Four Smart, Fast and Safe Steps to Threadsafe using CICS Tooling

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Preface

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Session Agenda

- Threadsafe Review
  - TCB Mode Switching
  - Threadsafe Risks
  - Threadsafe Challenges
  - Threadsafe Checklist for your CICS Enterprise
- “Threadsafe Considerations for CICS” Redbook Update
- CICS Tools Four Step Process for Applications
  - Step 1 - Identify candidates and capture baseline
  - Step 2 - Analyze program behavior and make modifications
  - Step 3 - Change program definitions to threadsafe
  - Step 4 - Test and benchmark results
- Reference Material
- Questions

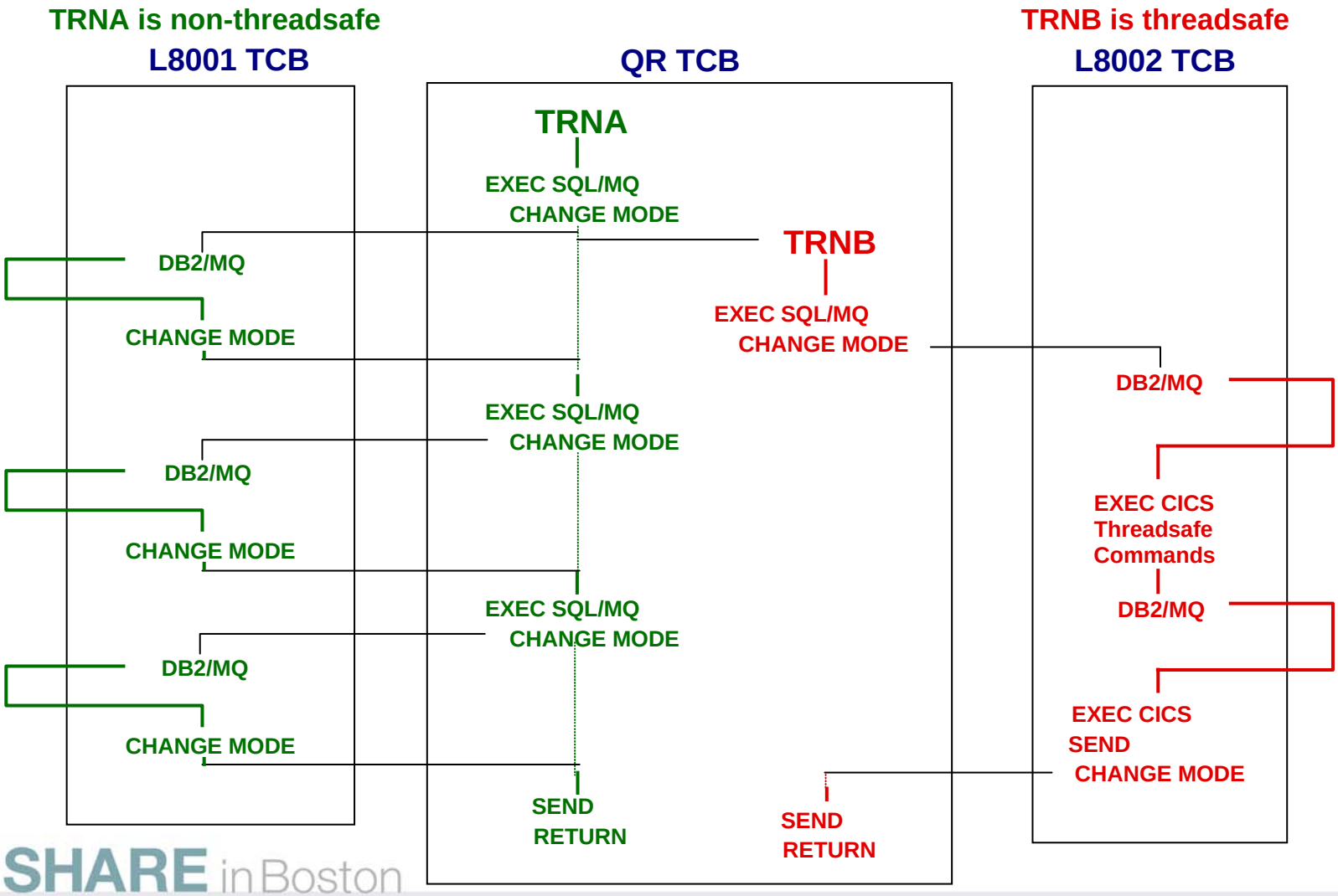
Threadsafe Review

- **Why make Applications threadsafe?**
  - Improve performance
    - CICS QR TCB is CPU constrained
    - Application tasks are waiting excessively for the QR TCB
    - CICS region in general is CPU constrained
    - Take advantage of multiple engines
  - Reduce cost by reducing the instruction path length
    - Each TCB switch is approximately 2,000 instructions
    - In CICS V3.2↑ and above, non-threadsafe DB2 and MQ transactions switch TCBs for each SQL statement or MQ command

Threadsafe Review

- **TCB Mode Switching**
  - Non-threadsafe
    - Programs run on the Quasi-reentrant (QR) TCB
    - TCB mode switch to the L8 occurs on each SQL/MQ command
      - *CICS V3.2↑ and above - MQ runs on the L8*
    - Each TCB switch is approximately 4,000 instructions roundtrip
  - Threadsafe
    - Program starts on the QR TCB
    - SQL/MQ commands cause a TCB mode switch to the L8 TCB
    - Stay on the L8 TCB until a non-threadsafe CICS command is encountered
    - Non-threadsafe CICS commands switch back to the QR
    - SQL/MQ command is required to switch back to the L8

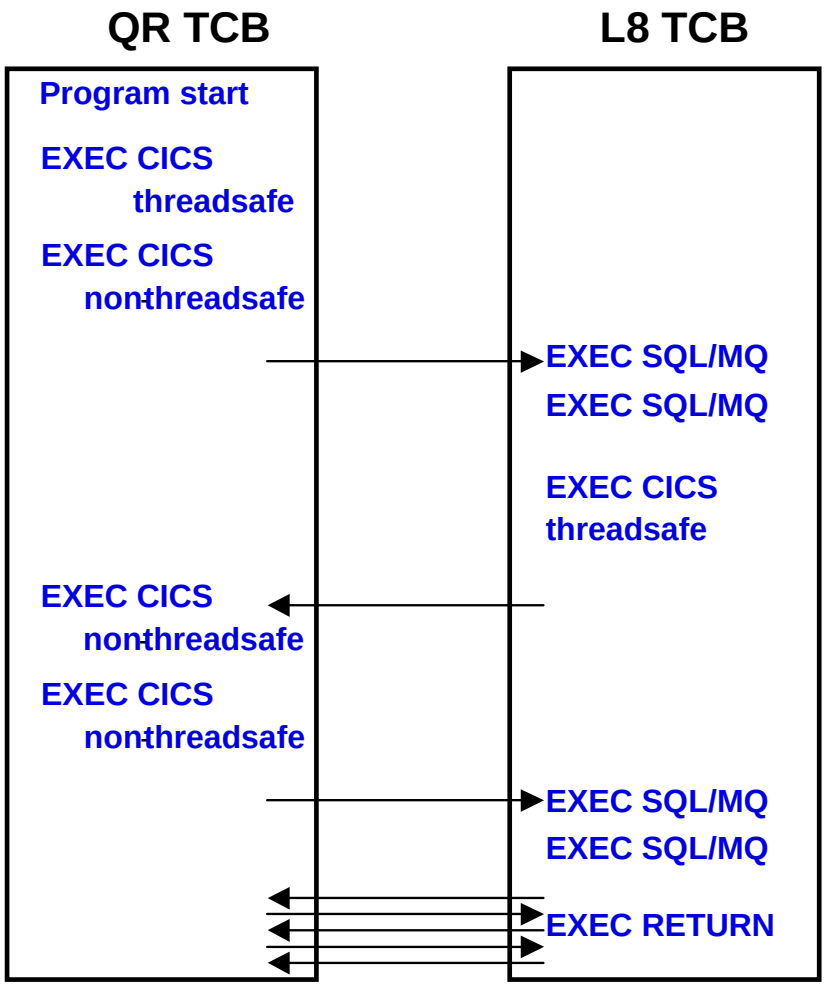
Threadsafe Review
CICS API/Threadsafe – CICS 3.2



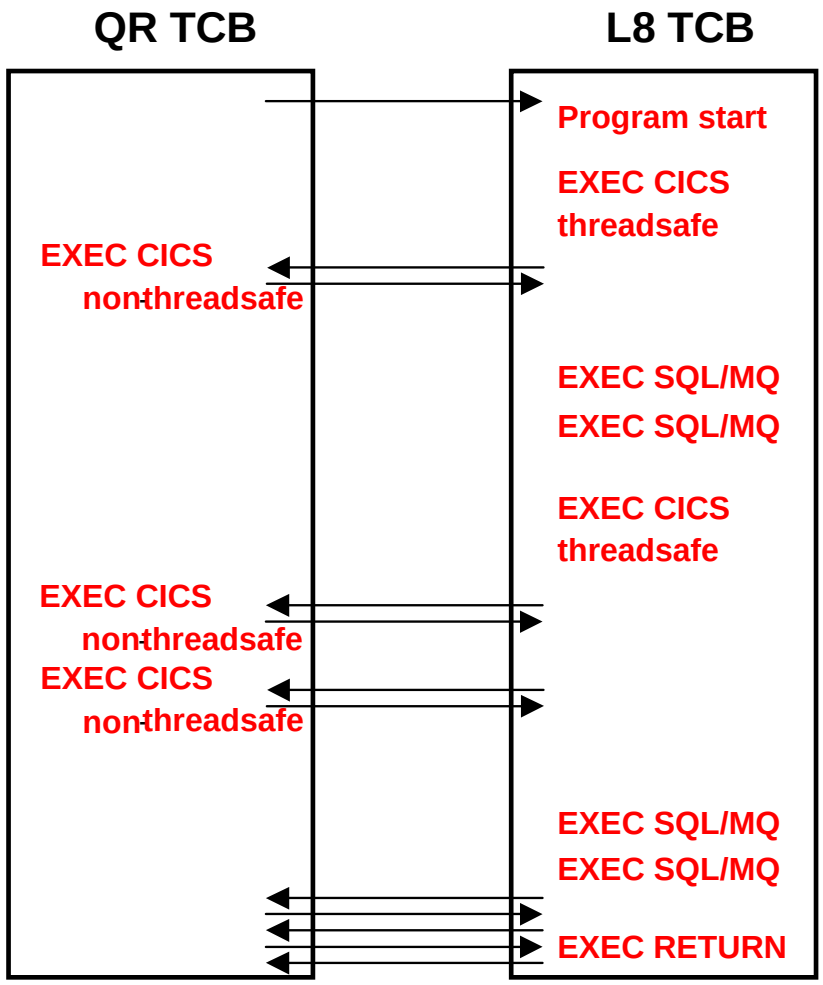
Threadsafe Review

- **TCB Mode Switching**
  - Open API, Threadsafe, **CICS Key**
    - Program starts on the L8 TCB
    - Stays on the L8 TCB until a non-threadsafe CICS command is encountered
    - Non-threadsafe CICS commands automatically switch back to the QR
    - Once the non-threadsafe CICS command is processed, a TCB mode switch occurs back to the L8
  - Open API, Threadsafe, **User Key**
    - Program starts on the L9 TCB
    - Stays on the L9 TCB until a non-threadsafe command is encountered
    - Non-threadsafe CICS commands switch back to the QR
    - Once the non-threadsafe CICS command is processed, a TCB mode switch occurs back to the L9
    - SQL/MQ commands switch to the L8, then switch right back to the L9
    - Not recommended for programs with SQL, MQ or IP CICS Sockets

Threadsafe Review
Threadsafe vs OPENAPI, Threadsafe

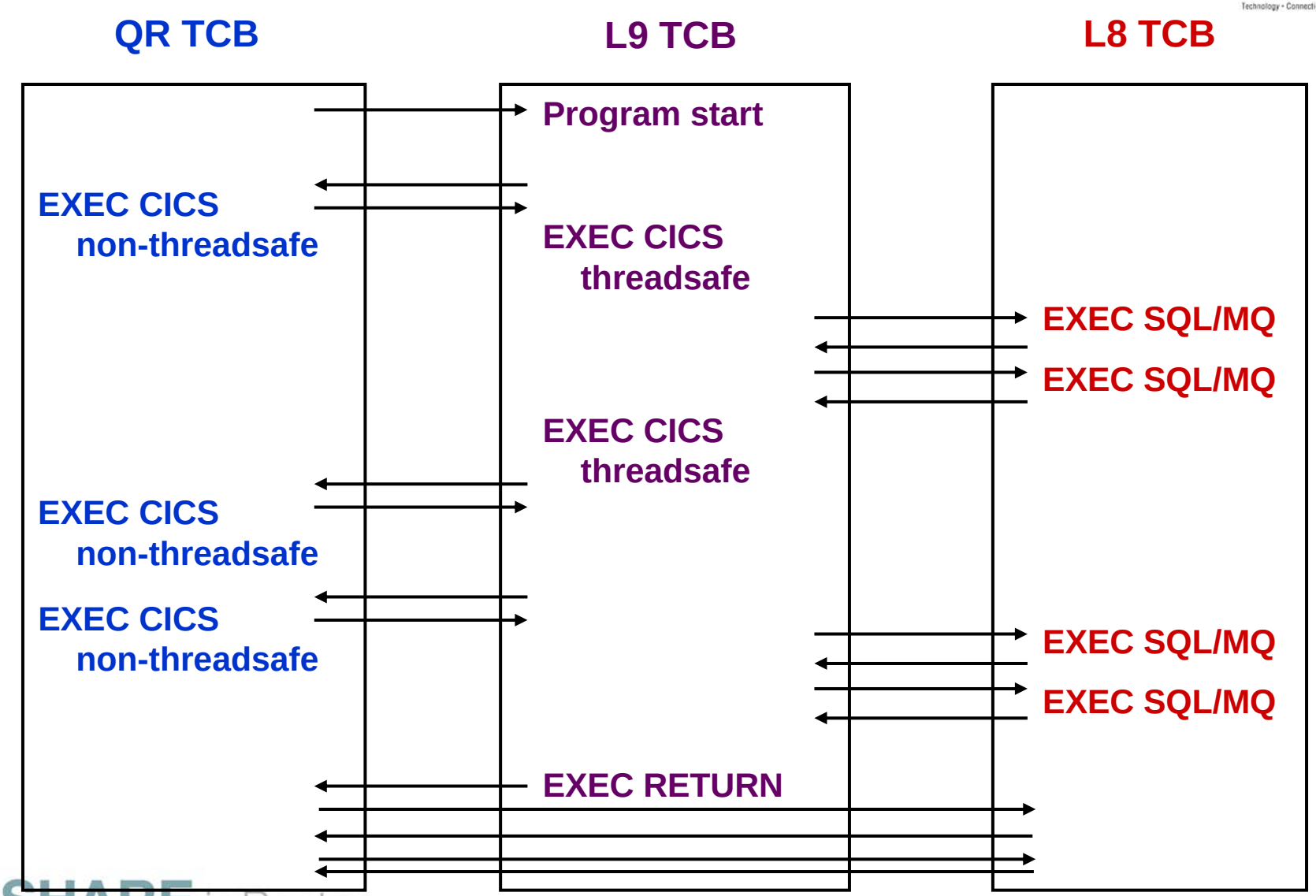


Blue = CICSAPI, Threadsafe



Red = OPENAPI, Threadsafe, CICS Key

OPENAPI CICS - User Key SQL, MQ and IP CICS Sockets (not recommended)



