Monitoring CICS© TS Version 5
Application Performance

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March 3, 2015
Session 16559
Agenda

• What is an Application?
• CICS TS Version 5 Application ‘Review’
• Application Monitoring Challenges
  – Monitoring Resource Usage
  – Monitoring Performance Problems
What is an Application?

• ‘Programmatic’ resources
  – Programs (ASM, Java, COBOL, etc.)
  – Displays (BMS maps, document templates)
  – Libraries, transactions, URIMAPs, etc.

• ‘Data’ resources
  – Files
  – Queues
  – Data bases
  – etc.

• ‘Communication’ resources
  – Connections, sessions, TCPIP Services, IPCONNs, etc.
CICS TS Version 5 Application Review

- What is the CICS TS Version 5 Application?
  - A collection of related CICS resources
    - Those directly associated with the Application – the code
    - Those required by the Application – the dependencies
  - Some resources may be ‘versioned’
    - Changes in the Application provide a new version
  - Managed as a single entity (by CPSM)
    - Actions affect Application as a whole
      - Install, Enable, Disable, Discard
    - Deployed (installed) on a pre-defined set of CICS regions (Platform)
CICS TS Version 5 Application Review

• What are the pieces that make up a CICS Application?
  – Three basic parts
    • The Platform – where is Application is to execute
    • The Bundles – groups of resources needed to execute
      – Created resources (those built by the application)
      – Existing resources (those needed to pre-defined)
    • The Policy – how is the Application supposed to behave
CICS TS Version 5 Application Review

- Defined resources vs. Existing resources
  - A defined resource is one that is to be created as part of the Application
  - A existing resource is one that is provided by the CICS regions (pre-defined)
  - Both are needed for the Application to execute
CICS TS Version 5 Application Review

• Defined Resources
  – The CICS resources dynamically created when the Application is installed
  – They include the versioned resources
    • PROGRAM and LIBRARY definitions
  – Other resources that can be defined using bundles
    • Transactions, URIMAPs, Files, JVM Servers, OSGi
    • TCPIP Services, Pipelines, WebServices, Events
    • Explorer built XML stream for these resources contains the RDO attributes used to create the resource when installed
CICS TS Version 5 Application Review

• Existing Resources
  – Those CICS resources that must be available to the Platform (pre-defined)
  – These are linked into the Bundle and may be:
    • Required – if they are not present on the Platform, the Application fails
    • Optional – may emit message if resource is unavailable
  – Types of dependent resources:
    • ATOMSERVICE, DB2CONN, DB2ENTRY, DB2TRAN, DOCTEMPLATE, ENQMODEL, EPADAPTER, EPADAPTERSET, EVENTBINDING, FILE, JOURNALMODEL, JVMSERVER, LIBRARY, MAPSET, MQCONN, PARTITIONSET, PIPELINE, PROCESSTYPE, PROGRAM, SCACOMPOSITE, TCPIPSERVICE, TDQUEUE, TRANSACTION, TSQMODEL, URIMAP, WEBSERVICE, XMLTRANSFORM
    • (Note that this includes resources that may also be created)
CICS TS Version 5 Application Review

• Policy – How should an application behave
  – CICS provides Policy to automatically perform an action against an application task based upon performance criteria
  – Actions are:
    • Issue a message
    • Emit an Event
    • ABEND the task
CICS TS Version 5 Application Review

• Application Policy criteria
  – There are 35 ‘choices’ across . . .
    • Time (CPU and elapsed)
    • Storage (size/requests for task and shared areas)
    • TD requests
    • TS (size/requests for aux and main)
    • Database (SQL) and file requests (browse, read, write, etc.)
    • Program LINKs
    • Transaction STARTs

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Monitoring CICS TS Version 5 Application Performance – Session 16559

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Application Monitoring Challenges

• CICS Applications contain “Private” resources
  – Program (and library) usage may not be available online

• Entry to CICS Applications not through TRAN IDs
  – Programs
    • LINK/XCTL from other CICS programs
    • EXEC CICS INVOKE APPLICATION(OPERATION())
  – URIMAPs (WEBSERVICEs)
Application Resource Monitoring Challenges

- Private resources belonging to an application
  - Multiple CICS Applications forced a need for greater ‘privacy’
- Consider the following pair of applications . . .

