Monitoring CICS© TS Version 5 Application Performance

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Agenda

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

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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.

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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)

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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

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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

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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)

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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

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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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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)

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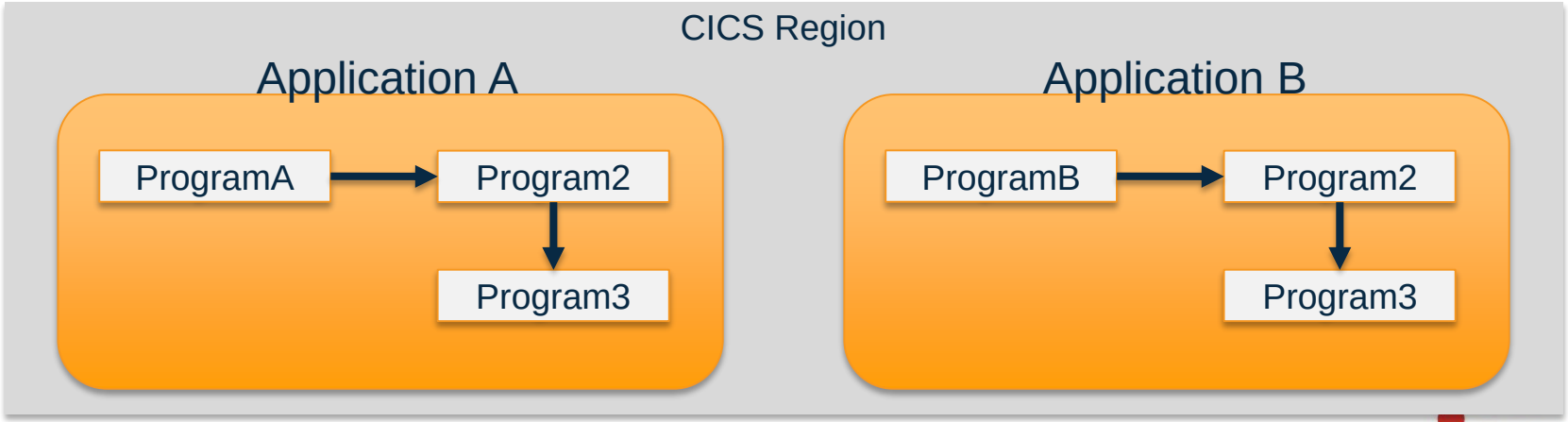
Application Resource Monitoring Challenges

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



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)

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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)

```
Platform     : Platform_DEV69PF_CTS52
Application  : application.psbappl
Major version:        1
Minor version:        0
Micro version:        0
Program     Times    Fetch    Average Lbry Newcopy  Program   Times Current  LIBRARY
Name         Used    Count Fetch Time Ofst   Count     Size Removed Location Name     LIBRARY Data Set Name
_____________________________________________________________________________________________________________

PSBP010A        0        0 0:00.00000    0       0        0       0 None
        Operation: bcvm.psbappl.enqueue
PSBP010B     5334        1 0:00.00112    1       0     1120       0 ERDSA    PSBAPPLD BCVM.PSBAPPL.LOAD
        Operation: bcvm.psbappl.ts.process
PSBP010C     5208        1 0:00.01320    1       0      992       0 ERDSA    PSBAPPLD BCVM.PSBAPPL.LOAD
        Operation: bcvm.psbappl.file.process
PSBP010D   206881        1 0:00.00243    1       0      888       0 ERDSA    PSBAPPLD BCVM.PSBAPPL.LOAD
        Operation: bcvm.psbappl.null
PSBP010E     2021        1 0:00.00153    1       0      992       0 ERDSA    PSBAPPLD BCVM.PSBAPPL.LOAD
        Operation: bcvm.psbappl.null.linker
PSBP010F     4106        1 0:00.00174    1       0     1152       0 ERDSA    PSBAPPLD BCVM.PSBAPPL.LOAD
        Operation: bcvm.psbappl.worker
PSBP0100        1        1 0:00.00528    1       0     5536       0 ERDSA    PSBAPPLD BCVM.PSBAPPL.LOAD
        Operation: bcvm.psbappl.main
PSBP0101        1        1 0:00.00145    1       0     2648       0 ERDSA    PSBAPPLD BCVM.PSBAPPL.LOAD
        Operation: bcvm.psbappl.router
PSBP0102        0        0 0:00.00000    0       0        0       0 None
        Operation: bcvm.psbappl.browse
PSBP0103     9440        1 0:00.00179    1       0     1024       0 ERDSA    PSBAPPLD BCVM.PSBAPPL.LOAD
PSBP0104     9440        1 0:00.00134    1       0     1296       0 ERDSA    PSBAPPLD BCVM.PSBAPPL.LOAD
PSBP0105     9440        1 0:00.00344    1       0     1256       0 ERDSA    PSBAPPLD BCVM.PSBAPPL.LOAD
PSBP0106     9440        1 0:00.00083    1       0     1304       0 ERDSA    PSBAPPLD BCVM.PSBAPPL.LOAD
PSBP0107     9314        1 0:00.00176    1       0     1160       0 ERDSA    PSBAPPLD BCVM.PSBAPPL.LOAD
PSBP0108     9314        1 0:00.00128    1       0      776       0 ERDSA    PSBAPPLD BCVM.PSBAPPL.LOAD
PSBP0109     9314        1 0:00.00132    1       0      960       0 ERDSA    PSBAPPLD BCVM.PSBAPPL.LOAD
```