Threadsafe Review
Exception - Storage Protection

- **STGPROT=NO**
  - OPENAPI programs will run under L8 TCBs
    - regardless of their EXECKEY value
  - CICS operates without any storage protection
    - runs in a single storage key (key 8)

Threadsafe Review

- **Threadsafe Risks**
  - Data Integrity
    - Programs must be reentrant to run on multiple TCBs
      - *QR provided serialization by default since only 1 copy of the program could run at a time*
      - *Threadsafe allows the program to have multiple copies running on multiple TCBs at the same time*
    - Programs must be coded to CICS threadsafe standards
    - Access to shared storage must be serialized or eliminated

Threadsafe Review

- **Threadsafe Challenges – Program Requirements**
  - Capable of being invoked on multiple TCBs concurrently
  - Normally read-only, they do not in general overwrite themselves
    - However they could overwrite themselves if updates are serialized correctly
    - For example, serialized update access to shared storage
  - Cannot rely on quasi-reentrancy for serialization
  - Must use serialization techniques to access shared resources with integrity
    - Compare and swap (CS)
    - Enqueue/dequeue to access shared resources with integrity

Threadsafe Review

- **Threadsafe Challenges – Program Requirements**
  - All programs accessing the same shared resource must be made threadsafe
    - For example, existing program's reliance on quasi-reentrancy to serialize access to the CWA is made invalid if just one other program can run concurrently on another TCB and access the same CWA field
  - Sometimes referred to as fully MVS reentrant programs
    - MVS reentrant is often misunderstood to mean that programs do not overwrite themselves. We add the term threadsafe as an indicator in CICS to run multiple copies of the program on multiple TCBs

Threadsafe Review

- **Threadsafe Challenges – CICS Environment**
  - Threadsafe your CICS environment before you begin with Applications
  - Use “Threadsafe Considerations for CICS Redbook” as a Threadsafe Project Guide, SG24-6351

Threadsafe Review
Threadsafe Checklist for your CICS Enterprise

Task	Description
❑ 1	Migrate to DB2 V7 or later
	▪ *User Dynamic plan exit name DFHD2PXT defined as threadsafe*
❑ 2	Install pre-req CICS PTFs
❑ 3	Install pre-req DB2 PTFs
❑ 4	Review SIT parameters
	▪ *FORCEQR*
	▪ *Emergency stopgap to shift programs back onto the QR TCB to provide resource serialization*
	▪ *Must not be set to yes for threadsafe*
	▪ *FCQRONLY*
	▪ *Yes (default) - Force all CICS API user application programs specified as threadsafe to run file control requests under the CICS QR TCB*
	▪ *No – Run programs as specified with concurrency parameter.*

Threadsafe Review
Threadsafe Checklist for your CICS Enterprise

Task	Description
❑ 5	**Address your exits**

- Identify all your exits (CICS IA)
- Contact vendors if necessary about their exits
- Review each exit for non threadsafe commands (CICS IA)
- Review each exit for use of shared resources (CICS IA)
- Make any coding adjustments and test (CICS IA/PA)
- Define them as threadsafe (CICS CM)
- Define phase one Global user exits as threadsafe by overriding with the threadsafe keyword on the EXEC CICS ENABLE command (CICS V3.2)

Threadsafe Review
Threadsafe Checklist for your CICS Enterprise

Task	Description
❑ 6	Review system parameters and make adjustments

- MAXOPENTCBS (make sure you do not over allocate)
- TCBLIMIT
- THREADLIMIT
- MXT
- RENTPGM=PROTECT (recommended but not required)

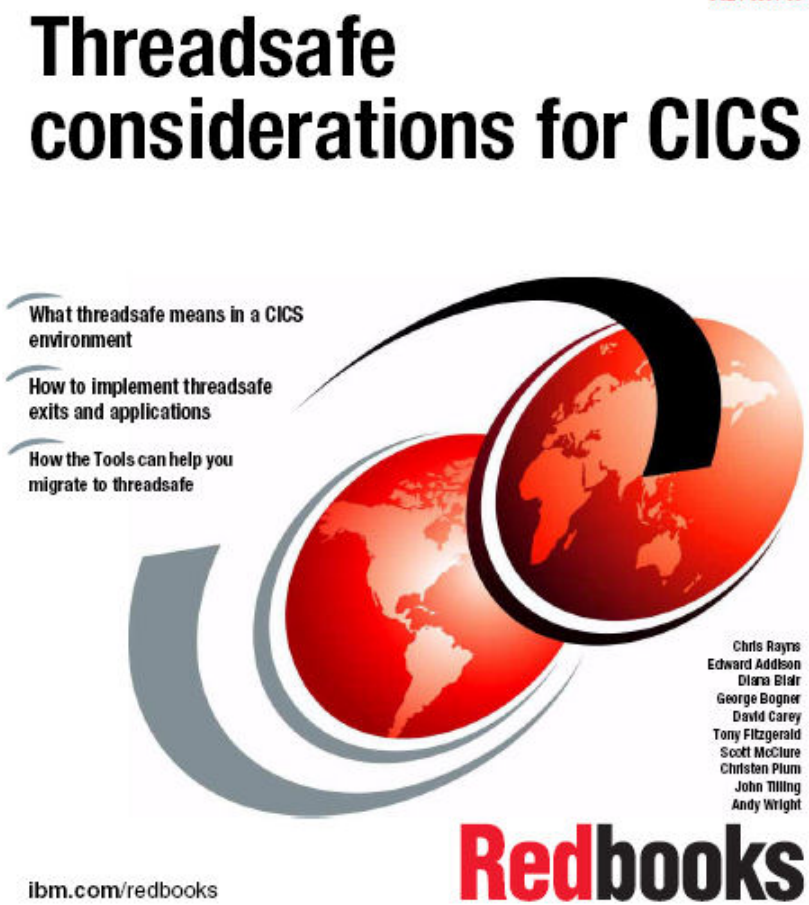
❑ 7 For best results, upgrade to CICS TS V3.2 or CICS TS V4.1

❑ 8 Retest exits in a threadsafe environment (CICS PA/IA)

“Threadsafe Considerations for CICS” Redbook Update Draft

http://www.redbooks.ibm.com/redpieces/abstracts/sg246351.html

- **SG24-6351-03**
- Chapter 5 – CICS Migration Tools
  - Rewritten
- CICS Explorer Plug-ins
  - CICS PA
  - CICS IA
  - CICS CM



CICS Tools 4 Step Process for Applications

- Step 1 - Identify candidates and capture baseline
- Step 2 - Analyze program behavior and make modifications
- Step 3 - Change program definitions to threadsafe
- Step 4 - Test and benchmark results

CICS Tools 4 Step Process for Applications

Step 1 - Identify candidates and capture baseline

- Determine best candidates
  - Target transactions with biggest payback relative to effort
  - Applications/transactions using the most CPU due to switching
  - How many switches (change modes) occurred?
  - What was the delay as the result?
  - How much CPU time did they use?
  - What is this costing me?
- Run test script to establish baseline SMF 110 data
  - Use as input to benchmark results in Step 4

CICS Tools 4 Step Process for Applications

Step 1 - Identify candidates and capture baseline

Tooling

- CICS Performance Analyzer
- CICS Statistics –
  - DFH0STAT
  - Shutdown statistics
- SMF 110 records – Key fields
  - DSCHMDLY
    - *Wait time for redispatch caused by TCB mode switch*
    - *TCB mode switch count*
  - TCB/CPU timings

CICS Tools 4 Step Process for Applications

Step 1 - Identify candidates and capture baseline

CICS Performance Analyzer

- SMF 110 data
- Supplied reports
  - CPU Usage, Delays, Change Mode Delays
  - TCB Analysis Report
  - Wait Analysis
- Historical Database
  - Optionally DB2
- CSV files
- Excel Spreadsheet charts and graphs
- CICS Explorer Extracts

CICS Tools 4 Step Process for Applications

Step 2 - Analyze behavior and make modifications

- Determine good candidate programs based on program behavior
  - What programs can be made threadsafe without program modification?
  - Which commands are threadsafe or not in a program?
  - What programs have commands requiring investigation?
    - Are there commands causing potential data integrity issues?
  - What commands need serialization wrapped around them?
  - What is the offset of the suspect command into the load module?

CICS Tools 4 Step Process for Applications

Step 2 - Analyze behavior and make modifications

- What TCB does the command currently run on?
- What commands will cause a TCB mode switch because the API is not threadsafe and must run on the QR TCB?
- Which transactions use GETMAIN SHARED, who GETMAINed it, and where?
- Are transactions FREEMAINing shared storage?
- What is the affect on the transaction flow after you change the program(s) to threadsafe compliance?

CICS Tools 4 Step Process for Applications

Step 2 - Analyze behavior and make modifications

Tooling

- CICS Interdependency Analyzer
- CICS Load Module Scanner – DFHEISUP
  - Modified DFHEIDTH table (Redbook)
    - *Commands to create or address a shared resource may not necessarily be confined to the programs that access or update it*
- Aux Trace
  - Chronological view of the transaction run in that region
- CEDF
- CICS Statistics - DFH0STAT (Redbook)

CICS Tools 4 Step Process for Applications

Step 2 - Analyze behavior and make modifications

CICS Interdependency Analyzer

- DB2 database
- Resource relationships based on real time capture
- CICS IA Explorer
  - Threadsafe Queries
- Dynamic Threadsafe Analysis Report
- Command Flow
  - Chronological view of the transaction
- Load Module/CSECT Scanner reports

CICS Tools 4 Step Process for Applications

Step 3 - Change program definitions to threadsafe

- Change resource definitions to make programs threadsafe from quasirent
- Install
- Newcopy
- Maintain audit history of CICS resource modifications
- Back-out to previous state if required

CICS Tools 4 Step Process for Applications

Step 3 - Change program definitions to threadsafe

Tooling

- CICS Configuration Manager
- CICS Explorer
- CPSM - BAS
- RDz
- CEDA
- CEMT

CICS Tools 4 Step Process for Applications

Step 3 - Change program definitions to threadsafe

CICS Configuration Manager

- Simplify management of CICS resources
- Controlled management of CICS resources definitions
- Create transformation rules for mass changes to threadsafe
- Can be across multiple regions and/or environments
- Package change, promote and install
- Maintain audit history of CICS resource modifications
- Compare resources across multiple definitions
- Back-out-to-previous state if required

CICS Tools 4 Step Process for Applications

- **Step 4 - Test and benchmark results**
- Test
  - Use the same test script as used in Step 1
  - Make program and definition changes as required in Steps 2 and 3
  - Run test script
  - Repeat the process outlined in Steps 1 and 2
  - Review the results after every change
  - Update databases for PA and IA with the collected data

CICS Tools 4 Step Process for Applications

- **Step 4 - Test and benchmark results**
- Benchmark
  - SMF 110 – Baseline and Change Results data
    - CICS PA Transaction Profiling report to verify results
    - Write your own report to compare baseline to Change Results
  - Rerun reports and queries from Step 2 to compare results
  - Analyze Chronological flow of Transaction
    - CICS IA Command Flow
    - CICS Aux Trace
    - Verify improvement in switching
  - Send report to management to show improvement

CICS Tools 4 Step Process for Applications

- **Step 4 - Test and benchmark results**
- Benchmark
  - What if the benchmark does not show improvement?
    - You could still be experiencing high TCB mode switches
      - *Review CICS PA Transaction Profiling report for switch improvement*
    - You may have non-threadsafe commands intermingled with SQL and/or MQ
      - *Review the CICS IA Command Flow to look for commands causing a TCB mode switch*

CICS Tools 4 Step Process for Applications

- **Step 4 - Test and benchmark results**

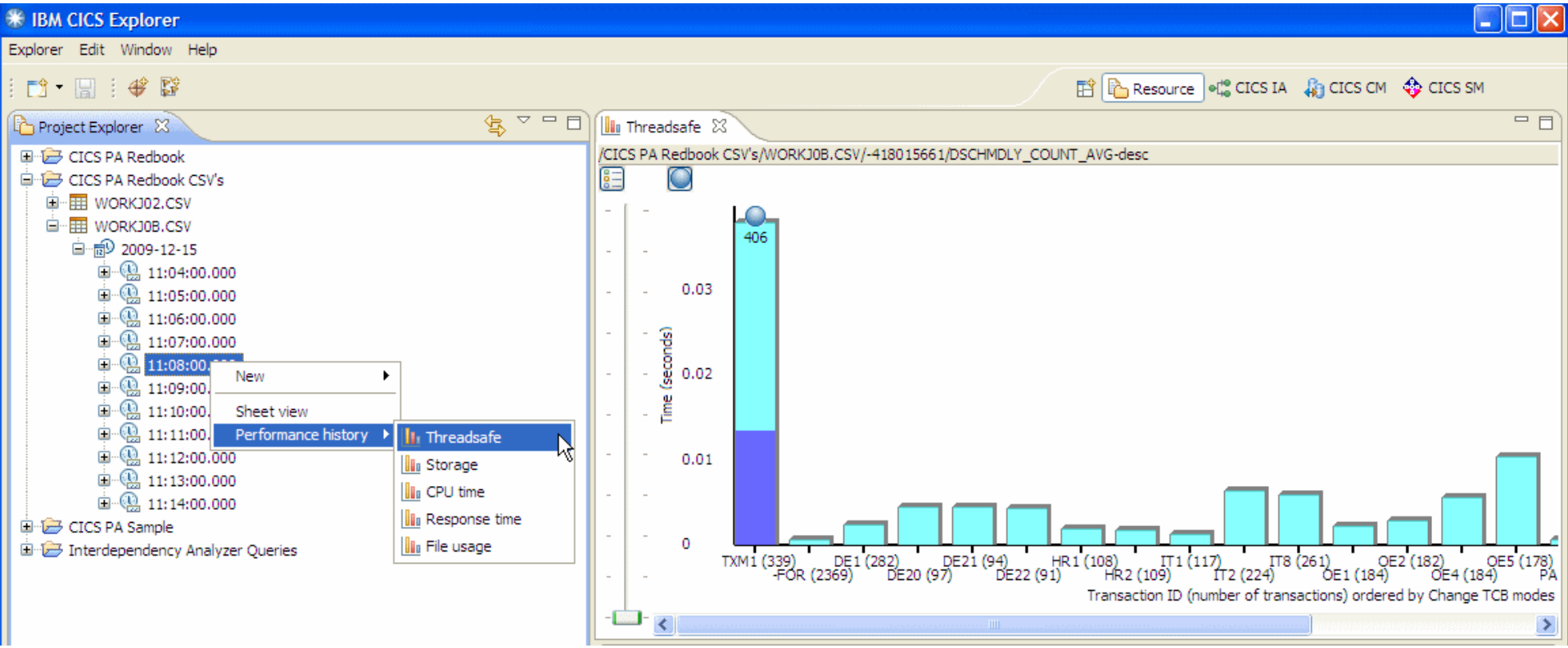
  Tooling

  - CICS Performance Analyzer
  - CICS Interdependency Analyzer
  - CICS Statistics –
    - DFH0STAT
    - Shutdown statistics
  - SMF 110 records – Key fields
    - DSCHMDLY
      - *Wait time for redispatch caused by TCB mode switch*
      - *TCB mode switch count*
    - TCB/CPU timings