![Diagram showing two applications with their programs]

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Monitoring CICS TS Version 5 Application Performance – Session 16559

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Application Resource Monitoring Challenges

- Private resources belonging to an application
  - LIBRARIES associated with CICS Applications are unavailable outside the application
  - Programs that are not application entry points cannot be the target of LINK/XCTL from outside the application
  - These are also unavailable from the CICS Explorer, CEMT INQUIRE or EXEC CICS INQUIRE
  - Only available in statistics report (DFHSTUP)
Application Resource Monitoring

• Statistics Data for Private Programs and Libraries
  – Contains same data as Public resources . . . plus . . .
  • Platform Name
  • Application Name
  • Application Major, Minor and Micro Versions
  • Operation (entry points only)
### Application Resource Monitoring

**DFHSTUP Report (TYPE=PROGRAM)**

<table>
<thead>
<tr>
<th>Platform</th>
<th>Platform_DEV69PP_CTS52</th>
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<tbody>
<tr>
<td>Application</td>
<td>application.psbappl</td>
</tr>
<tr>
<td>Major version</td>
<td>1</td>
</tr>
<tr>
<td>Minor version</td>
<td>0</td>
</tr>
<tr>
<td>Micro version</td>
<td>0</td>
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<table>
<thead>
<tr>
<th>Program Name</th>
<th>Times Used</th>
<th>Count Fetch</th>
<th>Average Fetch Time</th>
<th>Program Name</th>
<th>Times Current</th>
<th>LIBRARY Name</th>
<th>LIBRARY Data Set Name</th>
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<td>None</td>
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</table>

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Application Resource Monitoring

- Private Program Statistics
  - CICS Explorer

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Application Resource Monitoring

- Private Program Statistics
  - MVCICS Explorer (CPROG View)

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**Application Resource Monitoring**

- DFHSTUP Report (TYPE=LIBRARY)

<table>
<thead>
<tr>
<th>Library Name</th>
<th>Position</th>
<th>Ranking</th>
<th>Critical</th>
<th>Status</th>
<th>Program Loads</th>
<th>Number of Dsnames</th>
<th>Concatenation</th>
<th>Library Dname</th>
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</thead>
<tbody>
<tr>
<td>PSBAPPLD</td>
<td>1</td>
<td>50</td>
<td>n/a</td>
<td>Enabled</td>
<td>1</td>
<td>2</td>
<td>000</td>
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<td></td>
<td></td>
<td></td>
<td>001</td>
<td>BCVM.PSBAPPL.LOAD</td>
</tr>
</tbody>
</table>

- Private Library Data is Unavailable from CICS Explorer
Application Resource Monitoring

- MVCICS Explorer (CLIBR view)

- Full concatenation available in detail form
Application Performance Challenges

- Entry points are not traditional TRAN IDs
  - Many current monitoring techniques are based on the transaction ID
    - Vendor monitor products
    - Home grown monitors and reports
  - This can include CPU charge-back systems
Application Performance Monitoring Data

- CICS Provides data in SMF110 to identify applications

451 (TYPE-C, 'ACAPPLNM', 64 BYTES)
The 64-character name of the application in the application context data.

452 (TYPE-C, 'ACPLATNM', 64 BYTES)
The 64-character name of the platform in the application context data.

453 (TYPE-A, 'ACMAJVER', 4 BYTES)
The major version of the application in the application context data, expressed as a 4-byte binary value.

454 (TYPE-A, 'ACMINVER', 4 BYTES)
The minor version of the application in the application context data, expressed as a 4-byte binary value.

