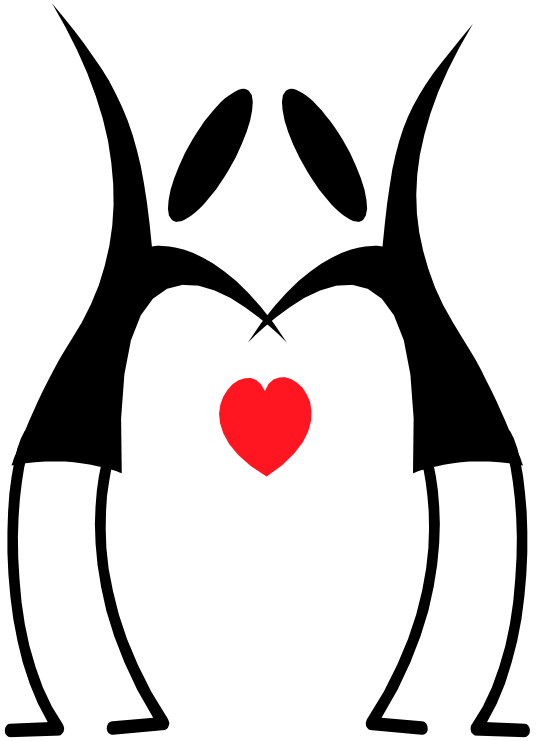
SHARE – Anaheim, March 14, 2014
Session 14924

Mining Gold From CICS Statistics



By Ivan Gelb

Think *Faster* with
Gelb Information

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Trademarks

- The following are trade or service marks of the IBM Corporation:

CICS, CICS TS , CICSPlex, DB2, IBM, MVS, OS/390, z/OS, Parallel Sysplex.

Any omissions are purely unintended.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Copyright Notice

© 2014, Ivan L. Gelb

Gelb Information Systems Corp.
10 Country Club Lane
Marlboro, NJ 07746-1447
Phone: 732-303-1333
E-mail: ivan@gelbis.com

Permission is granted to reproduce this presentation only in its entirety and including all copyright notices. All comments, contributions and questions are always welcome.

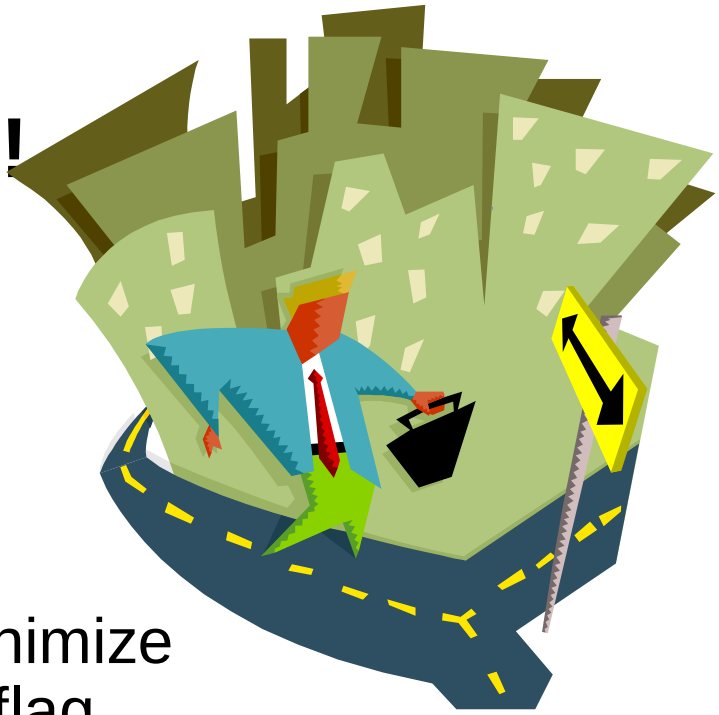
Disclaimer

All of the information in this document is tried and true. However, this fact alone cannot guarantee that you can get the same results at your place and with your skills. In fact, some of this advice can be hurtful if it is misused and misunderstood. As with all kinds of analysis, anything you may hear or read can be understood and misunderstood in many ways that may seem contradictory to you. Gelb Information Systems Corporation, Ivan Gelb and anyone found anywhere assume no responsibility for this information's accuracy, completeness or suitability for any purpose. Anyone attempting to adapt these techniques to their own environments anywhere do so completely at their own risk. ☺ ☺