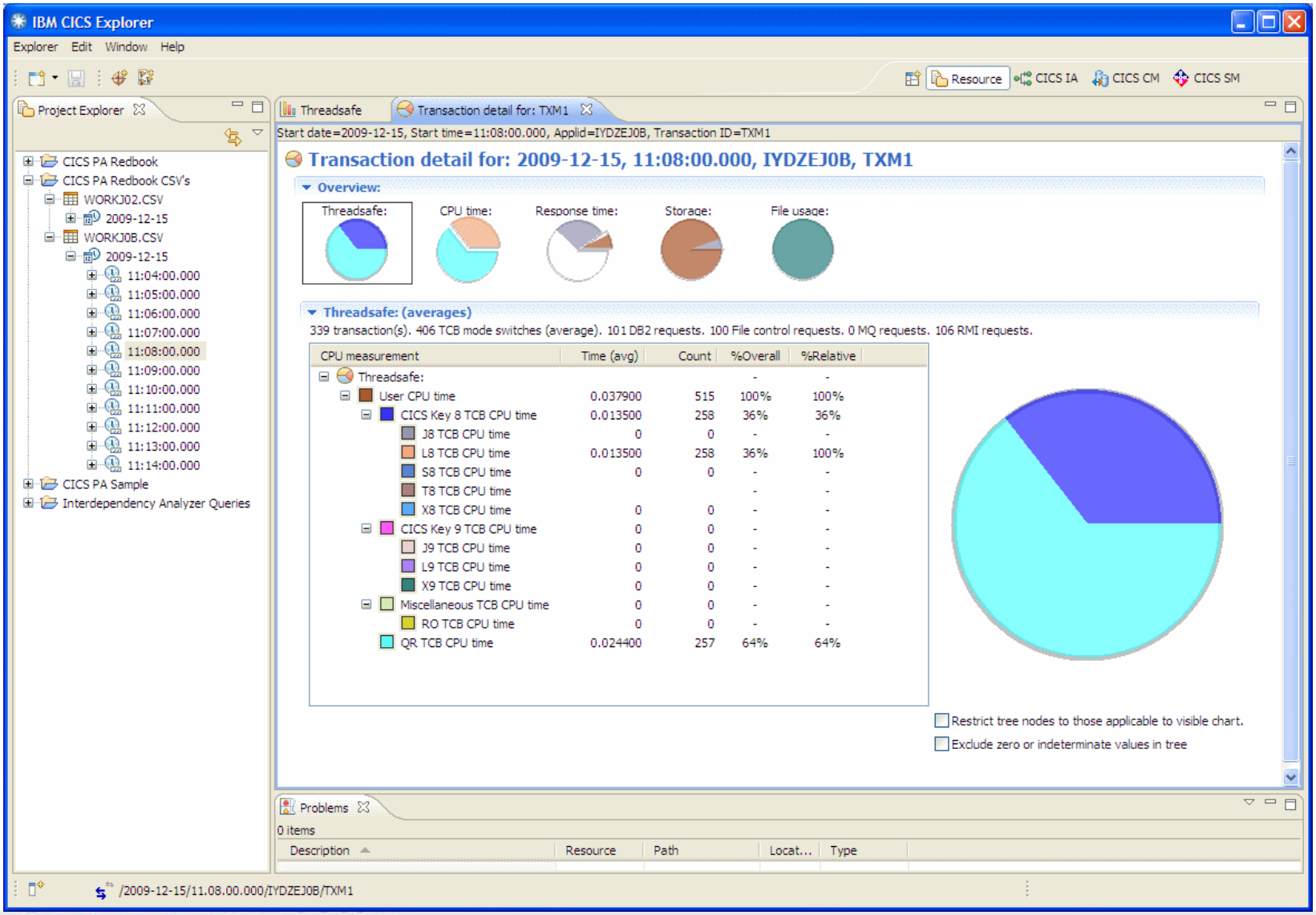
CICS Tools 4 Step Process for Applications

- **Application Case Scenario**
  - Redbook application for DB2
    - COBOL
    - DB2
    - VSAM
    - DRIVERP – driver program that performs setup work
    - WORKM - program that performs the DB2/VSAM work

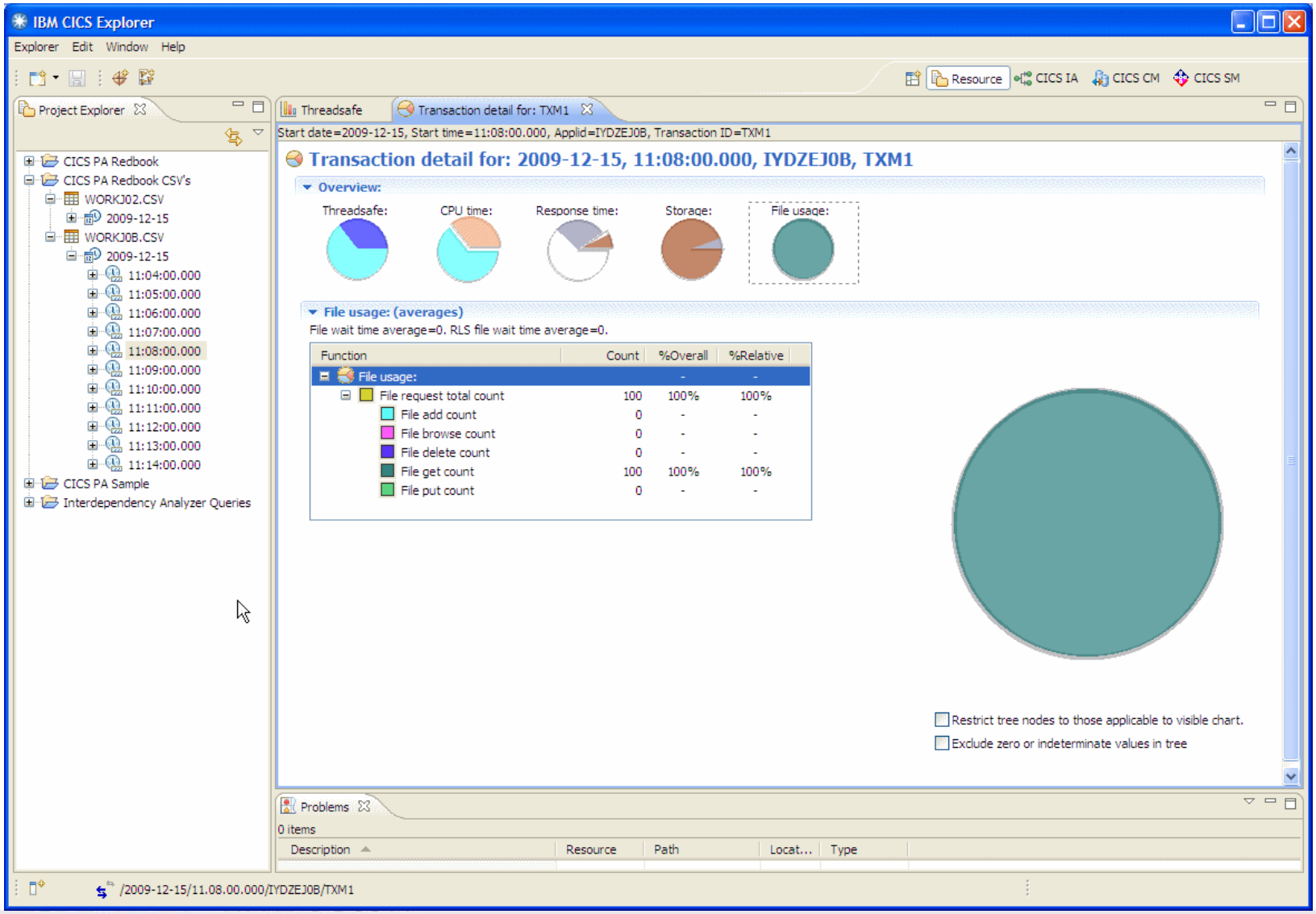
CICS PA Explorer - Threadsafe Chart
TXM1 is not Threadsafe



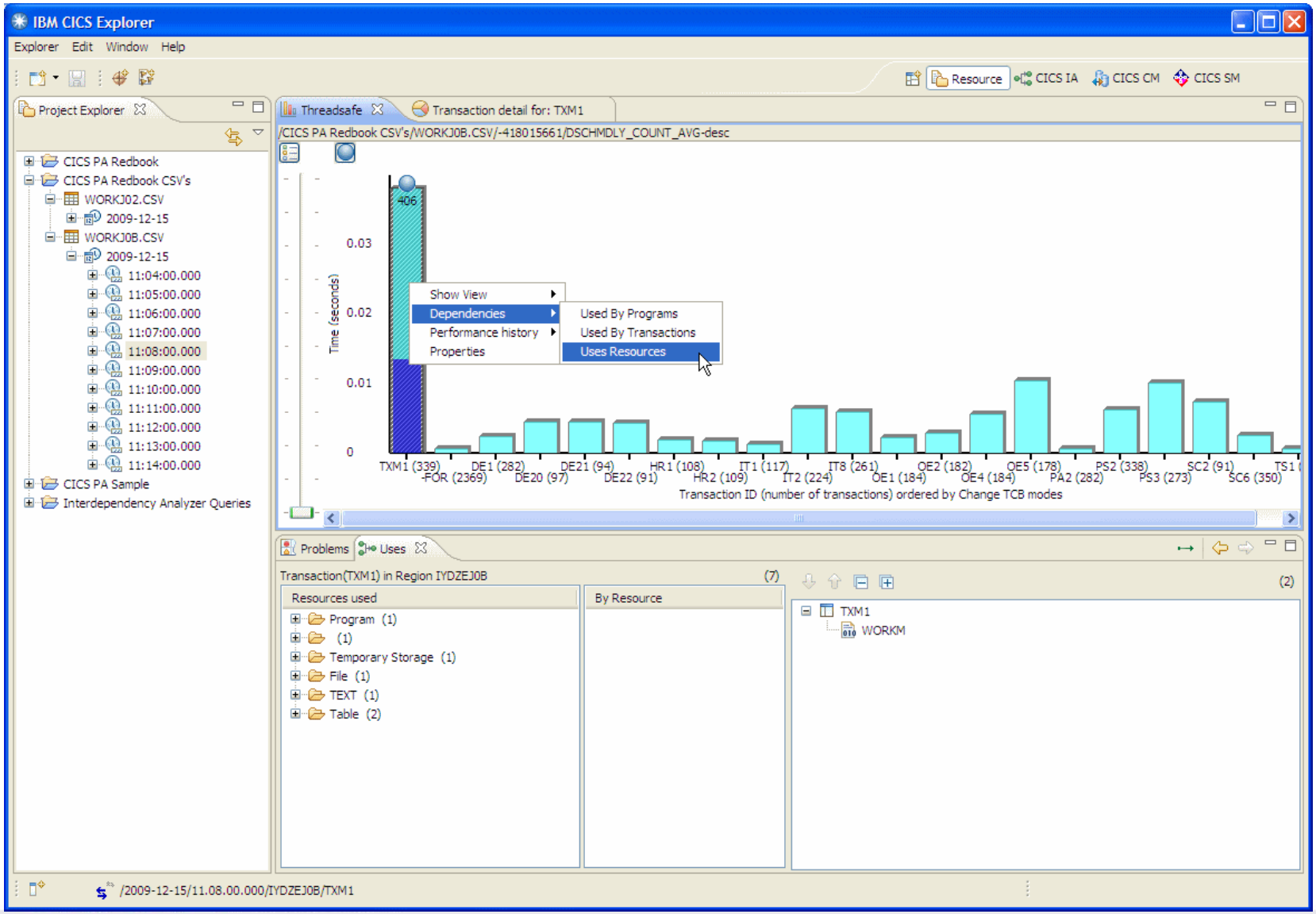
CICS PA Explorer - Threadsafe Detail View
TXM1 is not Threadsafe



