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CICS TS for VSE/ESA Performance Tuning Tips

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CICS TS Performance Tuning Tips

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Topics

- Definition of performance and tuning
- CICS performance constraints
- Options to reduce constraints
- Monitoring CICS performance
- Summary

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Definitions

Performance

The overall quality of service and operations of a given system as determined by ease-of-use, availability, response time, and throughput

Performance Evaluation

The analysis of such factors as throughput rate, turnaround time, and constrained resources to determine how well a system is meeting specific processing requirements

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Definitions…

Constraint

A place in the system where contention for a resource is affecting performance, sometimes referred to as "transaction throughput degradation" or bottleneck.

Tuning

The process of adjusting system control variables to make the system divide its resources most efficiently for the workload

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CICS Performance Constraints

- Hardware
  - CPU cycles
  - Real storage
  - I/O
    - DASD
    - Network
- Software
  - Software specifications
  - Virtual storage

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Hardware - CPU Cycles

- VSE/ESA 2.4+ supports Turbo Dispatcher only
  - Uses more CPU time than standard dispatcher
- CICS TS uses more CPU than CICS/VSE
- Review current CPU usage
  - IUI system status
  - CPUMON tool (download from z/VSE website)
  - Vendor monitoring products

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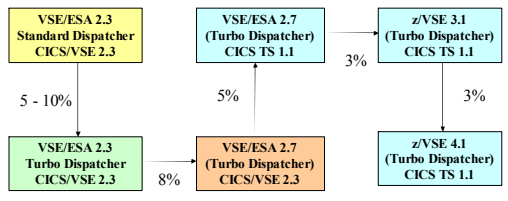
Hardware - CPU Cycles…

- CPU Time Requirements
  Source: VSE Performance Considerations documents



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Hardware - CPU Cycles…

- Solutions to processor constraint problems
  - Limit number of concurrent tasks in CICS
    - Lower MXT value
    - Use transaction classes

```
CEDA DEFINE TRANCLASS(CLASS01) MAXACTIVE(5)
CEDA DEFINE TRANSACTION … TRANCLASS(CLASS01)
```

  - Replaces DFHSIT CMXT and PCT TCLASS parameters in CICS/VSE 2.3

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Hardware - CPU Cycles…

- Solutions to processor constraint problems
  - Reduce trace overhead
    - Turn off system tracing
    - Use CICS TS special tracing by transaction or terminal
  - Increase CICS TS partition priority
  - Implement Shared Data Tables

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Hardware - CPU Cycles…

Activating CICS TS Special Tracing

```
CETR                  CICS Trace Control Facility              CIC1 DBDCCICS

Type in your choices.

Item                                Choice       Possible choices

Internal Trace Status       ===>  STARTED      STArted, STOpped
Internal Trace Table Size   ===>  256     K    16K - 1048576K

Auxiliary Trace Status      ===>  STOPPED      STArted, STOpped, Paused
Auxiliary Trace Dataset     ===>  A            A, B
Auxiliary Switch Status     ===>  NO           NO, NExt, All


Master System Trace Flag    ===>  ON           ON, OFf     <-- Set to OFF
Master User Trace Flag      ===>  ON           ON, OFf         Set to OFF

When finished, press ENTER.


PF1=Help      3=Quit      4=Components      5=Ter/Trn      9=Error List
```

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Hardware - CPU Cycles…

Activating CICS TS Special Tracing

```
CETR                  Transaction and Terminal Trace          CIC1 DBDCCICS

Type in your choices.

Item                              Choice      Possible choices

Transaction ID              ===>  ABCD        Any valid 4 character ID
Transaction Status          ===>  SPECIAL     STandard, SPecial, SUppressed

Terminal ID                 ===>  NB05        Any valid Terminal ID
Netname                     ===>  TELNB05     Any valid Netname
Terminal Status             ===>  SPECIAL     STandard, SPecial

Terminal ZCP Trace          ===>  OFF         ON, OFf



When finished, press ENTER.


PF1=Help      3=Quit                          9=Error List
```

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Hardware – Real Memory

- May require more real memory
- Virtual storage requirements are larger
  - CICS TS 31-bit partition GETVIS
    - Minimum 12.5MB plus VSAM buffer requirements
    - 50MB in VSE/ESA environment B ALLOC proc
  - More data space usage
    - Basic Security Manager
    - CICS Data Management Facility (DMF)
    - CICS Shared Data Tables
    - Environment B SYSDEF DSIZE=20MB

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Hardware – Real Memory…

- Exploiting more 31-bit virtual will increase real storage requirements
- Ideal paging rate for CICS system is zero
  - Review paging rates before migrating
    - SIR command
    - IUI system status dialog
    - Vendor monitoring product