455 (TYPE-A, 'ACMICVER', 4 BYTES)
The micro version of the application in the application context data, expressed as a 4-byte binary value.

456 (TYPE-C, 'ACOPERNM', 64 BYTES)
The 64-character name of the operation in the application context data.
### Application Performance Monitoring Data

- **Sample data from DFHMOLS**

<table>
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<tr>
<th>FIELD-NAME</th>
<th>UNINTERPRETED</th>
<th>INTERPRETED</th>
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<tr>
<td>DFHTASK</td>
<td>C001</td>
<td>TRAN</td>
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<td>DFHTASK</td>
<td>C004</td>
<td>TTYPE</td>
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<td>DFHCICS</td>
<td>T005</td>
<td>START</td>
</tr>
<tr>
<td>DFHCICS</td>
<td>T006</td>
<td>STOP</td>
</tr>
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<td>DFHTASK</td>
<td>P031</td>
<td>TRANNUM</td>
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<tr>
<td>DFHTASK</td>
<td>A109</td>
<td>TRANPRI</td>
</tr>
<tr>
<td>DFHTASK</td>
<td>C166</td>
<td>TCLSNAME</td>
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<tr>
<td>...</td>
<td></td>
<td></td>
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<td>DFHPROG</td>
<td>C071</td>
<td>PGMNAME</td>
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<tr>
<td>...</td>
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</table>
Application Performance Monitoring Data

- Batch reporting to provide key performance data
  - Total CPU for the application in a period (chargeback)
  - Average times for key application performance fields
    - CPU/Response/Suspend time
    - File control calls / Storage HWM

<table>
<thead>
<tr>
<th>APPLCATN NAME</th>
<th>CPU REAL TIME</th>
<th>RESPONSE TIME</th>
<th>SUSPEND TIME</th>
<th>FILE COUNT</th>
<th>STORAGE HI_WATER_MARK</th>
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<td>24.669227</td>
<td>3834.323193</td>
<td>1941.077996</td>
<td>974471</td>
</tr>
</tbody>
</table>

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Online Application Performance Data

- Monitors must change too
  - MVCICS Workloads
- New selection criteria
  - Application Name
  - Version
  - Platform
- Provides performance indicators (over time)
- Used in to determine SLAs and resolve problems
## Online Application Performance Data

### Session 16559

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Tasks</th>
<th>Resp</th>
<th>Cpu</th>
<th>Susp</th>
<th>Suspend</th>
<th>Dq</th>
<th>Com</th>
<th>FC</th>
<th>DBZ</th>
<th>IMS</th>
<th>ORM</th>
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<th>TS</th>
<th>EXO</th>
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<th>ENQ</th>
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<td>13:32</td>
<td>100%</td>
<td>100%</td>
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</tr>
</tbody>
</table>

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Online Application Performance Data

- Expanding the interval to see where the problem lies
  - Exception and file waits overlap and consume most of the average response time
Online Application Performance Data

- Drilling down further
  - All of the exception time for this interval was spent waiting for file strings
  - ... but who (or is that whom)?

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Online Application Performance Data

• Expansion of the large interval (15 minutes) down to single minute slices shows the offending set of tasks for this application (in red)
Online Application Performance Data

- Further expansion of individual tasks show some with extended response time.
Online Application Performance

- One last expansion shows it to be a specific file giving the issue
Conclusion

• CICS TS5 Applications provide challenges to monitoring
  – Data for resource monitoring may be harder to locate
    • This can cause issues in problem diagnosis
  – Old performance monitors may need updates
    • Batch programs need to look for different identifiers
    • Online monitors need similar changes
    • Performance indicators need to be examined across CICS regions to satisfy POLICY across the PLATFORM
Conclusion

- CICS TS5 Applications provide opportunities to monitoring
  - Application name provides access to performance data
  - Allows for a looser connection between the systems performance group and development
  - Decreases need for systems groups to intimately know every resource (transaction, program, etc.) that make the application work