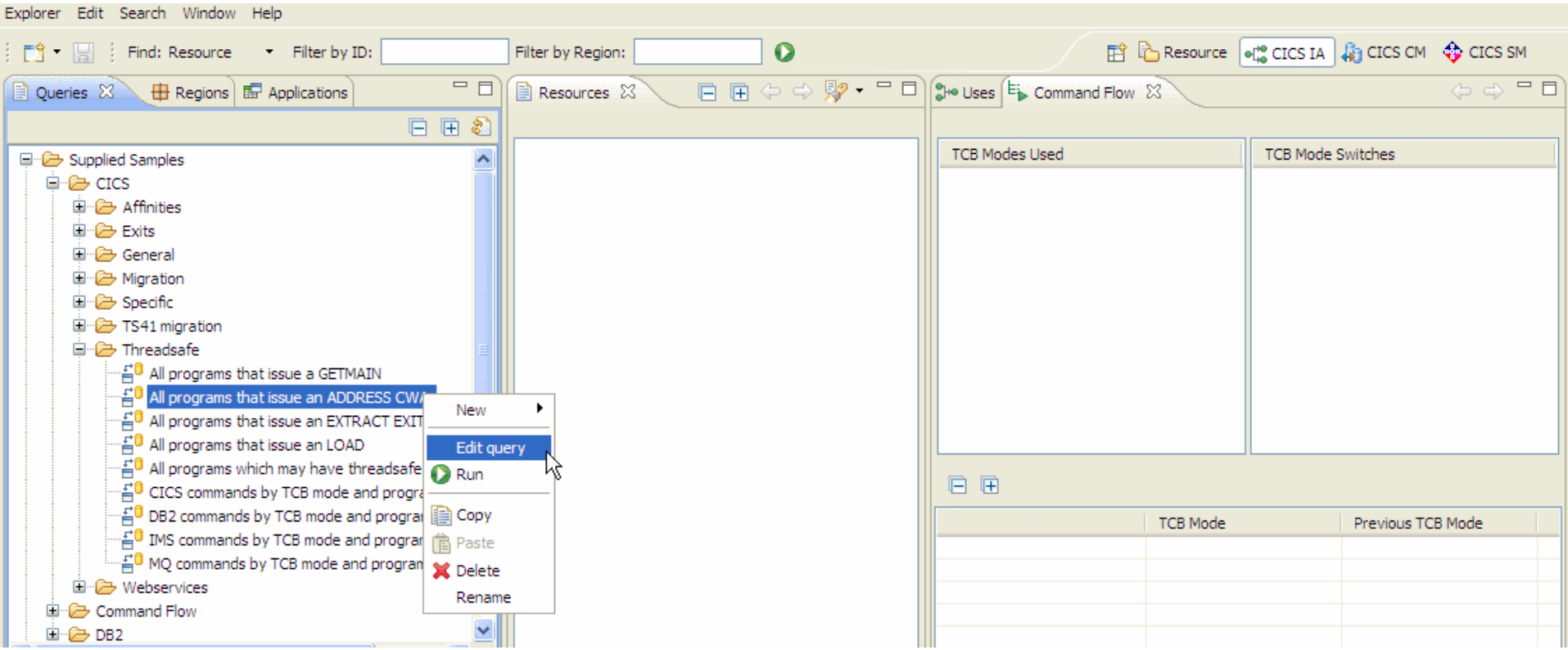
CICS PA Explorer - Detail View
File Usage



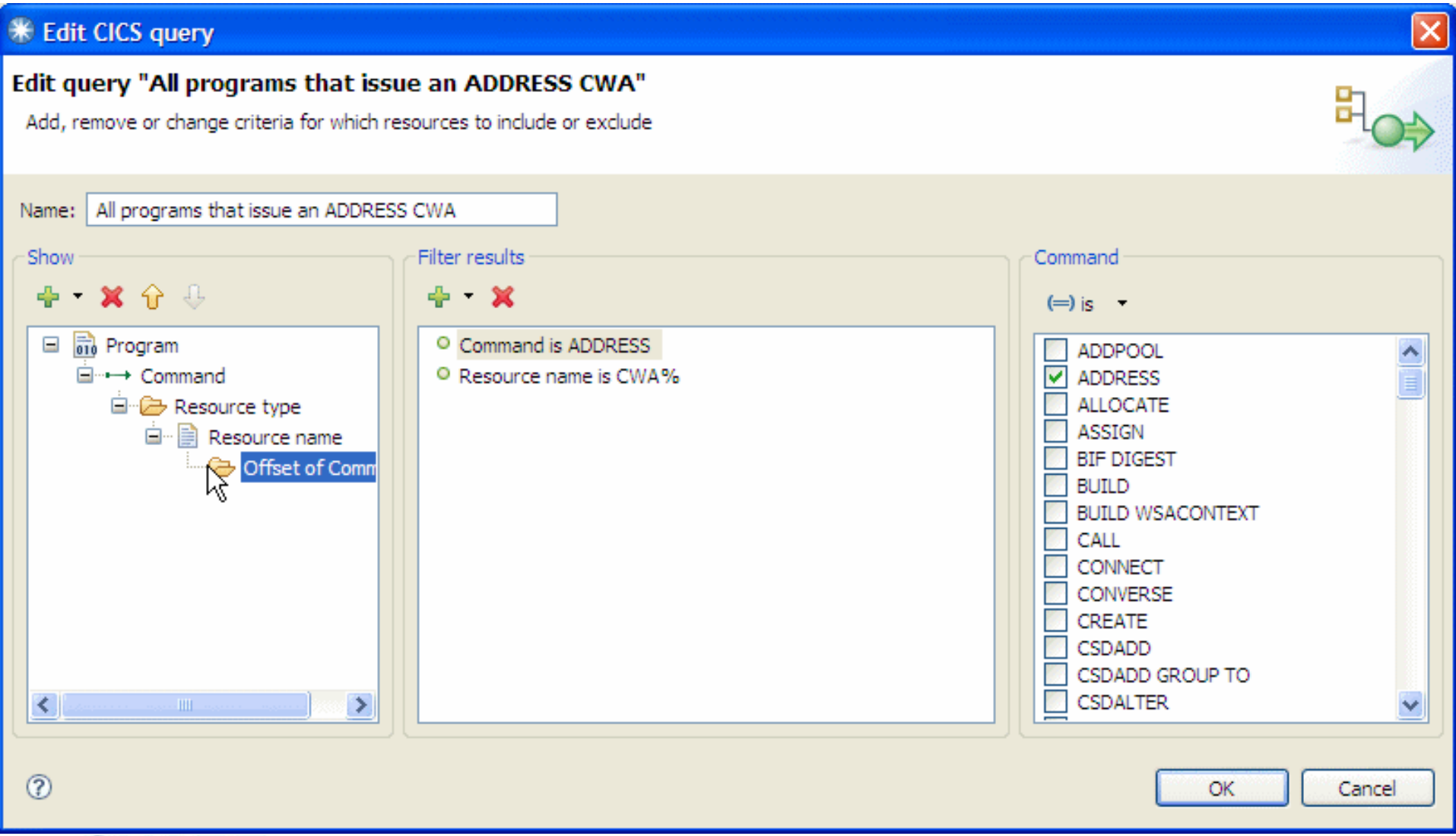
CICS PA Explorer - PA to IA Integration



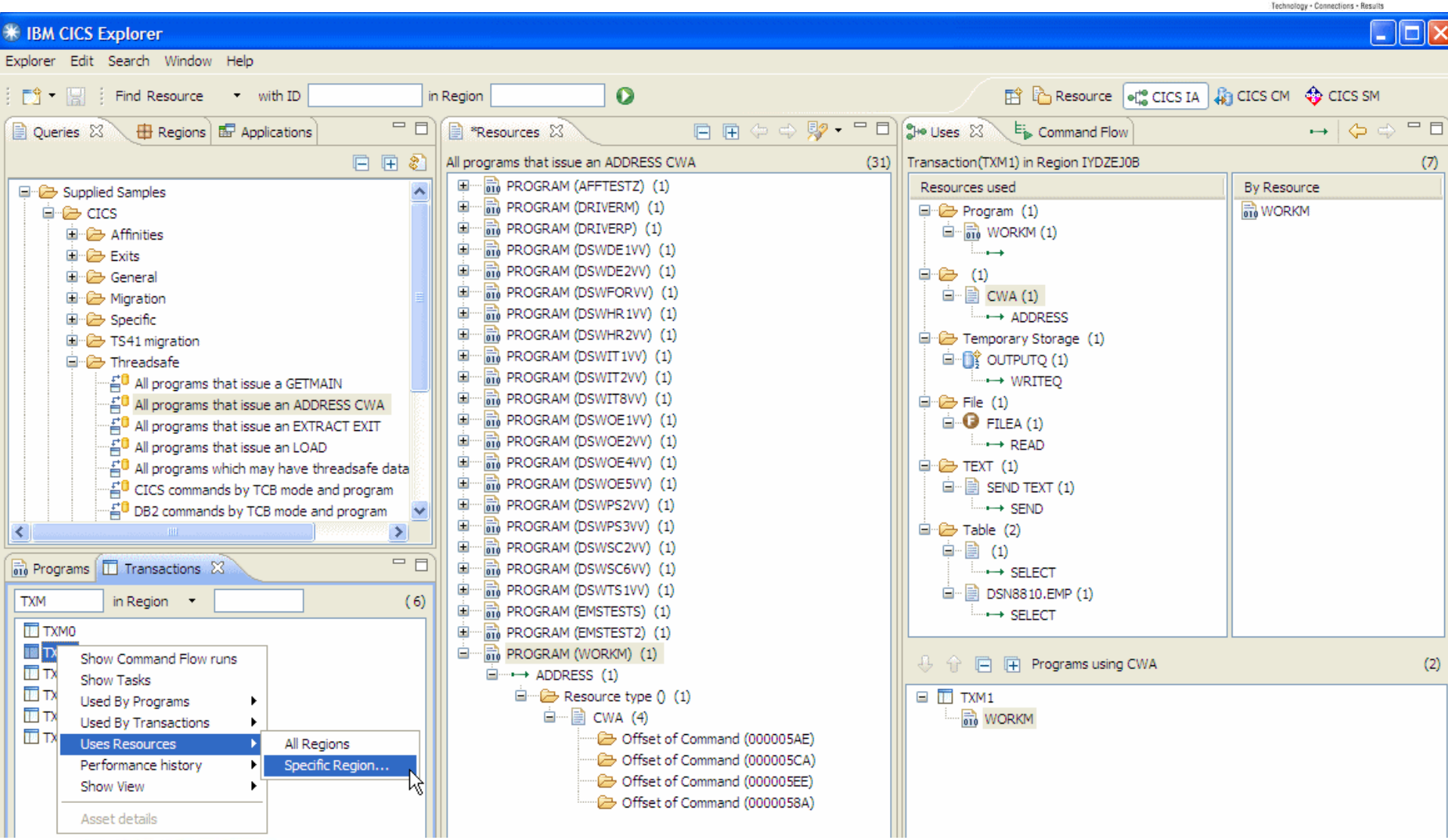
CICS IA Explorer - Edit query



CICS IA Explorer - Edit query



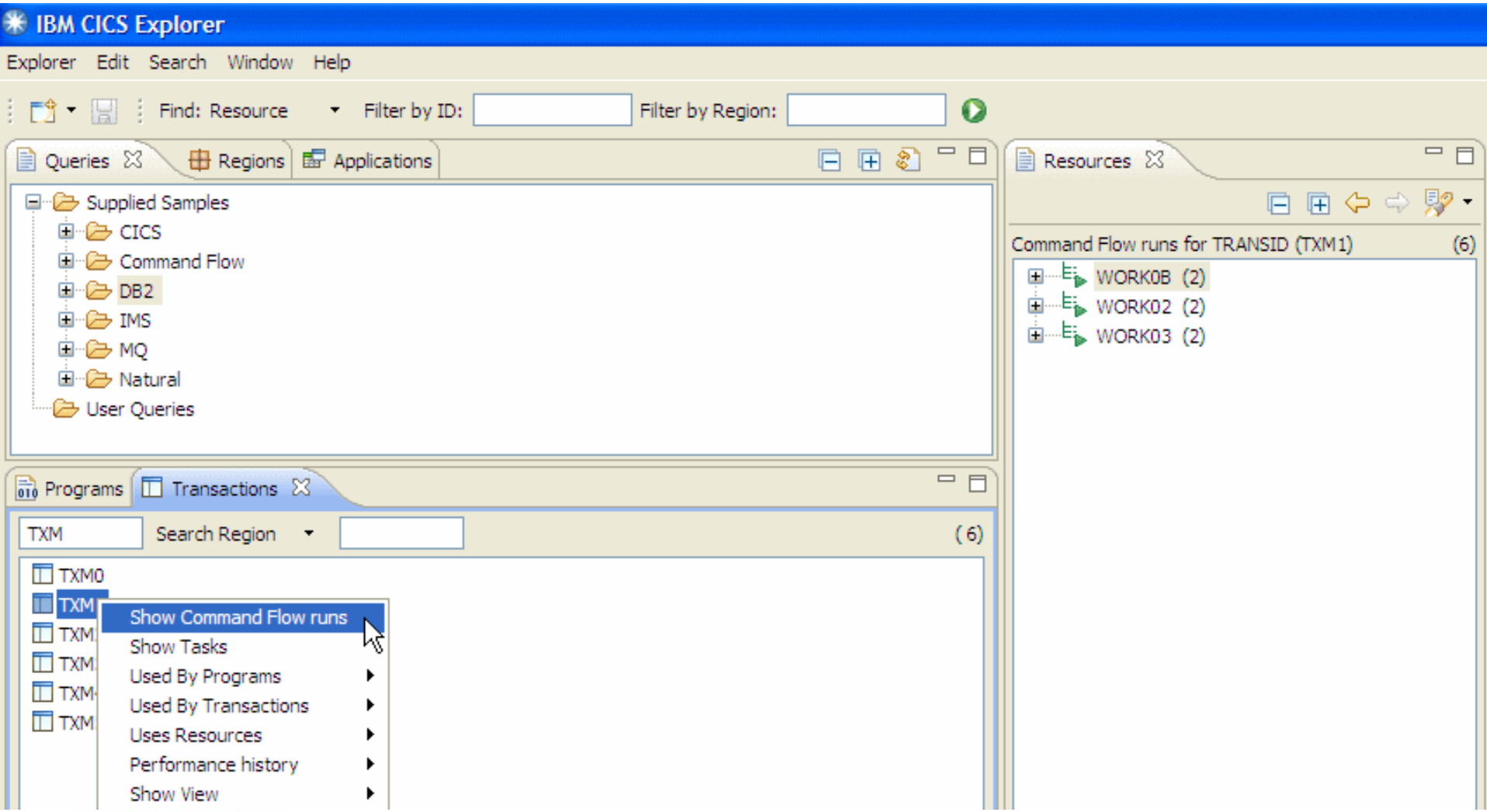
CICS IA Explorer - TXM1 Used Resources CWA Offset results