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Hardware – Real Memory…

SIR Command Output

```
sir
AR 0015 CPUID     = 17010E4A70600000
AR 0015 PROCESSOR = IBM 7060-H50 83 (10E4A83)  LPAR = RTCPROD   No. = 0001
AR 0015 VM-SYSTEM =                 (0000)   USERID =          VMCF = OFF
AR 0015      CPUs = 0000                      Cap. =  00%
AR 0015 PROC-MODE = ESA             IPL(F50)    02:25:05 EDT  08/21/2007
AR 0015 SYSTEM    = z/VSE           3.1.2                     06/09/2006
AR 0015             VSE/AF          7.1.0       DY46685       04/20/2007
AR 0015             VSE/POWER       7.1.0       DY46609       12/08/2006
AR 0015 IPL-PROC  = $IPLP           JCL-PROC  = $$JCLP
AR 0015 SUPVR     = $$A$SUPX        TURBO-DISPATCHER (46) ACTIVE
AR 0015                             HARDWARE COMPRESSION ENABLED
.
.
AR 0015 PGIN  TOT.= 0000000001      EXP.AVRGE.= 0000000000/SEC
AR 0015 PGOUT TOT.= 0000000001
AR 0015       UNC.= 0000000001      EXP.AVRGE.= 0000000000/SEC
AR 0015       PRE = 0000000000      EXP.AVRGE.= 0000000000/SEC
.
```

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Hardware – Real Memory…

IUI System Activity Display

```
 IESADMDA              DISPLAY SYSTEM ACTIVITY              15 Seconds  19:57:05
*---- SYSTEM (CPUs:  1 /  0 ) ----* *----------- CICS : DBDCCICS ------------*
|CPU      :    0%   I/O/Sec:    1  | |No. Tasks:     136   Per Second :     *  |
|Pages In :    0   Per Sec:    *  | |Dispatchable:    0   Suspended  :     3  |
|Pages Out:    0   Per Sec:    *  | |Peak Active :    6   MXT reached:     0  |
*-------------------------------* *-----------------------------------------*
Priority: Z,Y,W,X,S,R,P,C,BG=FA=F9=F8=F7=F6=F5=F4,T,F2,M,F3,FB,F1

 ID S JOB NAME  PHASE NAME  ELAPSED     CPU TIME   OVERHEAD   %CPU       I/O
 F1 1 POWSTART    IPWPOWER  221:05:14       8.25       4.47              4,607
 FB B SECSERV     BSTPSTS   221:05:14        .25        .13                337
 F3 3 VTAMSTRT    ISTINCVT  221:05:10      44.30      23.76              4,097
 F2 2 CICSICCF    DFHSIP    221:05:03     337.74     180.87             21,949
 F4 4 <=WAITING FOR WORK=>                 .00        .00                  2
 F5 5 <=WAITING FOR WORK=>                 .00        .00                  2
 F6 6 <=WAITING FOR WORK=>                 .00        .00                  2
 F7 7 <=WAITING FOR WORK=>                 .00        .00                  2
 F8 8 <=WAITING FOR WORK=>                 .00        .00                  2
 F9 9 <=WAITING FOR WORK=>                 .00        .00                  2
 FA A <=WAITING FOR WORK=>                 .00        .00                  2
 BG 0 <=WAITING FOR WORK=>                 .00        .00                  2

PF1=HELP      2=PART.BAL.   3=END       4=RETURN     5=DYN.PART   6=CPU
```

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Hardware – Real Memory…

- Solutions to paging problems
  - Buy more real memory
    - z/VSE 4.1 supports up to 8GB real storage
    - z/VSE 3.1 and VSE/ESA supports up to 2GB real storage
    - Eliminate page I/O and page datasets with NOPDS
      - VSIZE equals available real memory
  - Reduce CICS virtual storage usage

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Hardware – Real Memory…

- Load CICS TS phases in SVA
  - DFHSIT SVA=YES (default is NO)
  - Not an option if running CICS/VSE 2.3 partition
- Reduce VSAM buffer requirements
  - Use LSR pools or fewer buffers
- Limit number of concurrent tasks in CICS
  - Lower MXT value

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Hardware – DASD I/O

- Reduce number of I/O requests
  - CICS VSAM files
    - User VSAM files
    - CICS system files
      - Temporary Storage
      - Transient data
      - CSD file
  - Tune VSAM IDCAMS definitions
    - Large data controlinterval sizes (8K or greater)
    - Avoid Shareoption 4
    - Use FREESPACE for KSDS files to avoid CI/CA splits

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Hardware – DASD I/O

- Reduce number of I/O requests …
  - More data in memory
  - Use LSR pools
    - Index buffers are now separate from data buffers
  - Increase VSAM index and data buffers
    - More index buffers for random processing
    - More data buffers for sequential processing
    - VSAM buffers in 31-bit storage
  - Use Shared Data Tables

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Hardware – DASD I/O…

- Reduce number of I/O requests
  - Minimize program compression and loading
    - Make application programs 31-bit enabled
    - Use virtual disk for program load library
    - Most active libraries first in LIBDEF
- Reduce I/O service times
  - Multiple control units
  - Multiple channel paths
  - DASD caching
  - Faster DASD

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Software - specifications

- Waits caused by task parameters
  - MXT
    - Limits total number of user tasks in CICS partition
    - CICS TS pre-allocates storage based on MXT
    - Don't use 999
  - Transaction class
    - Limits total number of user tasks by class name
    - IBM supplied definitions DFHTCL01 – DFHTCL10 for transaction classes 1-10
    - MAXACTIVE default is 1

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Software - specifications…

- Waits caused by task parameters
  - Transaction processing priority
    - Three-digit value less than or equal 255
    - Transaction priority + terminal priority + operator priority
  - Priority aging
    - Mechanism to keep low priority tasks from being stranded
    - SIT PRTYAGE=32768|nnnnn (milliseconds)
    - Transaction priority increase by 1 every nnnnn ms.