Complete your session

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Application Resource Monitoring

- Private Program Statistics
  - CICS Explorer

Region	Name	Status	Use Count	Concurrent Use Count	Language	Share Status	CEDF Status	NEWCOPY Status
BCVDB690	PSBP010A	ENABLED	0	0	NOTDEFINED	PRIVATE	CEDF	NOTREQUIRED
BCVDB690	PSBP010B	ENABLED	5334	0	ASSEMBLER	PRIVATE	CEDF	NOTREQUIRED
BCVDB690	PSBP010C	ENABLED	5208	0	ASSEMBLER	PRIVATE	CEDF	NOTREQUIRED
BCVDB690	PSBP010D	ENABLED	206881	0	ASSEMBLER	PRIVATE	CEDF	NOTREQUIRED
BCVDB690	PSBP010E	ENABLED	2021	0	ASSEMBLER	PRIVATE	CEDF	NOTREQUIRED
BCVDB690	PSBP010F	ENABLED	4106	0	ASSEMBLER	PRIVATE	CEDF	NOTREQUIRED
BCVDB690	PSBP0100	ENABLED	1	1	ASSEMBLER	PRIVATE	CEDF	NOTREQUIRED
BCVDB690	PSBP0101	ENABLED	1	0	ASSEMBLER	PRIVATE	CEDF	NOTREQUIRED
BCVDB690	PSBP0102	ENABLED	0	0	NOTDEFINED	PRIVATE	CEDF	NOTREQUIRED

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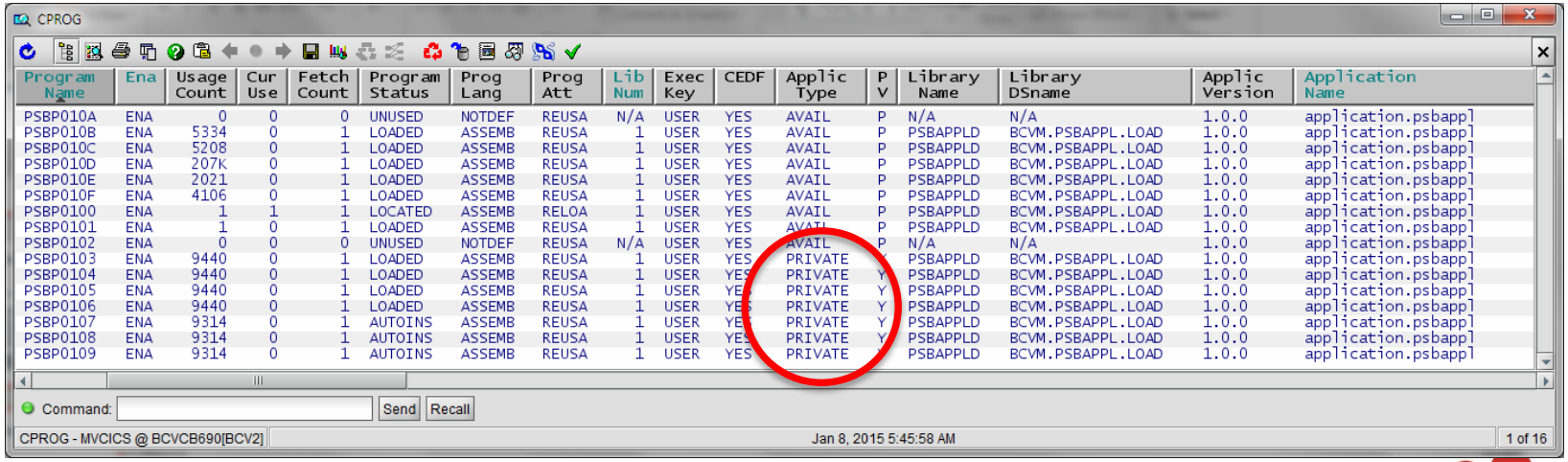
Application Resource Monitoring

