development teams
Do your Application Teams measure performance?

- Usually run ‘production like’ tests using some form of automation such as workload simulator
  - Tables and/or databases may not be production size
  - Transaction rates may not reach production levels
- How do you evaluate the results of the run?
  - How many transaction abends did you have?
  - How much CPU did the transactions use?
  - How many transactions exceeded the expected response time?
The typical Application Development process

• Focus is on function not performance
  – But may incorporate known performance orientated practices
• Tools used enable function and often include:
  – Setting of breakpoints
  – Instruction tracing
  – Storage modification
  – File management
• Data sizes
  – Databases and tables sizes may be a small subset of production
    • Minor programming mistake may go unnoticed
    • Full table and/or database scan due to incorrect call
Instrumentation data limitations for developers

- Do not know about it or how it can provide benefit
- May not be granted physical access
- Do not understand how to obtain the various instrumentation data
- Do not understand how to use the information
- Do not know that instrumentation data can extend your unit testing
- Data security issues – sensitive data
- Production test generates thousands if not millions of transactions. Where and how do I start?
- Do not understand the various traces and/or how to relate them to a transaction
- Do not know how to relate all the instrumentation into a single lifecycle view

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Eclipse GUI

- Run reports and follow workflows
- Tabulate list reports and search for outliers
- Export result sets to CSV
- Suitable as a quick “turn-key” implementation for off-z/OS analysis
- For more advanced use cases use the big data offering…

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Eclipse interface for Application Developers

1. Expert creates Workflow Template with pre-determined tasks:
   - Locate and Extract Instrumentation data
   - Create Exception Indexes
   - Run reports
   - Create CSV output for in depth analysis

2. The Application Developer:
   - Runs the task list
   - Reviews Performance and Exception reports
   - Uses CSV output for in depth analysis of performance exceptions
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<th>User ID</th>
<th>Input Q</th>
<th>Process</th>
<th>Total Tm</th>
<th>Resp Tm</th>
<th>CPU Tm</th>
<th>Start IMS</th>
<th>FFCalls</th>
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BigData Tooling example: in-depth Analysis

Application teams can then use a variety of available BigData Tooling for in-depth analysis.
Questions?

Complete your session evaluations online at www.SHARE.org/Orlando-Eval
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/

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