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Software - specifications...

- Waits caused by CICS VSAM definitions
  - Avoid wait on VSAM strings and buffers
    - User VSAM files in FCT
      - STRNO, BUFNI and BUFND parameters
    - LSR buffer pools
      - STRNO, index and data buffer specifications
    - Transient data and temporary storage datasets
      - SIT TS=(buffers, strings)
      - SIT TD=(buffers, strings)
    - CSD file
      - SIT CSDSTRNO, CSDLSRNO

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Software - specifications...

- Waits caused by CICS VSAM definitions
  - Avoid NOSPACE condition
    - Transient data and temporary storage datasets
    - Define secondary allocation or monitor space usage

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Software – virtual storage

- CICS TS Partition
  - Most of CICS nucleus above 16 MB line
  - All major CICS control blocks above 16 MB line
  - 8 Dynamic Storage Areas (DSA)
    - 4 DSAs above 16 MB line in extended (31-bit) DSA (EDSA)
    - 4 DSAs below 16 MB line in 24-bit DSA

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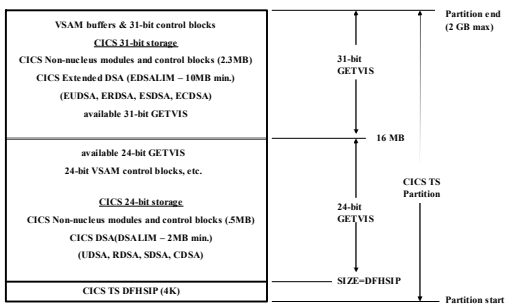
Software – virtual storage…



CICS Transaction Server Partition

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Software – virtual storage…

- Monitoring CICS TS partition GETVIS
  - CICS partition GETVIS statistics misleading
    - CICS TS requests all of partition GETVIS at startup to determine amount available
    - VSE GETVIS command shows maximum used
  - Reset GETVIS statistics after CICS startup
    - GETVIS xx,RESET
    - Sample CICS PLT GETVIS command program
      - SKCICMD in ICCF library 59
      - Resets GETVIS stats during CICS startup
      - Displays GETVIS stats during CICS shutdown

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Software – virtual storage…

- Parameters that control CICS TS Dynamic Storage Areas
  - SIT EDSALIM
    - Maximum amount of GETVIS for CICS 31-bit DSAs
    - Minimum size 10MB, default 20MB
  - SIT DSALIM
    - Maximum amount of GETVIS for CICS 24-bit DSAs
    - Minimum size 2MB, default 5MB
  - Monitor with CEMT INQ DSA or statistics

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Software – virtual storage...

- Parameters to exploit 31-bit storage
  - Transaction definition
  - Program definition
  - EXEC CICS GETMAIN requests
  - Program's addressing mode (AMODE) and residency mode (RMODE)
  - SIT options

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Software – virtual storage...

- Transaction definition parameters
  - Controls DSA used for task lifetime storage
    - TASKDATALOC(value)
      - BELOW 24-bit DSA
      - ANY either 31-bit or 24-bit DSA
        - Program must be linked AMODE(31)

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Software – virtual storage...

- Program definition parameters
  - Controls DSA used for EXEC commands with SET option
    - DATALOCATION(value)
      - BELOW 24-bit DSA
      - ANY either 31-bit or 24-bit DSA
        - Application program must be linked AMODE(31)

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Software – virtual storage...

- Program definition parameters
  - EXEC CICS GETMAIN with FLENGTH option
    - Acquired in 24-bit DSA if program linked AMODE(24)
    - Acquired in 31-bit DSA if program linked AMODE(31)
  - Program linked RMODE(ANY)
    - Program loaded in 31-bit or 24-bit DSA

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Software – virtual storage...

- SIT options to exploit 31-bit storage
  - TCT User Area (TCTUA)
    - SIT TCTUALOC=BELOW|ANY
      - BELOW 24-bit DSA
      - ANY 31-bit or 24-bit DSA
        - Application programs addressing TCTUA must be linked AMODE(31)

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Shared Data Tables

- Data in memory option
- High performance file access
  - Read operations
    - Full key, imprecise key, and browse
  - FCT or RDO option DATATABLE=CMT|UMT
- Extends previous support in CICS/VSE
- Data Table now in VSE Data Space
  - Owned by FOR

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Shared Data Tables...

- Can be shared between CICS TS partitions in same VSE system
  - Cross memory services for read data access
  - Requires MRO between CICS partitions
    - Control functions
    - File updates

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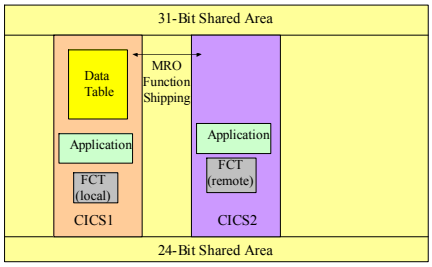
Shared Data Tables...

CICS/VSE Support



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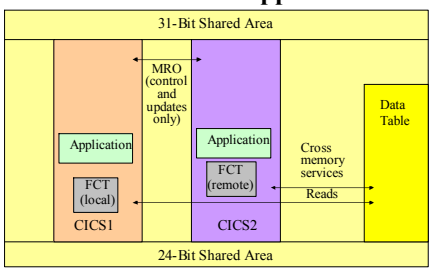
Shared Data Tables...