- Private Program Statistics
  - MVCICS Explorer (CPROG View)



Application Resource Monitoring

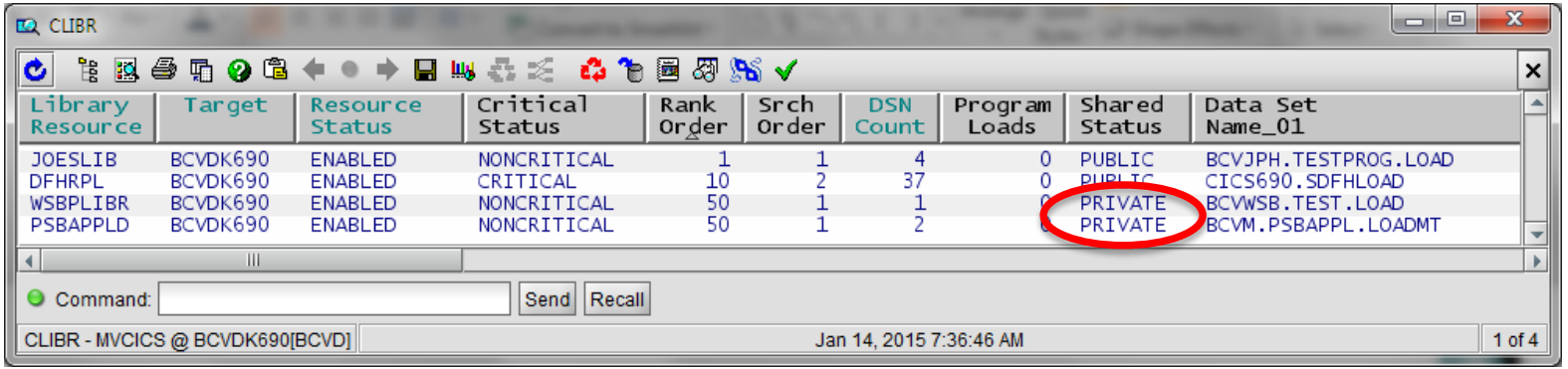
- DFHSTUP Report (TYPE=LIBRARY)

```
Platform     : Platform_DEV69PF_CTS52
Application  : application.psbappl
Major version:        1
Minor version:        0
Micro version:        0
LIBRARY    Search                     Enable       Program  Number   Concat-
Name      Position  Ranking  Critical  Status         Loads  Dsnames  enation  LIBRARY Dsname
_____________________________________________________________________________________________
PSBAPPLD       1       50       n/a    Enabled            1       2      000    BCVM.PSBAPPL.LOADMT
                                                                          001    BCVM.PSBAPPL.LOAD
```