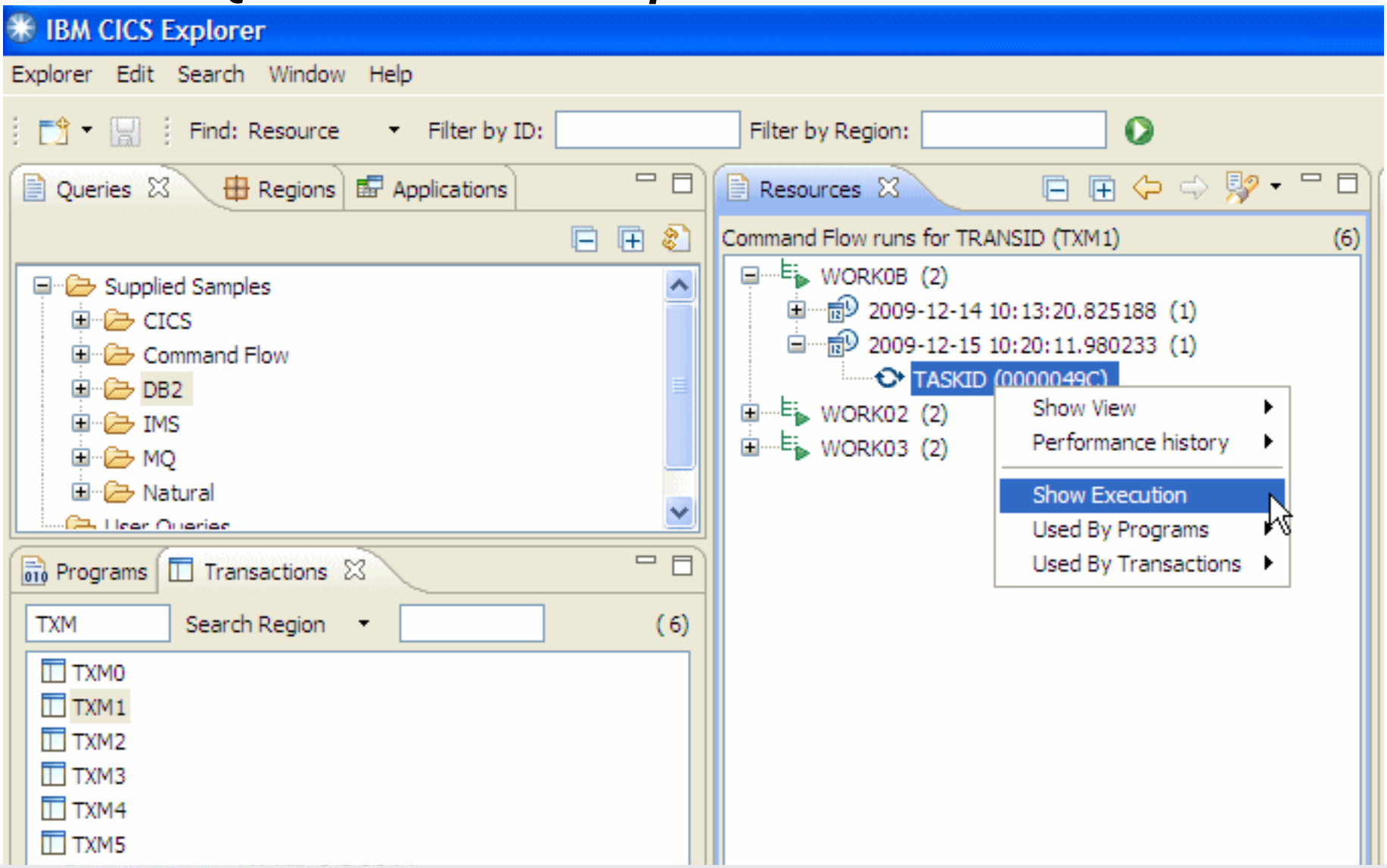
Detail Dynamic Threadsafe Analysis Report
Quasirent

```
Program Dynamic Analysis - THREADSAFE DETAIL LISTING FOR CICS TS 3.1

APPLID   Program   Linkedit   Execution  Concurrency  APIST   Storage  CICS  LIB Dataset Name
                     Date        Key                          Protect  Rel
-------- -------- ---------- ----------- ----------- ------- -------- ----- ----------------------------------

                  CMD  Function                 Type             Resource                         Offset   Program  Use     Threadsafe
                  Type                                                                                     Length   Count
                  ---- ------------------------ ---------------- -------------------------------- -------- -------- ------- -----------


IYDZEJOB DRIVERM  0001-01-01 USER       QUASIRENT   CICSAPI INACTIVE 0640
                  CICS ADDRESS                                   CWA                                 502     1668        1     N  *
                  CICS DELETEQ                TSQUEUE AUX        OUTPUTQ                             4BE     1668        1     Y
                  CICS INQUIRE                PROGRAM            WORKM                               6CA     1668        1     N
                  CICS SEND                   TEXT               SEND TEXT                           7E6     1668        1     N
                  CICS WRITEQ                 TSQUEUE AUX        OUTPUTQ                             78A     1668        1     Y
  Total CICS calls:          5  Threadsafe:         2  Non-Threadsafe:              3  Indeterminate Threadsafe:        0
                                DB2 calls:          0  MQ calls:                    0  IMS calls:                       0
                                Dynamic Calls:      0  Threadsafe Inhibitor calls:  1

IYDZEJOB WORKM    0001-01-01 USER       QUASIRENT   CICSAPI INACTIVE 0640
                  CICS ADDRESS                                   CWA                                 5CA     1928        1     N  *
                  CICS ADDRESS                                   CWA                                 58A     1890        1     N  *
                  CICS READ                   FILE               FILEA                               8B2     1890        1     N
                  CICS READ                   FILE               FILEA                               8F2     1928        1     N
                  CICS SEND                   TEXT               SEND TEXT                           9A2     1928        1     N
                  CICS WRITEQ                 TSQUEUE            OUTPUTQ                             912     1890        1     Y
                  CICS WRITEQ                 TSQUEUE            OUTPUTQ                             952     1928        1     Y
                  CICS ADDRESS                                   CWA                                 5CA     1928        1     N  *
                  CICS ADDRESS                                   CWA                                 58A     1890        1     N  *
                  CICS READ                   FILE               FILEA                               8B2     1890        1     N
                  CICS READ                   FILE               FILEA                               8F2     1928        1     N
                  CICS SEND                   TEXT               SEND TEXT                           9A2     1928        1     N
                  CICS WRITEQ                 TSQUEUE            OUTPUTQ                             912     1890        1     Y
                  CICS WRITEQ                 TSQUEUE            OUTPUTQ                             952     1928        1     Y
                  CICS ADDRESS                                   CWA                                 5CA     1928        1     N  *
                  CICS ADDRESS                                   CWA                                 58A     1890        1     N  *
                  CICS READ                   FILE               FILEA                               8B2     1890        1     N
                  CICS READ                   FILE               FILEA                               8F2     1928        1     N
                  CICS SEND                   TEXT               SEND TEXT                           9A2     1928        1     N
                  CICS WRITEQ                 TSQUEUE            OUTPUTQ                             912     1890        1     Y
                  CICS WRITEQ                 TSQUEUE            OUTPUTQ                             952     1928        1     Y
                  CICS ADDRESS                                   CWA                                 5CA     1928        1     N  *
                  CICS ADDRESS                                   CWA                                 58A     1890        1     N  *
                  CICS READ                   FILE               FILEA                               8B2     1890        1     N
                  CICS READ                   FILE               FILEA                               8F2     1928        1     N
                  CICS SEND                   TEXT               SEND TEXT                           9A2     1928        1     N
                  CICS WRITEQ                 TSQUEUE            OUTPUTQ                             912     1890        1     Y
                  CICS WRITEQ                 TSQUEUE            OUTPUTQ                             952     1928        1     Y
                  CICS ADDRESS                                   CWA                                 5CA     1928        1     N  *
                  CICS ADDRESS                                   CWA                                 58A     1890        1     N  *
                  CICS READ                   FILE               FILEA                               8B2     1890        1     N
                  CICS READ                   FILE               FILEA                               8F2     1928        1     N
                  CICS SEND                   TEXT               SEND TEXT                           9A2     1928        1     N
                  CICS WRITEQ                 TSQUEUE            OUTPUTQ                             912     1890        1     Y
                  CICS WRITEQ                 TSQUEUE            OUTPUTQ                             952     1928        1     Y
                  DB2  SELECT                 TABLE                                                  64A     1890        1     Y
                  DB2  SELECT                 TABLE              DSN8810.EMP                         68E     1928        1     Y
                  DB2  SELECT                 TABLE                                                  64A     1890        1     Y
                  DB2  SELECT                 TABLE              DSN8810.EMP                         68E     1928        1     Y
                  DB2  SELECT                 TABLE                                                  64A     1890        1     Y
                  DB2  SELECT                 TABLE              DSN8810.EMP                         68E     1928        1     Y
                  DB2  SELECT                 TABLE              DSN8810.EMP                         68E     1928        1     Y
                  DB2  SELECT                 TABLE              DSN8810.EMP                         68E     1928        1     Y
  Total CICS calls:         35  Threadsafe:        10  Non-Threadsafe:             25  Indeterminate Threadsafe:        0
                                DB2 calls:          8  MQ calls:                    0  IMS calls:                       0
                                Dynamic Calls:      0  Threadsafe Inhibitor calls: 10
```

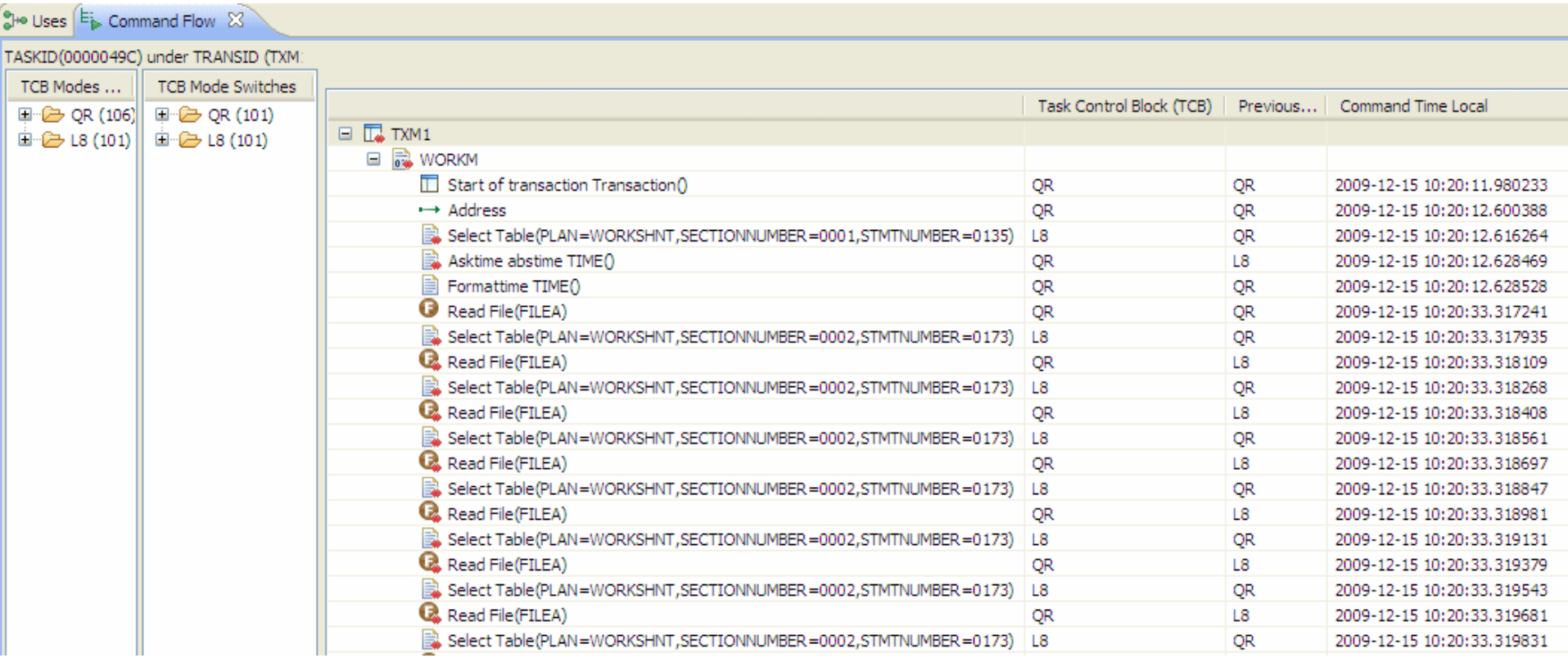
CICS IA Explorer – Select Command Flow runs for transaction TXM1