CICS TS Support



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Monitoring CICS Performance

MXT statistics

```
Applid DBDCCICS  Sysid CIC1  Jobname CICSICCF    Date 04/27/04    Time 16:33:51
_____________________________________________________________________________
Transaction Manager
_____________________________________________________________________________
  Total Accumulated transactions so far. . :           1,754
  Accumulated transactions (since reset) . :           1,045
  Maximum transactions allowed (MXT) . . . :              50
  Times at MXT . . . . . . . . . . . . . . :               0
  Current Active User transactions . . . . :               6
  Peak Active User transactions. . . . . . :               8
  Total Active User transactions . . . . . :           1,045
  Current Running transactions . . . . . . :               1
  Current Dispatchable transactions. . . . :               0
  Current Suspended transactions . . . . . :               5
  Current System transactions. . . . . . . :               0
  Transactions Delayed by MXT. . . . . . . :               0
  Total MXT queueing time. . . . . . . . . : 00:00:00.00000
  Average MXT queueing time. . . . . . . . : 00:00:00.00000
  Current Queued User transactions . . . . :               0
  Total Queueing time for current queued . : 00:00:00.00000
  Average Queueing time for current queued : 00:00:00.00000
Dispatcher
_____________________________________________________________________________
  Dispatcher start time. . . :  15:50:05.18869
  Peak tasks . . . . . . . . :      16
  Current tasks. . . . . . . :      14
  Current ICV time . . . . . :   1,000ms
  Current ICVR time. . . . . :  20,000ms
  Current ICVPSD time. . . . :     200ms
  Current PRTYAGING time . . :   5,000ms
  Number of active CICS TCBs :       2
```

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Monitoring CICS Performance...

DSA storage statistics

```
Partition size established from ALLOC parameter . . :      51,199K
Storage BELOW 16MB
_____________________________________________________________________________
  Partition GETVIS area size under 16 Mb. . . . . . :      12,284K
    Partition GETVIS used area below 16 Mb. . . . . :       8,676K
    Partition GETVIS free area below 16 Mb. . . . . :       3,608K
    Partition GETVIS maximum used below 16 Mb . . . :      12,284K
    Partition GETVIS largest free area  below 16 Mb . :     3,596K
_____________________________________________________________________________
  Current DSA Limit . . . . . . . . :      5,120K
  Current Allocation for DSAs . . . :      2,304K
  Peak Allocation for DSAs. . . . . :      2,304K
                                        CDSA          UDSA          SDSA          RDSA
_____________________________________________________________________________
  Current DSA Size. . . . . . . . . :        512K          256K        1,024K          512K
  Current DSA Used. . . . . . . . . :        396K           40K          76BK          344K
  Current DSA Used as % of DSA. . . :         77%           15%           75%           67%
* Peak DSA Used . . . . . . . . . . :        396K          92K          776K          344K
  Peak DSA Size . . . . . . . . . . :        512K          256K        1,024K          512K
  Cushion Size. . . . . . . . . . . :         64K           64K           64K           64K
  Free Storage (inc. Cushion) . . . :        116K          216K          256K          168K
* Peak Free Storage . . . . . . . . :        160K          252K          272K          168K
* Lowest Free Storage . . . . . . . :        116K          164K          248K          168K
  Largest Free Area . . . . . . . . :        104K          180K          240K          144K

  Getmain Requests. . . . . . . . . :       5,366        14,079           184             0
  Freemain Requests . . . . . . . . :       5,351        14,069           132             0

  Times no storage returned . . . . :           0             0             0             0
  Times request suspended . . . . . :           0             0             0             0
  Current requests suspended. . . . :           0             0             0             0
  Peak requests suspended . . . . . :           0             0             0             0
  Requests purged while waiting . . :           0             0             0             0
  Times Cushion released. . . . . . :           0             0             0             0
  Times Short-On-Storage. . . . . . :           0             0             0             0
  Total time Short-On-Storage . . . : 00:00:00.00000  00:00:00.00000  00:00:00.00000  00:00:00.00000
  Average Short-On-Storage time . . : 00:00:00.00000  00:00:00.00000  00:00:00.00000  00:00:00.00000
  Storage Violations. . . . . . . . :           0             0             0             0
  Access. . . . . . . . . . . . . . :       CICS          CICS          CICS      READONLY
  '*' indicates values reset on last DSA Size change
```

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Monitoring CICS Performance...