- 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

```
----------FIELD-NAME-------------------------UNINTERPRETED-------------------------------INTERPRETED----------------------

          DFHTASK  C001     TRAN             D7E2C2C4                                      PSBD
             ...
          DFHTASK  C004     TTYPE            E2400000                                      S
          DFHCICS  T005     START            CE58382200C87C5C                          2015/01/12 11:58:27.142791
          DFHCICS  T006     STOP             CE58382202CBAA58                          2015/01/12 11:58:27.151034
          DFHTASK  P031     TRANNUM          0012734C                                    12734
          DFHTASK  A109     TRANPRI          00000001                                        1
          DFHTASK  C166     TCLSNAME         D7E2C2E6 D9D2D3C4                             PSBWRKLD
             ...
          DFHPROG  C071     PGMNAME          D7E2C2D7 F0F1F0C4                             PSBP010D
             ...

             ...
          DFHTASK  C451     ACAPPLNM         81979793 898381A3 8996954B 97A28281 97979300  application.psbappl
          DFHTASK  C452     ACPLATNM         D79381A3 86969994 6DC4C5E5 F6F9D7C6 6DC3E3E2  Platform_DEV69PF_CTS
                                    +X0014   F5F20000 00000000 00000000 00000000 00000000  52
          DFHTASK  A453     ACMAJVER         00000001                                        1
             ...
          DFHTASK  C456     ACOPERNM         8283A594 4B97A282 81979793 4B95A493 93000000  bcvm.psbappl.null
             ...
```

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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

```
APPLREPT                                                                                  Summary of Some Key Application Performance Fields

APPLCATN                                                                  CPU REAL       RESPONSE        SUSPEND         FILE          STORAGE
NAME                                                                TOTAL           TIME           TIME           TIME        COUNT    HI_WATER_MARK
-------------------------------------------------------------------------  -------------  -------------  -------------  -----------  ---------------

application.psbappl                                                 21377      24.669227    3834.323193    1941.077996       974471         53001040
                                                                               0.001154       0.179367       0.090802           46             2479
```