CICS IA Explorer - Select Command Flow Run WORK0B Quasirent TXM1 capture

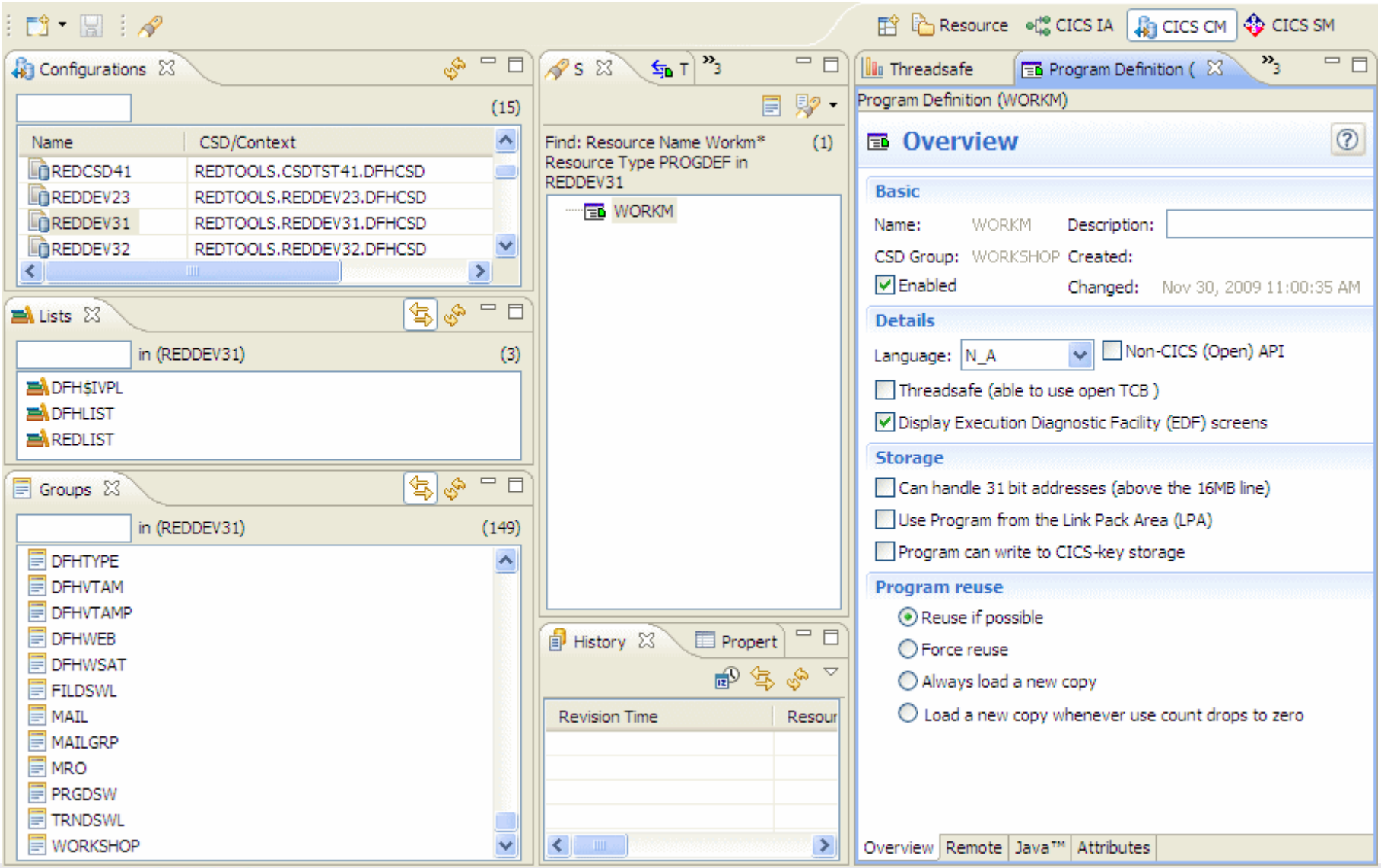


CICS IA Explorer - Command Flow execution WORK0B Quasirent TXM1 capture

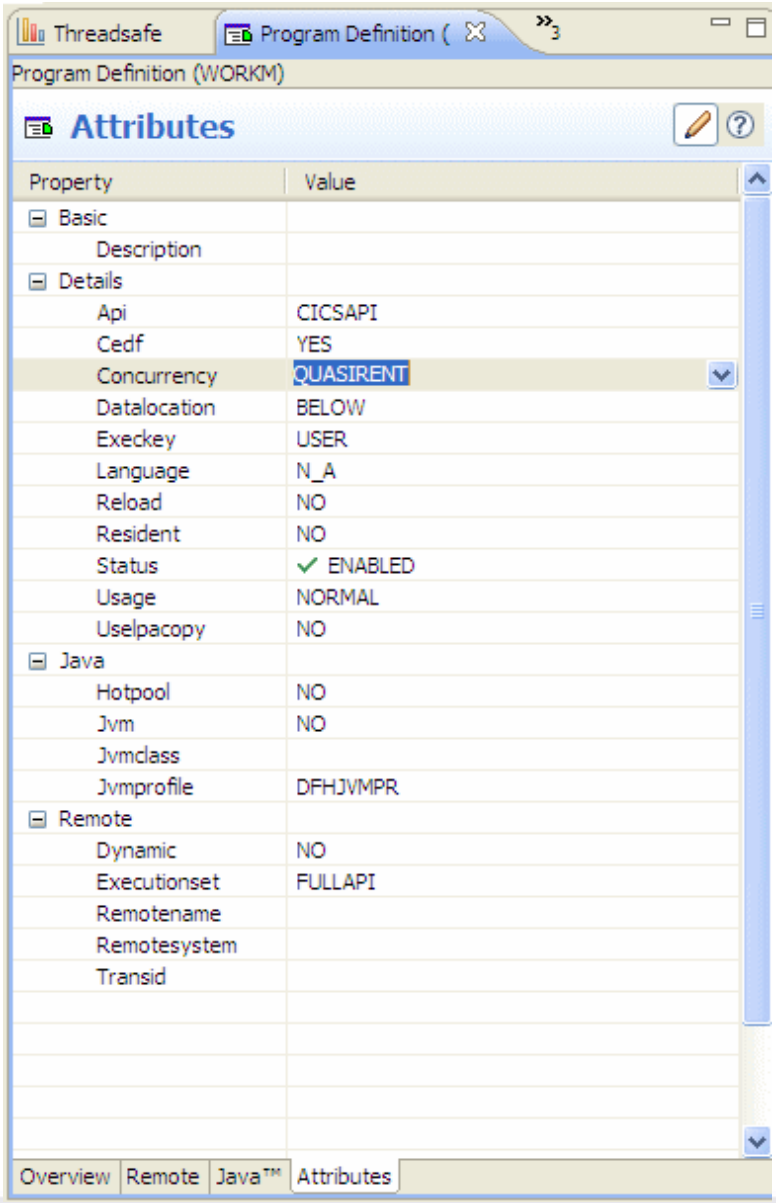


	Task Control Block (TCB)	Previous...	Command Time Local
TXM1			
WORKM			
Start of transaction Transaction()	QR	QR	2009-12-15 10:20:11.980233
Address	QR	QR	2009-12-15 10:20:12.600388
Select Table(PLAN=WORKSHNT,SECTIONNUMBER=0001,STMTNUMBER=0135)	L8	QR	2009-12-15 10:20:12.616264
Asktime abstime TIME()	QR	L8	2009-12-15 10:20:12.628469
Formattime TIME()	QR	QR	2009-12-15 10:20:12.628528
Read File(FILEA)	QR	QR	2009-12-15 10:20:33.317241
Select Table(PLAN=WORKSHNT,SECTIONNUMBER=0002,STMTNUMBER=0173)	L8	QR	2009-12-15 10:20:33.317935
Read File(FILEA)	QR	L8	2009-12-15 10:20:33.318109
Select Table(PLAN=WORKSHNT,SECTIONNUMBER=0002,STMTNUMBER=0173)	L8	QR	2009-12-15 10:20:33.318268
Read File(FILEA)	QR	L8	2009-12-15 10:20:33.318408
Select Table(PLAN=WORKSHNT,SECTIONNUMBER=0002,STMTNUMBER=0173)	L8	QR	2009-12-15 10:20:33.318561
Read File(FILEA)	QR	L8	2009-12-15 10:20:33.318697
Select Table(PLAN=WORKSHNT,SECTIONNUMBER=0002,STMTNUMBER=0173)	L8	QR	2009-12-15 10:20:33.318847
Read File(FILEA)	QR	L8	2009-12-15 10:20:33.318981
Select Table(PLAN=WORKSHNT,SECTIONNUMBER=0002,STMTNUMBER=0173)	L8	QR	2009-12-15 10:20:33.319131
Read File(FILEA)	QR	L8	2009-12-15 10:20:33.319379
Select Table(PLAN=WORKSHNT,SECTIONNUMBER=0002,STMTNUMBER=0173)	L8	QR	2009-12-15 10:20:33.319543
Read File(FILEA)	QR	L8	2009-12-15 10:20:33.319681
Select Table(PLAN=WORKSHNT,SECTIONNUMBER=0002,STMTNUMBER=0173)	L8	QR	2009-12-15 10:20:33.319831

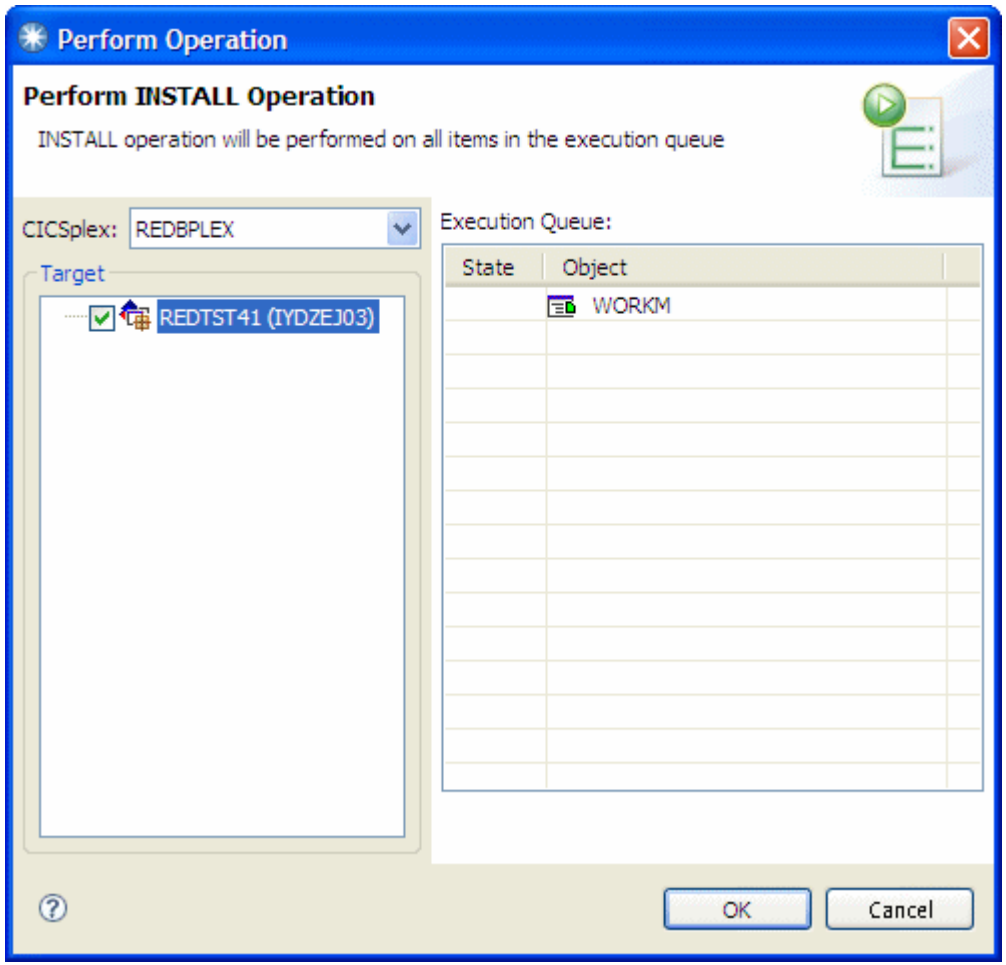
CICS CM Explorer - View of program WORKM Quasirent



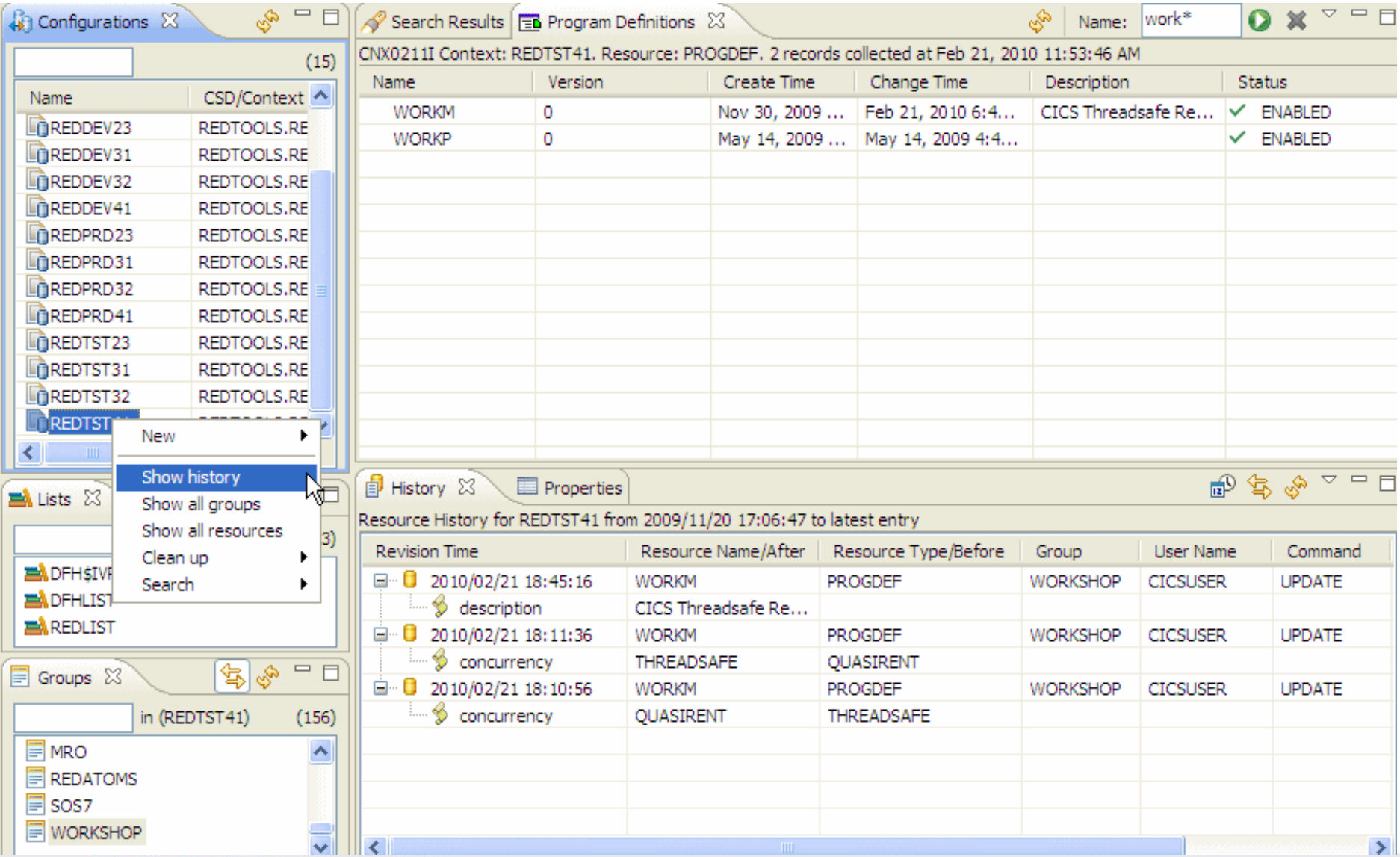
CICS CM Explorer – Detail Attributes WORKM Quasirent