DSA storage statistics

```
Storage ABOVE 16MB
_____________________________________________________________________________
  Partition GETVIS area size above 16 Mb. . . . . . :      38,912K
    Partition GETVIS used area above 16 Mb  . . . . :      28,284K
    Partition GETVIS free area above 16Mb . . . . . :      10,628K
    Partition GETVIS maximum used above 16 Mb . . . :      28,564K
    Partition GETVIS largest free area above 16 Mb  . :    14,188K
_____________________________________________________________________________
  Current EDSA Limit. . . . . . . . :      25,600K
  CICS Trace table size . . . . . . . . . . . . . . :          80K
  Current Allocation for EDSAs. . . :      10,240K
  Peak Allocation for EDSAs . . . . :      10,240K
                                       ECDSA         EUDSA         ESDSA         ERDSA
_____________________________________________________________________________
  Current DSA Size. . . . . . . . . :       3,072K        1,024K        1,024K        5,120K
  Current DSA Used. . . . . . . . . :       2,344K           64K          232K        5,060K
  Current DSA Used as % of DSA. . . :          76%            6%           22%           98%
* Peak DSA Used . . . . . . . . . . :       2,384K           64K          232K        5,060K
  Peak DSA Size . . . . . . . . . . :       3,072K        1,024K        1,024K        5,120K
  Cushion Size. . . . . . . . . . . :         128K            0K          128K          256K
  Free Storage (inc. Cushion) . . . :         728K          960K          792K          60K
* Peak Free Storage . . . . . . . . :         808K        1,024K          912K          192K
* Lowest Free Storage . . . . . . . :         688K          960K          792K          60K
  Largest Free Area . . . . . . . . :         716K          960K          792K          56K

  Getmain Requests. . . . . . . . . :        39,105           615             6             4
  Freemain Requests . . . . . . . . :        34,557           611             0             0

  Times no storage returned . . . . :             0             0             0             0
  Times request suspended . . . . . :             0             0             0             0
  Current requests suspended. . . . :             0             0             0             0
  Peak requests suspended . . . . . :             0             0             0             0
  Requests purged while waiting . . :             0             0             0             0
  Times Cushion released. . . . . . :             0             0             0             0
  Times Short-On-Storage. . . . . . :             0             0             0             0
  Total time Short-On-Storage . . . : 00:00:00.00000  00:00:00.00000  00:00:00.00000  00:00:00.00000
  Average Short-On-Storage time . . : 00:00:00.00000  00:00:00.00000  00:00:00.00000  00:00:00.00000
  Storage Violations. . . . . . . . :             0             0             0             0
  Access. . . . . . . . . . . . . . :         CICS          CICS          CICS      READONLY
  '*' indicates values reset on last DSA Size change
```

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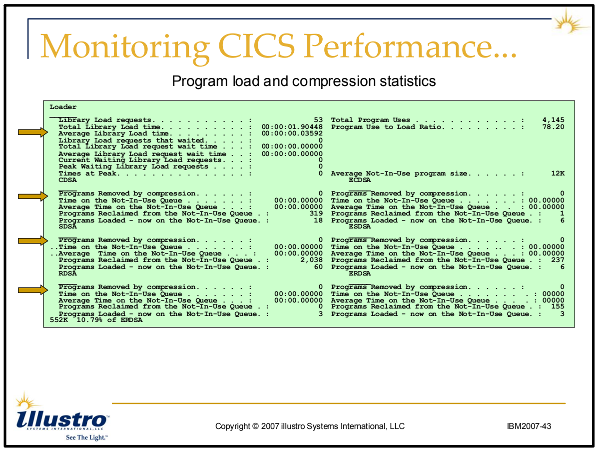

Monitoring CICS Performance...

Program load and compression statistics

```
Loader

  Library Load requests. . . . . . . . . . . . :              53  Total Program Uses . . . . . . . . . . . . :    4,145
  Total Library Load time. . . . . . . . . . . :  00:00:01.90448  Program Use to Load Ratio. . . . . . . . . :    78.20
  Average Library Load time. . . . . . . . . . :  00:00:00.03592
  Library Load requests that waited. . . . . . :               0
  Total Library Load request wait time . . . . :  00:00:00.00000
  Average Library Load request wait time . . . :  00:00:00.00000
  Current Waiting Library Load requests. . . . :               0
  Peak Waiting Library Load requests . . . . . :               0
  Times at Peak. . . . . . . . . . . . . . . . :               0  Average Not-In-Use program size. . . . . . :      12K
  CDSA                                                                 ECDSA

  Programs Removed by compression. . . . . . . :               0  Programs Removed by compression. . . . . . :        0
  Time on the Not-In-Use Queue . . . . . . . . :     00:00.00000  Time on the Not-In-Use Queue . . . . . . . : 00.00000
  Average Time on the Not-In-Use Queue . . . . :     00:00.00000  Average Time on the Not-In-Use Queue .   .  : 00.00000
  Programs Reclaimed from the Not-In-Use Queue . :           319  Programs Reclaimed from the Not-In-Use Queue . :     1
  Programs Loaded - now on the Not-In-Use Queue. :            18  Programs Loaded - now on the Not-In-Use Queue. :     6
  SDSA                                                                 ESDSA

  Programs Removed by compression. . . . . . . :               0  Programs Removed by compression. . . . . . :        0
..Time on the Not-In-Use Queue . . . . . . . . :     00:00.00000  Time on the Not-In-Use Queue . . . . ..  . : 00.00000
..Average  Time on the Not-In-Use Queue . . . :      00:00.00000  Average Time on the Not-In-Use Queue . . . : 00.00000
  Programs Reclaimed from the Not-In-Use Queue . :         2,038  Programs Reclaimed from the Not-In-Use Queue . :   237
  Programs Loaded - now on the Not-In-Use Queue. :            60  Programs Loaded - now on the Not-In-Use Queue. :     6
  RDSA                                                                 ERDSA

  Programs Removed by compression. . . . . . . :               0  Programs Removed by compression. . . . . . :        0
  Time on the Not-In-Use Queue . . . . . . . . :     00:00.00000  Time on the Not-In-Use Queue . . . . . . . . : 00000
  Average Time on the Not-In-Use Queue . . . . :     00:00.00000  Average Time on the Not-In-Use Queue . . . . : 00000
  Programs Reclaimed from the Not-In-Use Queue . :             0  Programs Reclaimed from the Not-In-Use Queue . :   155
  Programs Loaded - now on the Not-In-Use Queue. :             3  Programs Loaded - now on the Not-In-Use Queue. :     3
552K  10.79% of ERDSA
```