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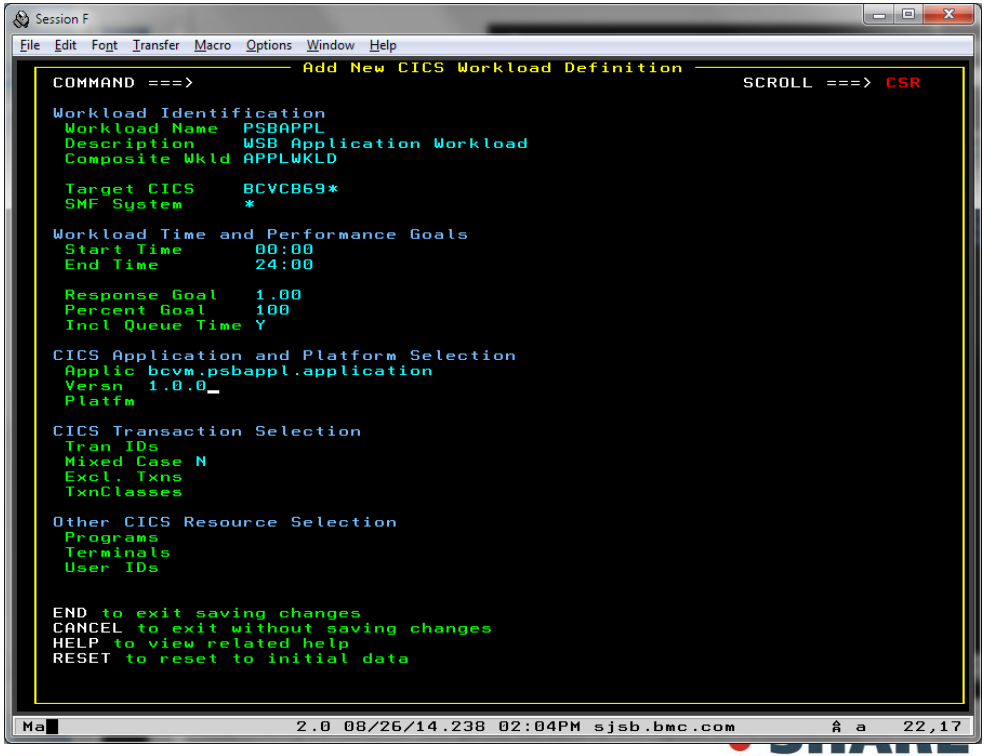
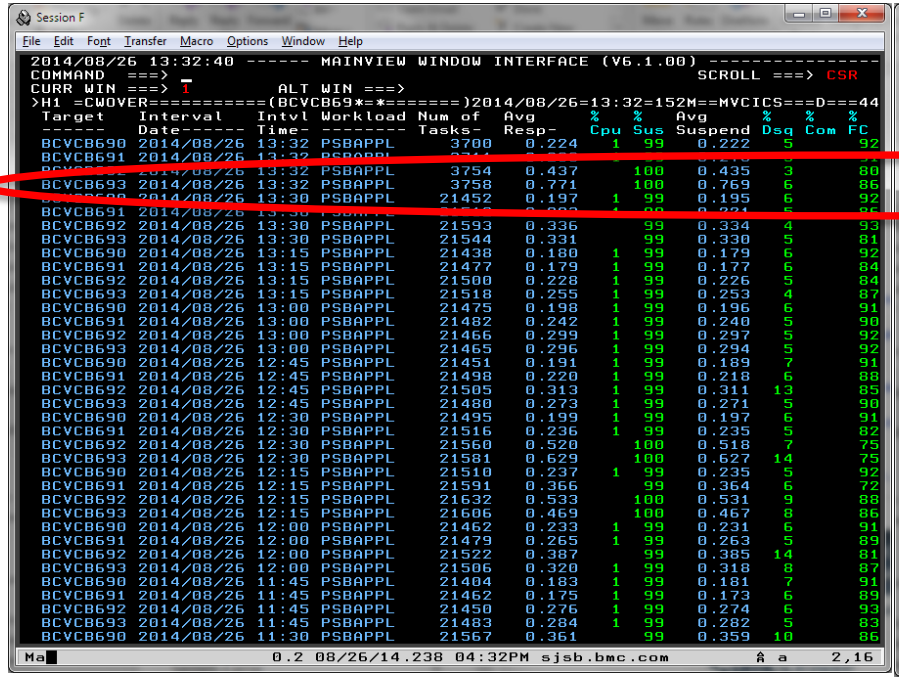
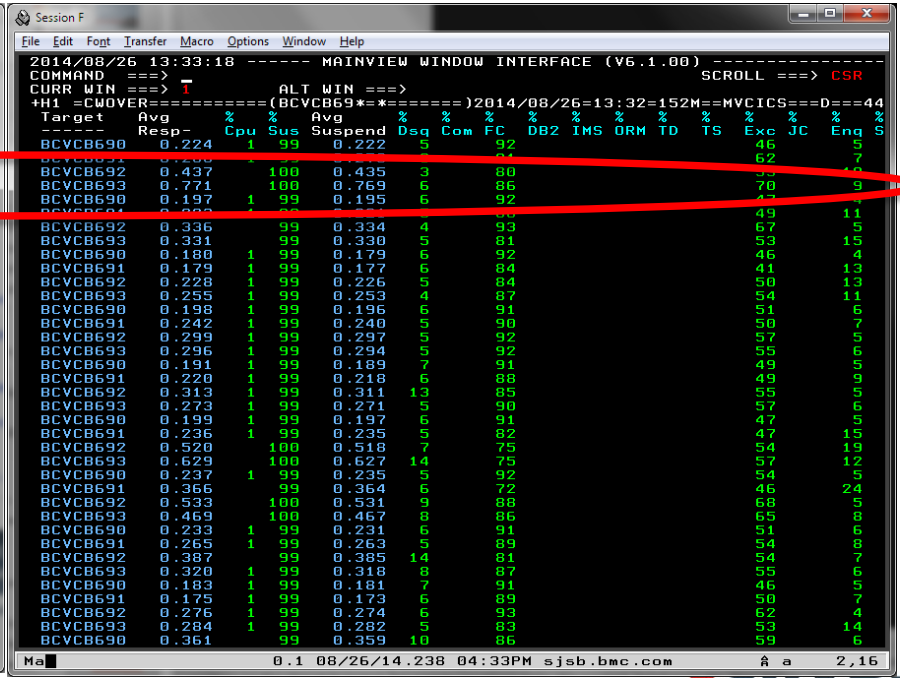
Online Application Performance Data