CICS CM Explorer - Install Program WORKM



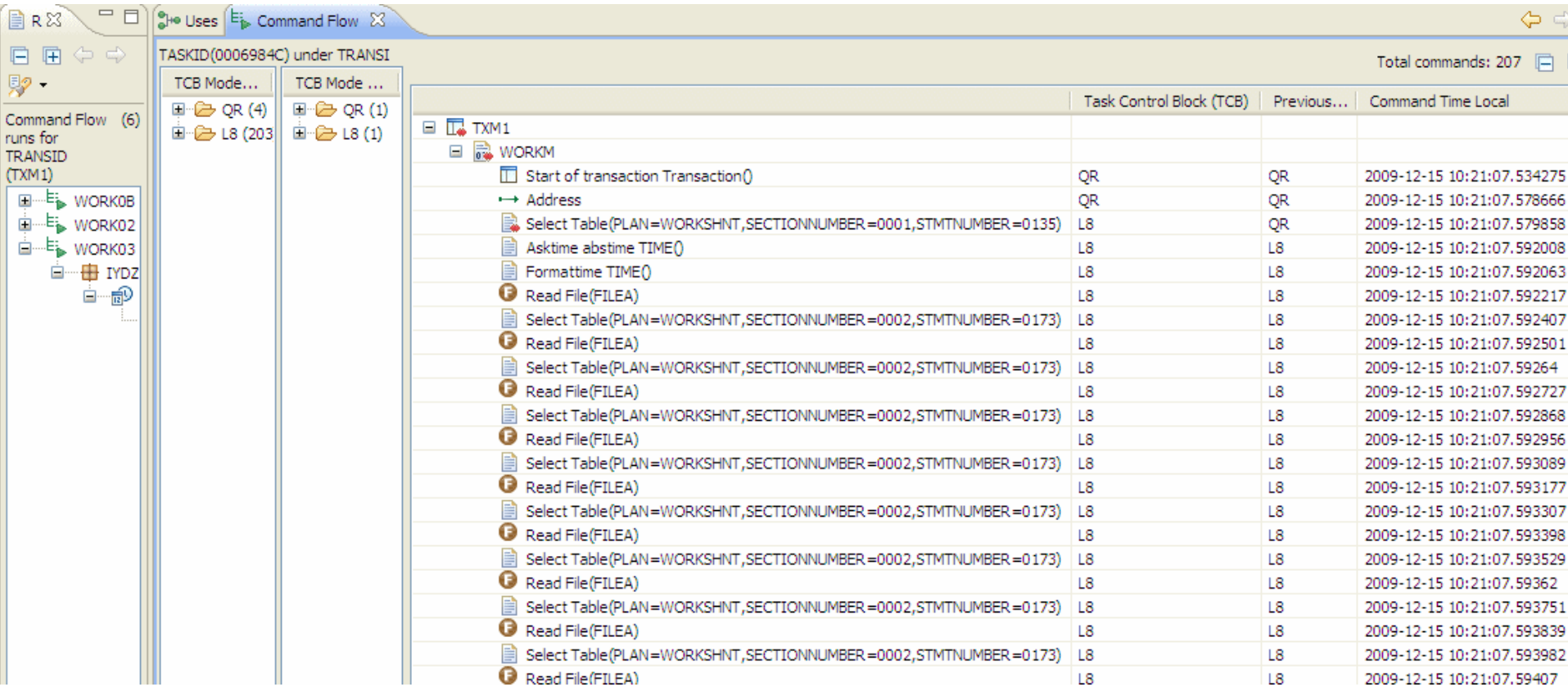
CICS CM Explorer - View History



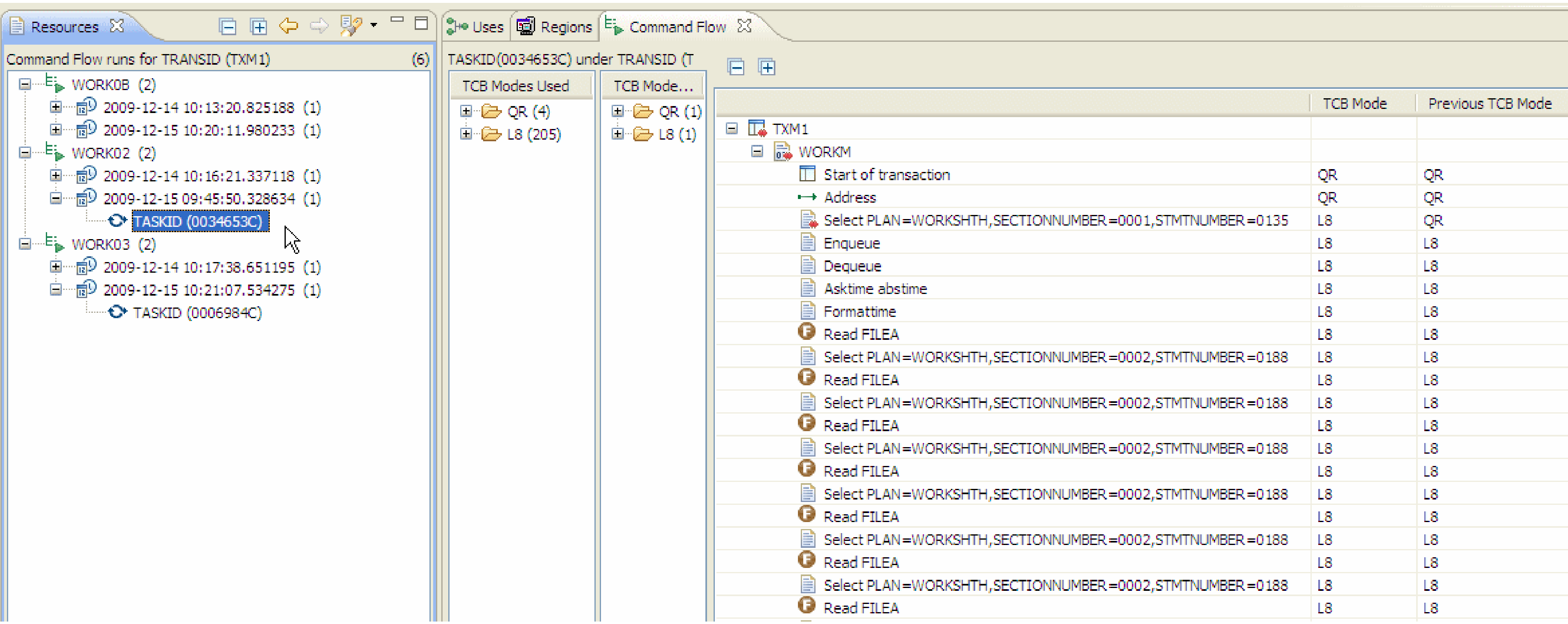
CICS CM ISPF - Compare Resources

```
  File  Menu  Settings  Hilite  Help
------------------------------------------------------------------------------
Compare                              Program
Command ===> _

    Program . . . : WORKM                          WORKM
    ResGroup  . . : WORKSHOP                       WORKSHOP
==> Location  . . : REDTOOLS.REDDEV31.DFHCSD       REDTOOLS.REDTST41.DFHCSD
==> Change Date . : 2009/11/30 11:00:35            2010/02/21 18:44:52
==> Description . :                            >   CICS Threadsafe Redbook Pr >
                                                                 More:      +
    Language  . . : N_A                            N_A
    Reload  . . . : NO                             NO
    Resident  . . : NO                             NO
    Usage . . . . : NORMAL                         NORMAL
    UseLPAcopy  . : NO                             NO
    Status  . . . : ENABLED                        ENABLED
    CEDF  . . . . : YES                            YES
    DataLocation  : BELOW                          BELOW
    ExecKey . . . : USER                           USER
==> Concurrency . : QUASIRENT                      THREADSAFE
    API . . . . . : CICSAPI                        CICSAPI

   Remote Attributes
    Dynamic . . . : NO                             NO
    RemoteSystem  :
    RemoteName  . :
    TransID . . . :
    ExecutionSet  : FULLAPI                        FULLAPI

   JVM Attributes
    JVM . . . . . : NO                             NO
```

CICS IA Explorer - Command Flow execution WORK03 Threadsafe TXM1 capture



CICS IA Explorer - Command Flow execution WORK02 Threadsafe TXM1 capture



Detail Dynamic Threadsafe Analysis Report
WORKM Threadsafe

```
APPLID   Program   Linkedit   Execution  Concurrency  APIST  Storage  CICS  LIB Dataset Name
                    Date        Key                          Protect  Rel
-------- -------- ---------- ----------- ----------- ------- -------- ----- ----------------------------------

                  CMD  Function                 Type             Resource                          Offset   Program  Use     Threadsafe
                  Type                                                                                      Length   Count
                  ---- ------------------------ ---------------- --------------------------------  -------- -------- ------- ----------


IYDZEJ02 DRIVERM  0001-01-01 USER         QUASIRENT   CICSAPI INACTIVE 0660   REDTOOLS.WORKSEM.LOADLIB2
                  CICS ADDRESS                                   CWA                                    502     1668       1     N  *
                  CICS DELETEQ                  TSQUEUE AUX      OUTPUTQ                                4BE     1668       1     Y
                  CICS INQUIRE                  PROGRAM          WORKM                                  6CA     1668       1     N
                  CICS SEND                     TEXT             SEND TEXT                              7E6     1668       1     N
                  CICS WRITEQ                   TSQUEUE AUX      OUTPUTQ                                730     1668       1     Y
                  CICS ADDRESS                                   CWA                                    502     1668       1     N
                  CICS DELETEQ                  TSQUEUE AUX      OUTPUTQ                                4BE     1668       1     Y
                  CICS INQUIRE                  PROGRAM          WORKM                                  6CA     1668       1     N
                  CICS SEND                     TEXT             SEND TEXT                              7E6     1668       1     N
                  CICS WRITEQ                   TSQUEUE AUX      OUTPUTQ                                730     1668       1     Y
  Total CICS calls:         10  Threadsafe:           4  Non-Threadsafe:              6  Indeterminate Threadsafe:        0
                                DB2 calls:            0  MQ calls:                    0  IMS calls:                       0
                                Dynamic Calls:        0  Threadsafe Inhibitor calls:  2

IYDZEJ02 WORKM    0001-01-01 USER         THREADSAFE  CICSAPI INACTIVE 0660   REDTOOLS.WORKSEM.LOADLIB2
                  CICS ADDRESS                                   CWA                                    5EE     1930       1     N  *
                  CICS DEQUEUE                  ENQNAME          ADDR                                   7A2     1930       1     I
                  CICS ENQUEUE                  ENQNAME          ADDR                                   6EA     1930       1     I
                  CICS READ                     FILE             FILEA                                  994     1930       1     Y
                  CICS SEND                     TEXT             SEND TEXT                              A2E     1930       1     N
                  CICS WRITEQ                   TSQUEUE          OUTPUTQ                                9DE     1930       1     Y
                  CICS ADDRESS                                   CWA                                    5EE     1930       1     N  *
                  CICS DEQUEUE                  ENQNAME          ADDR                                   7A2     1930       1     I
                  CICS ENQUEUE                  ENQNAME          ADDR                                   6EA     1930       1     I
                  CICS READ                     FILE             FILEA                                  994     1930       1     Y
                  CICS SEND                     TEXT             SEND TEXT                              A2E     1930       1     N
                  CICS WRITEQ                   TSQUEUE          OUTPUTQ                                9DE     1930       1     Y
                  CICS ADDRESS                                   CWA                                    5EE     1930       1     N  *
                  CICS DEQUEUE                  ENQNAME          ADDR                                   7A2     1930       1     I
                  CICS ENQUEUE                  ENQNAME          ADDR                                   6EA     1930       1     I
                  CICS READ                     FILE             FILEA                                  994     1930       1     Y
                  CICS SEND                     TEXT             SEND TEXT                              A2E     1930       1     N
                  CICS WRITEQ                   TSQUEUE          OUTPUTQ                                9DE     1930       1     Y
                  .......
                  .......
                  DB2  SELECT                   TABLE            DSN8810.EMP                            6B2     1930       1     Y
                  DB2  SELECT                   TABLE            DSN8810.EMP                            6B2     1930       1     Y
                  DB2  SELECT                   TABLE            DSN8810.EMP                            6B2     1930       1     Y
                  DB2  SELECT                   TABLE            DSN8810.EMP                            6B2     1930       1     Y
                  DB2  SELECT                   TABLE            DSN8810.EMP                            6B2     1930       1     Y
                  DB2  SELECT                   TABLE                                                   66E     1928       1     Y
                  DB2  SELECT                   TABLE                                                   66E     1928       1     Y
                  DB2  SELECT                   TABLE                                                   66E     1928       1     Y
  Total CICS calls:         45  Threadsafe:          16  Non-Threadsafe:             13  Indeterminate Threadsafe:       16
                                DB2 calls:            8  MQ calls:                    0  IMS calls:                       0
                                Dynamic Calls:        0  Threadsafe Inhibitor calls:  8
```

CICS PA ISPF Interface - Transaction Profiling Default report

V3R1M0 CICS Performance Analyzer
Transaction Profiling

PROF0001 Printed at 0:37:37 2/22/2010

Report Data from 11:29:59 12/15/2009 to 11:39:58 12/15/2009
Baseline Data from 11:04:58 12/15/2009 to 11:14:57 12/15/2009

CICS Threadsafe Redbook Transaction Profiling

Tran		#Tasks	Avg Response Time	Avg Dispatch Time	Avg User CPU Time	Avg Suspend Time	Avg DispWait Time	Avg FC Wait Time	Avg FCAMRq Count	Avg IR Wait Time	Avg SC24UHWM Count	Avg SC31UHWM Count
TXM1	Report	3583	.0371	.0296	.0215	.0076	.0028	.0000	100	.0000	0	34016
TXM1	Baseline	3465	.5621	.0518	.0378	.5103	.1480	.0000	100	.0000	0	34000
	Delta	+118	-.5250	-.0222	-.0163	-.5028	-.1453	.0000	0	.0000	0	+16
	Change%	+3.41	-93.39	-42.92	-43.13	-98.51	-98.13	.00	.00	.00	.00	+.05
Total	Report	3583	.0371	.0296	.0215	.0076	.0028	.0000	100	.0000	0	34016
	Baseline	3465	.5621	.0518	.0378	.5103	.1480	.0000	100	.0000	0	34000
	Delta	+118	-.5250	-.0222	-.0163	-.5028	-.1453	.0000	0	.0000	0	+16
	Change%	+3.41	-93.39	-42.92	-43.13	-98.51	-98.13	.00	.00	.00	.00	+.05

CICS PA ISPF Interface - Modified report form CPUSUM

```
                    EDIT SUMMARY Report Form - CPUSUMTS    Row 1 of 13 More: >
Command ===> _____________________________________________ Scroll ===> PAGE

Description  . . . Transaction Threadsafe CPU      Version (VRM): 620

Selection Criteria:
 _  Performance                                    Page width . . 132

    Field    Sort
/   Name +   K  O Type     Fn   Description
__  TRAN     K  A ________ ___  Transaction identifier
__  TASKCNT     _ ________ ___  Total Task count
__  RESPONSE    _ ________ AVE  Transaction response time
__  RESPONSE    _ ________ MAX  Transaction response time
__  DISPATCH    _ TIME     AVE  Dispatch time
__  CPU         _ TIME     AVE  CPU time
__  SUSPEND     _ TIME     AVE  Suspend time
__  QRCPU       _ TIME     AVE  CICS QR TCB CPU time
__  L8CPU       _ TIME     AVE  CICS L8 TCB CPU time
__  DSCHMDLY    _ TIME     AVE  Redispatch wait time caused by change-TCB mode
__  DSCHMDLY    _ COUNT    AVE  Redispatch wait time caused by change-TCB mode
    EOR                         ---------------- End of Report ----------------
```