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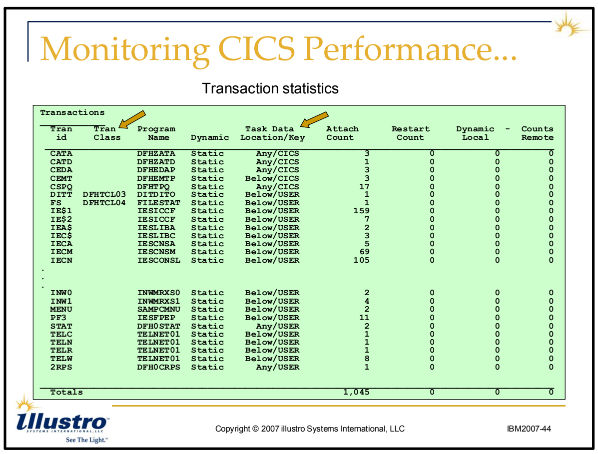

Monitoring CICS Performance...

Transaction statistics

Transactions

Tran id	Tran Class	Program Name	Dynamic	Task Data Location/Key	Attach Count	Restart Count	Dynamic - Local	Counts Remote
CATA		DFHZATA	Static	Any/CICS	3	0	0	0
CATD		DFHZATD	Static	Any/CICS	1	0	0	0
CEDA		DFHEDAP	Static	Any/CICS	3	0	0	0
CEMT		DFHEMTP	Static	Below/CICS	3	0	0	0
CSPQ		DFHTPQ	Static	Any/CICS	17	0	0	0
DITT	DFHTCL03	DITDITO	Static	Below/USER	1	0	0	0
FS	DFHTCL04	FILESTAT	Static	Below/USER	1	0	0	0
IE$1		IESICCF	Static	Below/USER	159	0	0	0
IE$2		IESICCF	Static	Below/USER	7	0	0	0
IEA$		IESLIBA	Static	Below/USER	2	0	0	0
IEC$		IESLIBC	Static	Below/USER	3	0	0	0
IECA		IESCNSA	Static	Below/USER	5	0	0	0
IECM		IESCNSM	Static	Below/USER	69	0	0	0
IECN		IESCONSL	Static	Below/USER	105	0	0	0
.								
.								
.								
INW0		INWMRXS0	Static	Below/USER	2	0	0	0
INW1		INWMRXS1	Static	Below/USER	4	0	0	0
MENU		SAMPCMNU	Static	Below/USER	2	0	0	0
PF3		IESFPEP	Static	Below/USER	11	0	0	0
STAT		DFH0STAT	Static	Any/USER	2	0	0	0
TELC		TELNET01	Static	Below/USER	1	0	0	0
TELN		TELNET01	Static	Below/USER	1	0	0	0
TELR		TELNET01	Static	Below/USER	1	0	0	0
TELW		TELNET01	Static	Below/USER	8	0	0	0
2RPS		DFH0CRPS	Static	Any/USER	1	0	0	0
Totals					1,045	0	0	0

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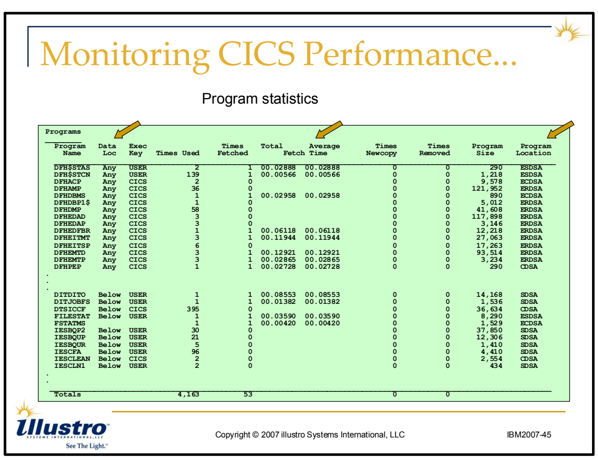

Monitoring CICS Performance...