- 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





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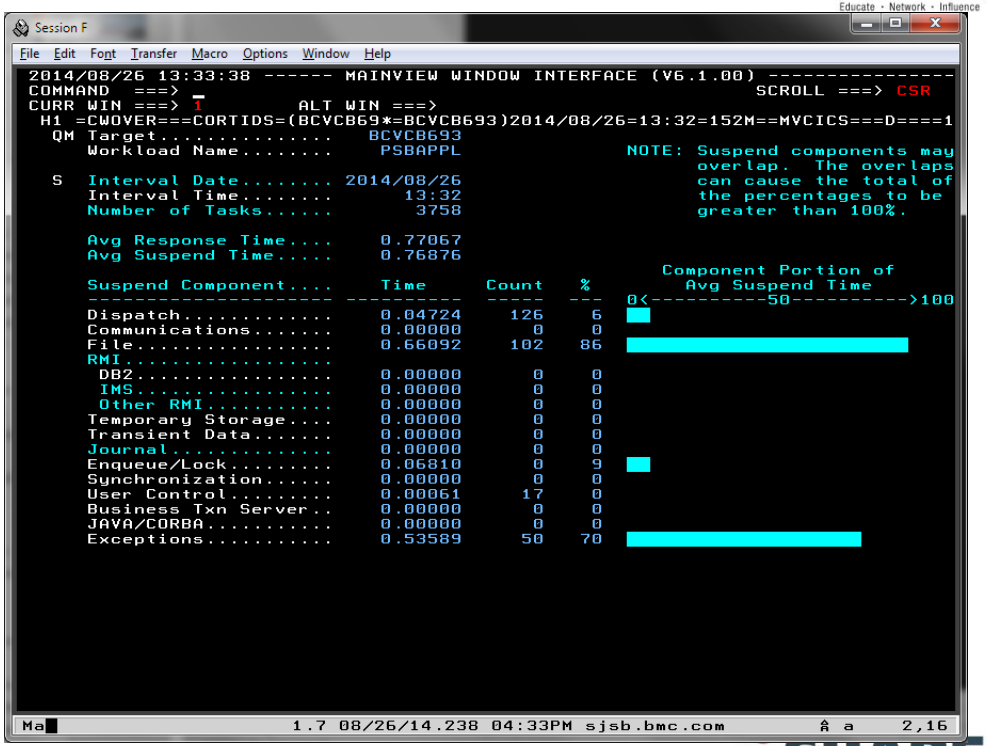
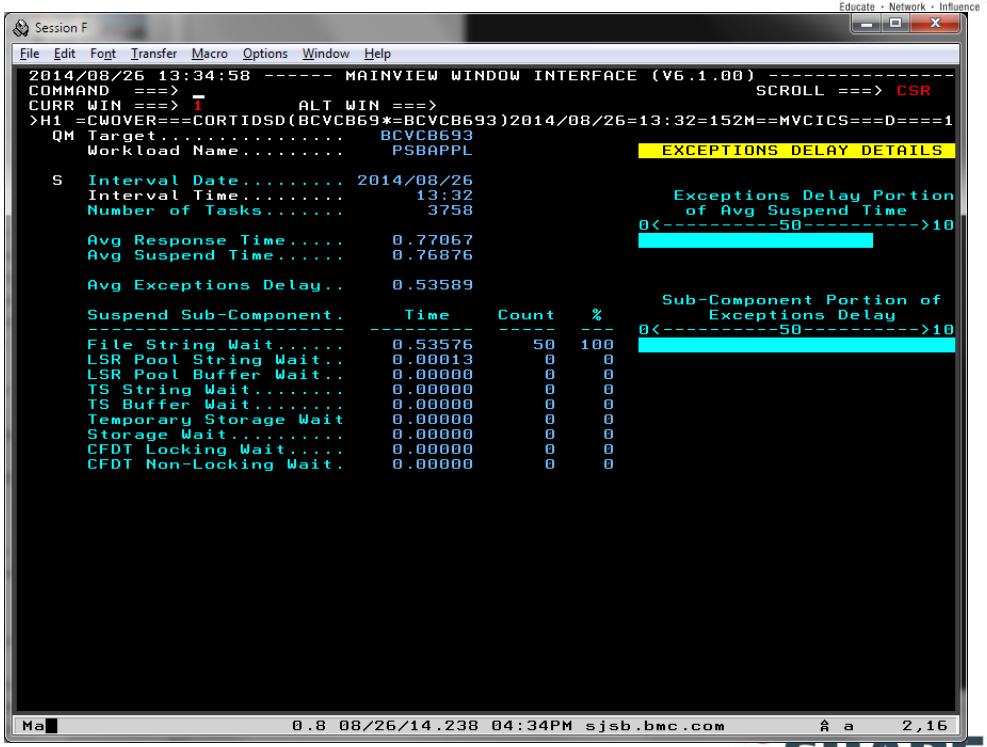
Online Application Performance Data