CICS PA ISPF Interface - Transaction Profiling report Using modified form

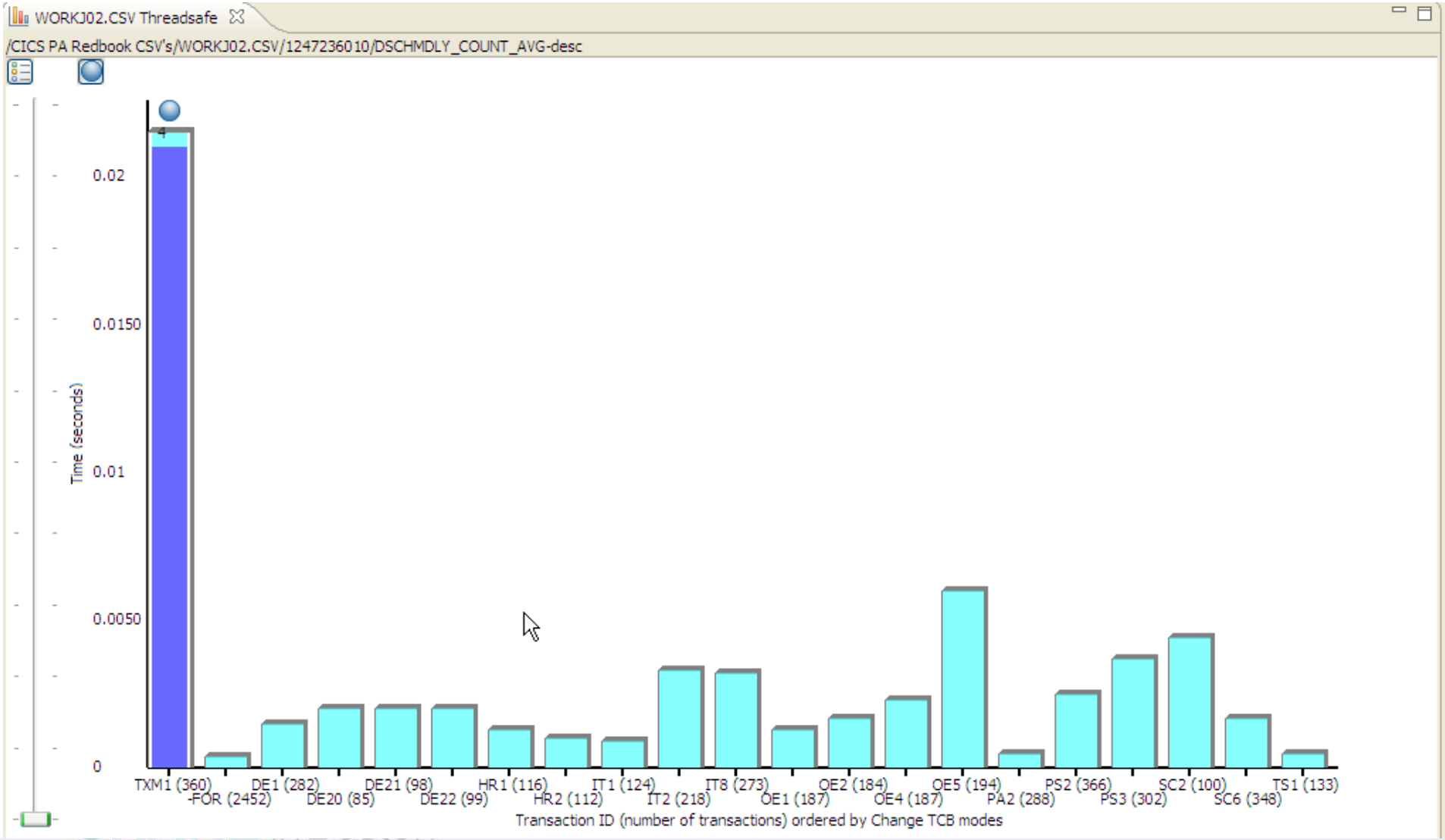
V3R1M0 CICS Performance Analyzer
Transaction Profiling

PROF0001 Printed at 23:31:23 2/21/2010
Report Data from 11:29:59 12/15/2009 to 11:39:58 12/15/2009
Baseline Data from 11:04:58 12/15/2009 to 11:14:57 12/15/2009

CICS Threadsafe Redbook CPUSUM Transaction Profiling

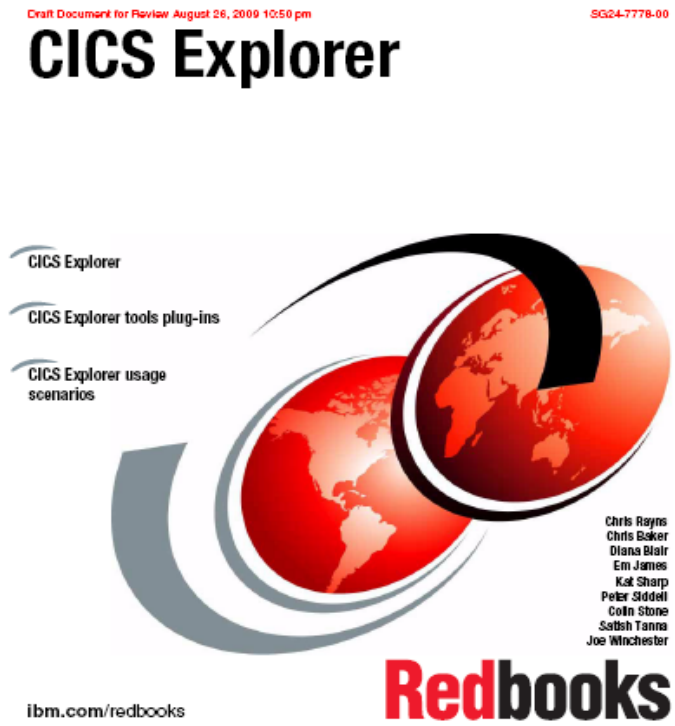
Tran		#Tasks	Avg Response Time	Max Response Time	Avg Dispatch Time	Avg User CPU Time	Avg Suspend Time	Avg QR CPU Time	Avg L8 CPU Time	Avg DSCHMDLY Time	Avg DSCHMDLY Count
TXM1	Report	3583	.0371	.5399	.0296	.0215	.0076	.0005	.0210	.0027	4
TXM1	Baseline	3465	.5621	2.7829	.0518	.0378	.5103	.0243	.0135	.1324	406
	Delta	+118	-.5250	-2.2430	-.0222	-.0163	-.5028	-.0239	+.0075	-.1297	-402
	Change%	+3.41	-93.39	-80.60	-42.92	-43.13	-98.51	-98.00	+55.78	-97.94	-99.01
Total	Report	3583	.0371	.5399	.0296	.0215	.0076	.0005	.0210	.0027	4
	Baseline	3465	.5621	2.7829	.0518	.0378	.5103	.0243	.0135	.1324	406
	Delta	+118	-.5250	-2.2430	-.0222	-.0163	-.5028	-.0239	+.0075	-.1297	-402
	Change%	+3.41	-93.39	-80.60	-42.92	-43.13	-98.51	-98.00	+55.78	-97.94	-99.01

CICS PA Explorer - Threadsafe Detail View
TXM1 is Threadsafe



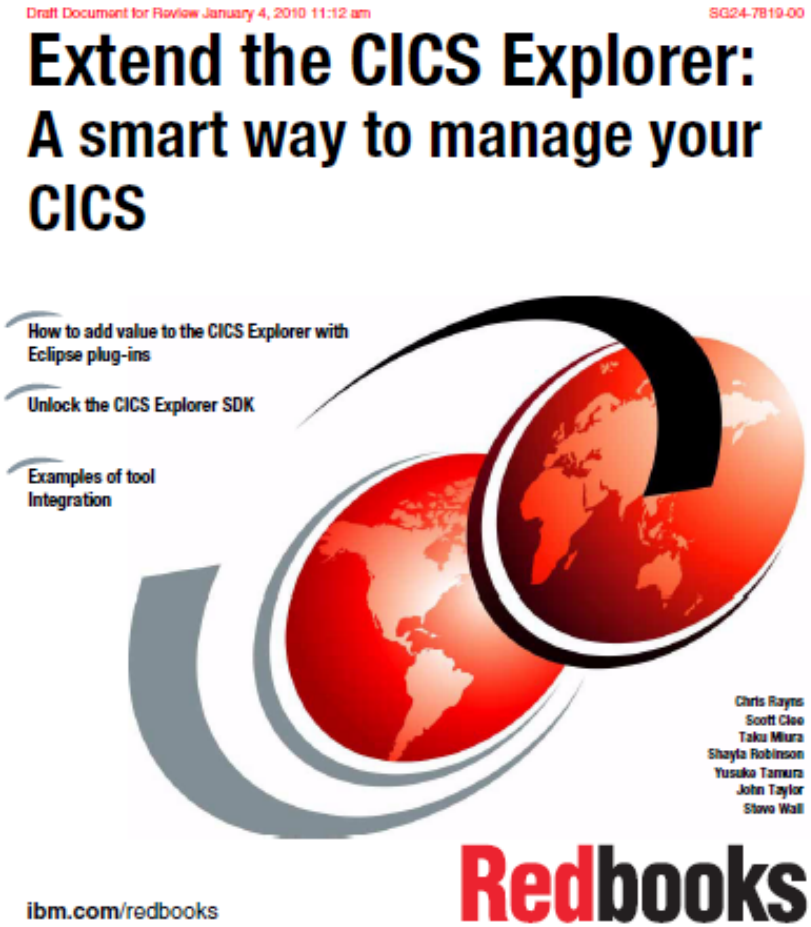
CICS Explorer RedBook SG24-7778-00

- This RedBook focuses on the new CICS Explorer
- The first part of the RedBook overviews the CICS Explorer, along with all the CICS Tools plug-ins
- The second part of the RedBook focuses on different scenarios in which the CICS Explorer can be used, along with the CICS Tools plug-ins to resolve different problems



CICS Explorer SDK Redbook SG24-7819-00

- This Redbook® focuses on the new CICS Explorer SDK
- The first part of the Redbook gives an overview of the CICS Explorer, along with an overview of PlugIns and Eclipse
- The second part of the Redbook focuses on the SDK and how to write a PlugIn and how to Extend the Explorer via PlugIns
- Two Demos are included
- http://www.redbooks.ibm.com/redpieces/abstracts/sg247819.html



Reference

- CICS Tools Web site: http://www.ibm.com/cics/tools
- Redbooks:
  - Threadsafe Considerations for CICS, SG24-6351-02

    http://www.redbooks.ibm.com/abstracts/sg246351.html?Open
  - CICS Interdependency Analyzer

    http://www.redbooks.ibm.com/abstracts/sg246458.html?Open
- Support Pac:
  - IBM CICS Explorer for Windows SupportPac –New Face of CICS

    http://tinyurl.com/6o6n9v
- Running OMEGAMON XE for CICS as threadsafe

  http://www-01.ibm.com/software/tivoli/features/ccr2/ccr2-2004-06/features-cics.html
- Try CICS tools for free for 60 days

  www.ibm.com/software/os/zseries/trials/cicstools
- Contact your Local IBM Representative
- Program numbers (license):
  - 5697-J23: CICS Interdependency Analyzer

Reference

Tools WEB sites

- CICS tools, including library: www.ibm.com/cics/tools
- WebSphere zSeries tools: www.ibm.com/software/websphere/zadportal
- Try CICS tools for free for 60 days
  www.ibm.com/software/os/zseries/trials/cicstools

Support Pacs

- CP12: CICS PA Historical Database Reporting
  www.ibm.com/support/docview.wss?uid=swg24011321

Business Article

- The Wall Street Journal, June 24, 2007. *The Dinosaurs That Won't Die:* *http://blogs.wsj.com/biztech/2007/07/24/the-dinosaurs-that-wont-die/*

Program numbers (licence):

5697-J23: CICS Interdependency Analyzer
5697-N40: CICS Performance Analyzer
5697-I78: CICS Configuration Manager
5655-P30: CICS VSAM Recovery
5697-I76: CICS VSAM Transparency
5697-I94: CICS Batch Application Control
5655-K01: IBM Session Manager
5655-I05: CICS OTTO

CICS Communities and Information

zSeries PD/CICS/Icing Sales - CICS Communities

- CICS Transaction Server V4.1
  - http://ibm.com/cics/tserver/v41/
- CICS Explorer home page
  - Remember this link ibm.com/cics/explorer
- CICS Explorer Forum
  - http://tinyurl.com/68bndw
  - IBM developerWorks forum with FAQs, Links and resources, ISV Contributions, etc. Ask questions, suggest improvements, report problems, chat
- New! CICS Hub on the Rational COBOL Café
  - http://ibm.com/software/rational/cafe/community/cobol/cics
- Twitter
  - Subscribe to the IBM_System_z channel to get CICS Explorer news flashes
- CICS Blog
  - Comment and opinion at TheMasterTerminal.com
- CICS eNews
  - Subscribe for news about CICS and related products
- YouTube channels
  - CICS Explorer - Videos, demos and other cool stuff
  - CICSFluff - Other CICS videos

Sources of Information

- Web
  - CICS IA
    - home page ibm.com/cics/ianaly
    - Library page http://www-01.ibm.com/software/sw-library/en_US/products/W202225T13749V07
  - CICS Tools
    - Home page ibm.com/cics/tools/
    - Trial download ibm.com/software/os/zseries/trials/cicstools/
  - CICS Explorer
    - Home page ibm.com/cics/explorer
    - Download page http://ibm.com/cics/explorer/download
  - CICS TS home page ibm.com/cics
- Demos and animations
  - CICS Explorer demo - featuring Threadsafe Analysis using the CICS PA and CICS IA perspectives - http://www.youtube.com/watch?v=Jk3YdvI8lno
  - CICS Explorer animation - http://www.youtube.com/watch?v=-NzWwUi5lLw
  - CICS Transaction Server in your SOA - Great source of links to more CICS ecosystem information - ftp://ftp.software.ibm.com/software/htp/cics/presentations/CICS_TS_in_your_SOA_-_Links_-_Issue_3.ppt

Thank You !

Any questions?