Program statistics

Programs

Program Name	Data Loc	Exec Key	Times Used	Times Fetched	Total Fetch Time	Average Time	Times Newcopy	Times Removed	Program Size	Program Location
DFH$STAS	Any	USER	2	1	00.02888	00.02888	0	0	290	ESDSA
DFH$STCN	Any	USER	139	1	00.00566	00.00566	0	0	1,218	ESDSA
DFHACP	Any	CICS	2	0			0	0	9,578	ECDSA
DFHAMP	Any	CICS	36	0			0	0	121,952	ERDSA
DFHDBMS	Any	CICS	1	1	00.02958	00.02958	0	0	890	ECDSA
DFHDBP1$	Any	CICS	1	0			0	0	5,012	ERDSA
DFHDMP	Any	CICS	58	0			0	0	41,608	ERDSA
DFHEDAD	Any	CICS	3	0			0	0	117,898	ERDSA
DFHEDAP	Any	CICS	3	0			0	0	3,146	ERDSA
DFHEDFBR	Any	CICS	1	1	00.06118	00.06118	0	0	12,218	ERDSA
DFHEITMT	Any	CICS	3	1	00.11944	00.11944	0	0	27,063	ERDSA
DFHEITSP	Any	CICS	6	0			0	0	17,263	ERDSA
DFHEMTD	Any	CICS	3	1	00.12921	00.12921	0	0	93,514	ERDSA
DFHEMTP	Any	CICS	3	1	00.02865	00.02865	0	0	3,234	ERDSA
DFHPEP	Any	CICS	1	1	00.02728	00.02728	0	0	290	CDSA
.										
.										
.										
DITDITO	Below	USER	1	1	00.08553	00.08553	0	0	14,168	SDSA
DITJOBFS	Below	USER	1	1	00.01382	00.01382	0	0	1,536	SDSA
DTSICCF	Below	CICS	395	0			0	0	36,634	CDSA
FILESTAT	Below	USER	1	1	00.03590	00.03590	0	0	8,290	ESDSA
FSTATMS			1	1	00.00420	00.00420	0	0	1,529	ECDSA
IESBQP2	Below	USER	30	0			0	0	37,850	SDSA
IESBQUP	Below	USER	21	0			0	0	12,306	SDSA
IESBQUR	Below	USER	5	0			0	0	1,410	SDSA
IESCFA	Below	USER	96	0			0	0	4,410	SDSA
IESCLEAN	Below	CICS	2	0			0	0	2,554	CDSA
IESCLN1	Below	USER	2	0			0	0	434	SDSA
.										
.										
Totals			4,163	53			0	0		

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Monitoring CICS Performance...

Temporary Storage statistics

```
Temporary Storage
_________________
  Put/Putq main storage requests . . . . . :       1,332
  Get/Getq main storage requests . . . . . :         176
  Peak storage used for TS Main. . . . . . :          5K
  Current storage used for TS Main . . . . :          0K
  Put/Putq auxiliary storage requests. . . :       1,357
  Get/Getq auxiliary storage requests. . . :       2,050
  Times temporary storage queue created. . :       1,669
  Peak temporary storage queues in use . . :         206
  Current temporary storage queues in use. :          11
  Items in longest queue . . . . . . . . . :         484
  Queue extension threshold. . . . . . . . :          20
  Queue extensions created . . . . . . . . :          24
  Control interval size. . . . . . . . . . :       4,096
  Control intervals in the DFHTEMP dataset :         330
  Peak control intervals used. . . . . . . :          41
  Current control intervals in use . . . . :          32
  Available bytes per control interval . . :       4,032
  Segments per control interval. . . . . . :          63
  Bytes per segment. . . . . . . . . . . . :          64
  Writes bigger than control interval size :           0
  Largest record length written. . . . . . :       3,968
  Times auxiliary storage exhausted. . . . :           0
  Number Temporary storage compressions. . :          82
  Temporary storage strings. . . . . . . . :           8
  Peak Temporary storage strings in use. . :           1
  Temporary storage string waits . . . . . :           0
  Peak users waiting on string . . . . . . :           0
  Current users waiting on string. . . . . :           0
  Temporary storage buffers. . . . . . . . :           8
  Temporary storage buffer waits . . . . . :           0
  Peak users waiting on buffer . . . . . . :           0
  Current users waiting on buffer. . . . . :           0
```

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Monitoring CICS Performance...

Transient Data statistics

```
Transient Data
______________
  Transient data reads . . . . . . . . . . :           0
  Transient data writes. . . . . . . . . . :           0
  Transient data formatting writes . . . . :           0
  Control interval size. . . . . . . . . . :       4,096
  Control intervals in the DFHNTRA dataset :         108
  Peak control intervals used. . . . . . . :           2
  Times NOSPACE on DFHNTRA occurred. . . . :           0
  Transient data strings . . . . . . . . . :           3
  Times Transient data string in use . . . :           0
  Peak Transient data strings in use . . . :           0
  Times string wait occurred . . . . . . . :           0
  Peak users waiting on string . . . . . . :           0
  Transient data buffers . . . . . . . . . :           3
  Times Transient data buffer in use . . . :          94
  Peak Transient data buffers in use . . . :           1
  Peak buffers containing valid data . . . :           1
  Times buffer wait occurred . . . . . . . :           0
  Peak users waiting on buffer . . . . . . :           0
  I/O errors on the DFHNTRA dataset. . . . :           0
```

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Monitoring CICS Performance...