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



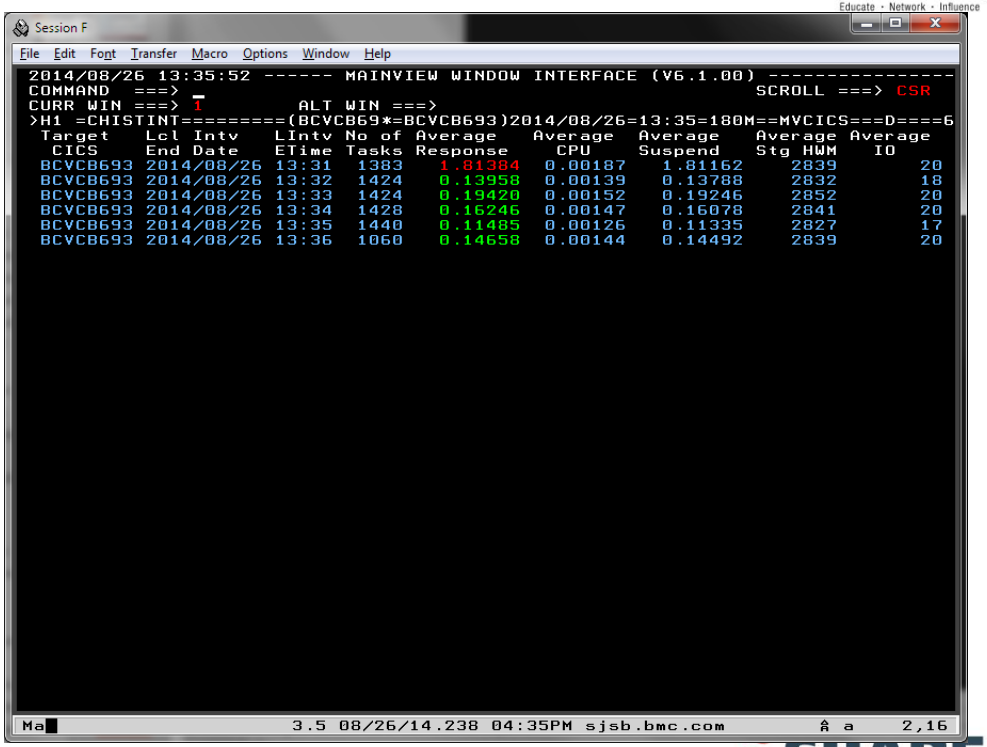
Online Application Performance Data

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



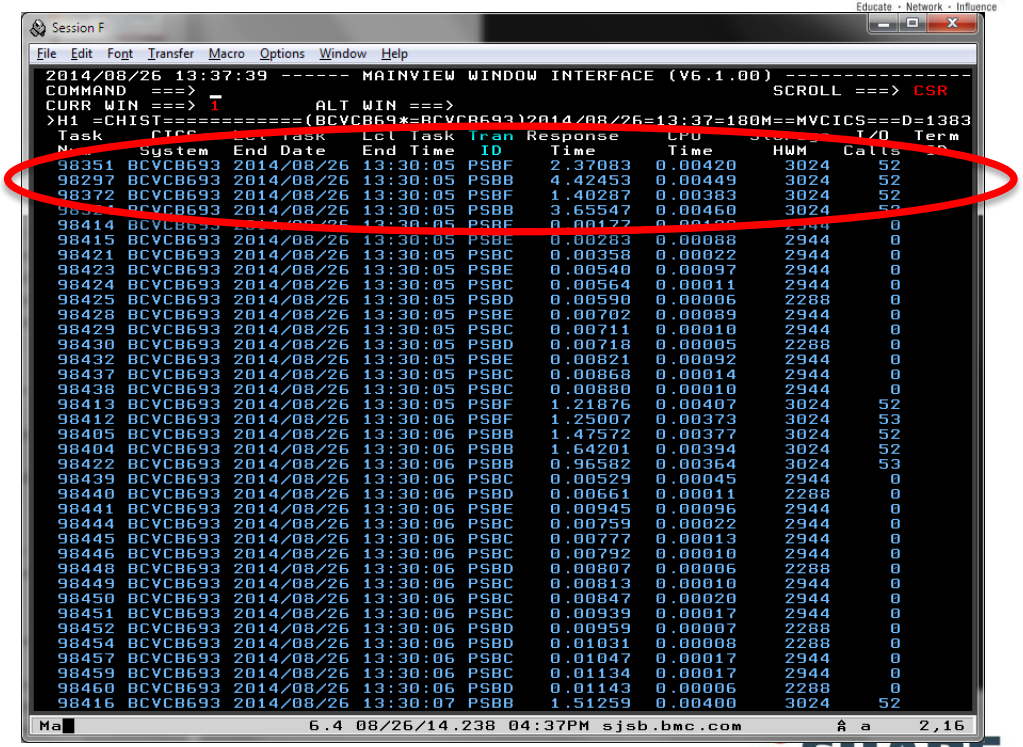
Online Application Performance Data

- 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