File and Data Tables statistics

```
Files
_____
                Access          LSR  Str Waits   Read  Get Update  Browse     Add   Update   Delete    Data   Index
  Filename Method  Type          Pool Max Total Requests  Requests  Requests  Requests Requests Requests  EXCPs  EXCPs

  DFHCSD   VSAM                    1   0     0        0         0         0         0        0        0       0       0
  IESCNTL  VSAM    KSDS            0   0     0       96         0         0         0        0        0      96      96
  IESPRB   VSAM    KSDS            0   0     0        2         2         0         0        2        0       3       0
  IESSCUT  VSAM    KSDS            1   0     0        0         0         0         0        0        0       4       4
  IESTRFL  VSAM    KSDS            1   0     0       23         0         0         0        0        0      10       3
  INWFILE  VSAM    KSDS            1   0     0       42        10         2        52        2        0     350     159

  Totals                                             163        12         2        52        4        0     463     262

Data Tables - Requests
______________________
                  Data          Max   Successful  Records   Adds via    Adds via    Adds     Rewrite    Delete    Read
  Filename      Table Type    Num recs    Reads   Not Found     Read        API     Rejected  Requests  Requests Retries

Data Tables - Storage
_____________________
                                  <---- Total ----->  <---- Entries --->  <----- Index ----->  <------ Data ------>
                 Current    Peak    Storage  Storage    Storage  Storage    Storage  Storage    Storage  Storage
  Filename Type Records   Records  Allocated  In-Use   Allocated  In-Use   Allocated  In-Use   Allocated  In-Use
```

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Monitoring CICS Performance...

LSR pool statistics

```
LSR Pools
 Pool Number :   1      Time Created :   15:52:07.37886
 ------------------------------------------------------
   Maximum key length . . . . . :          22
   Total number of strings  . . . :        10
   Peak concurrently active strings :       1
   Total requests waited for string :       0
   Peak requests waited for string. :       0
Buffer Totals
 ------------------------------------------------------
   Data Buffers . . . . . :          28   Index Buffers. . . . . :          0
     Successful look asides . . . :  521     Successful look asides . . . :  0
     Buffer reads . . . . . :        363     Buffer reads . . . . . :        0
     User initiated writes. . . . :  269     User initiated writes. . . . :  0
     Non-user initiated writes. . . :  0     Non-user initiated writes. . . :0
Data and Index Buffer Statistics
 ------------------------
                    Look                User
  Size  Buffers     Asides      Reads   Writes      Writes
 ------------------------------------------------------------
   512       8         54         13        0           0
  2048       6          0        155      195           0
  4096      14        467        195       74           0
```

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Monitoring CICS Performance…

- Options for collecting/reporting statistics
  - Data Management Facility (DMF)
    - Statistics recorded automatically or at user request
    - Print using DFHSTUP
  - User program for selected statistics
    - System Programming Interface command
    - At user request
  - Sample program DFH0STAT
    - Output to VSE/POWER LST queue or TS
    - At user request

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Monitoring CICS Performance…

- What gets recorded by DMF
  - Automatically
    - Interval Statistics
      - Only with initialization parameter STATRCD=ON
      - User specified interval - default is 3 hours
      - Calculated forward from midnight (3 AM, 6 AM, 9 AM,etc)
    - End of Day Statistics
      - User specified - default is midnight
      - Shutdown - normal or immediate
    - Unsolicited Statistics
      - For dynamically allocated and de-allocated resources
        - Files, LSRPOOLS, transactions, programs, etc.

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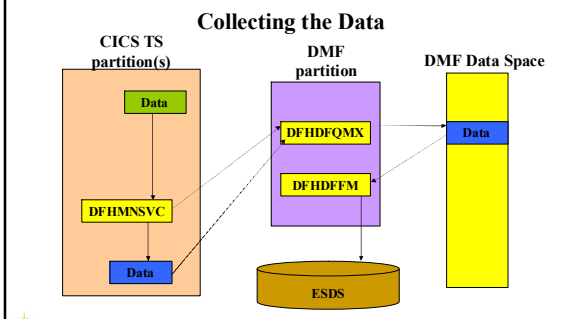
Monitoring CICS Performance…



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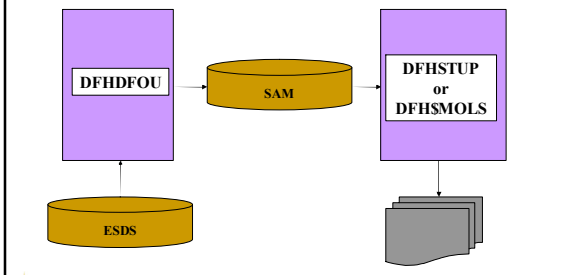
Monitoring CICS Performance…



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Monitoring CICS Performance…

- Sample program DFH0STAT.C
  - COBOL for VSE/ESA source in PRD1.BASE
  - Uses EXEC CICS COLLECT STATISTICS commands
  - Output to
    - VSE/POWER LST queue using Report Controller
    - CICS Temporary Storage queue
  - Can be executed
    - From terminal
    - From PLT during CICS shutdown
    - As a STARTed transaction

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Summary

- Performance of CICS TS system depends on may factors
- Similar tuning options as CICS/VSE 2.3 but several new options
- More support to improve CICS performance
  - 31-bit storage exploitation
  - Shared Data tables

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Other Sources of Information

- CICS TS Performance Guide
- IBM Redbooks
  - Migration to VSE/ESA 2.4 and CICS Transaction Server for VSE/ESA 1.1 (SG24-5595)
  - Implementation of VSE/ESA 2.4 and CICS Transaction Server for VSE/ESA 1.1 (SG24-5624)
- CICS Transaction Server Website
  - www-4.ibm.com/software/ts/cics
  - Manuals, flyers, brochures, etc.

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