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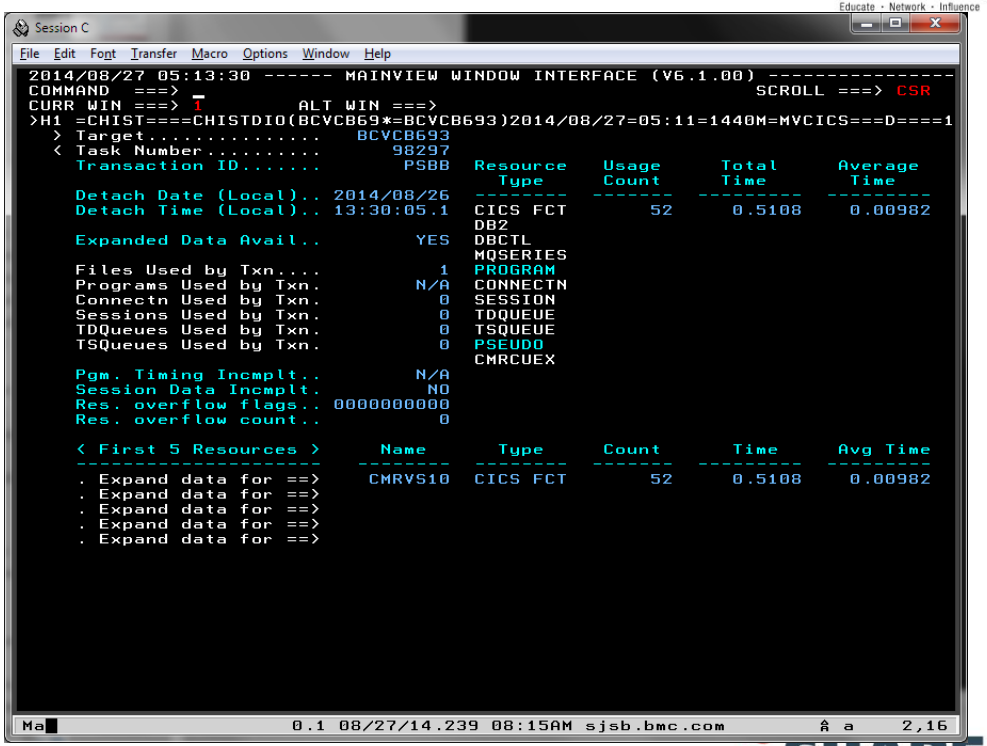
Online Application Performance

- 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

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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

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