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Agenda

- Performance Monitoring
- Performance Reports
  - **Your questions any time!**

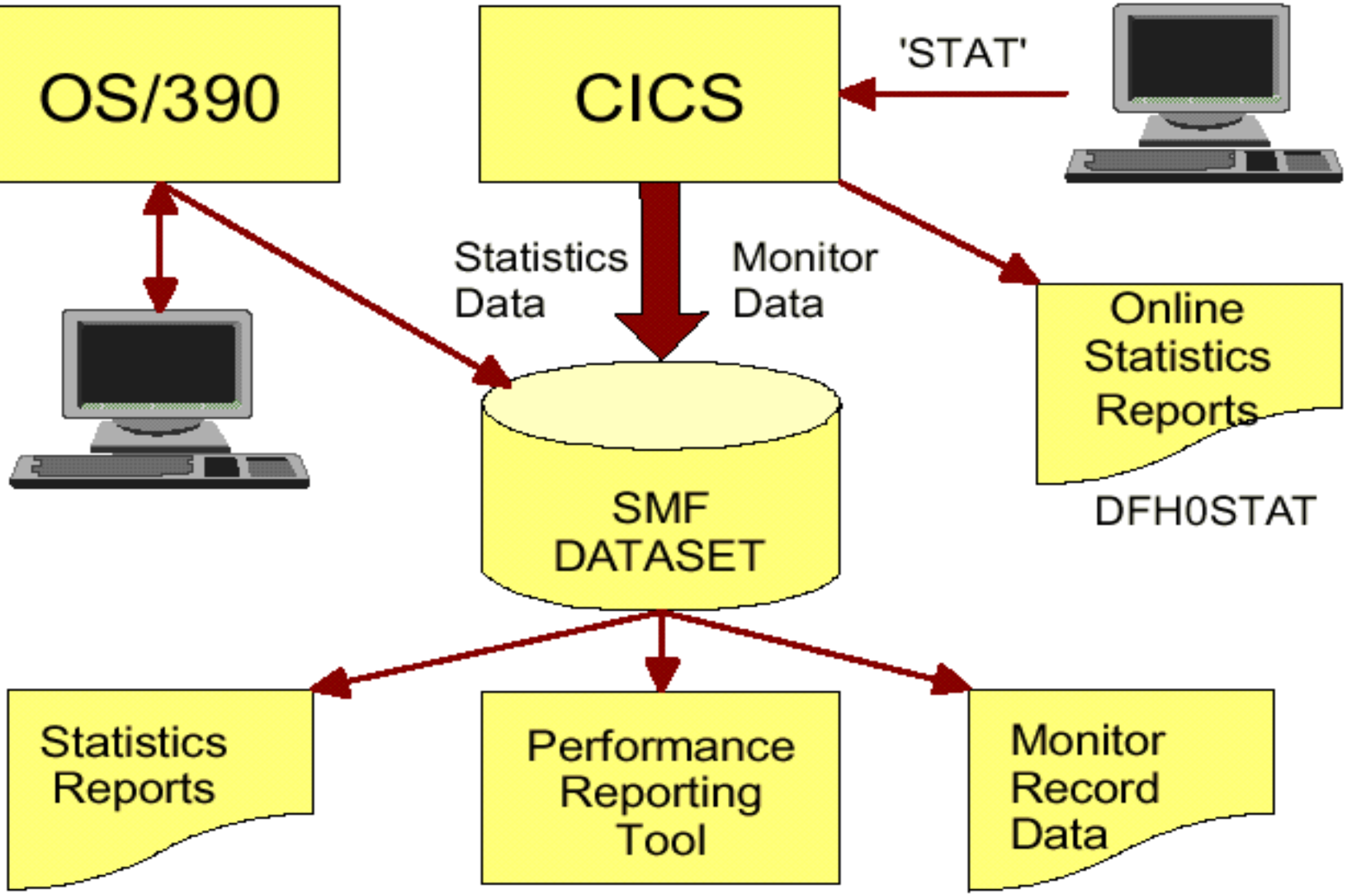


Keys to symbols meanings:

☺ example of good performance
☹ example of poor performance
☠ bottleneck example / avoid or minimize
< system “health” indicator/metric flag

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Monitoring Overview



Source: Chris Baker, IBM Hursley, UK

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Measurement Data Sources

- Resource Measurement Facility (RMF)
  - System wide resource level details: CPU disks, storage, work details and summary
- System Management Facility (SMF)
  - Address space level details for work: batch, STC, CICS, etc. + resource level details/address space
- CICS daily and interval statistics
  - Region level statistics and resource counters for: CPU, IO, storage, etc…
- CICS Monitoring Facility (CMF)
  - Transaction level excruciating details by region

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Performance Reporting

- **Recommendation:** Consider RMF for reporting CICS response time BUT—
- If goal = REGION, response times not reported to service class(es)
- At least TORs must be managed with goal = TRANSACTION to get response time reports from RMF records.

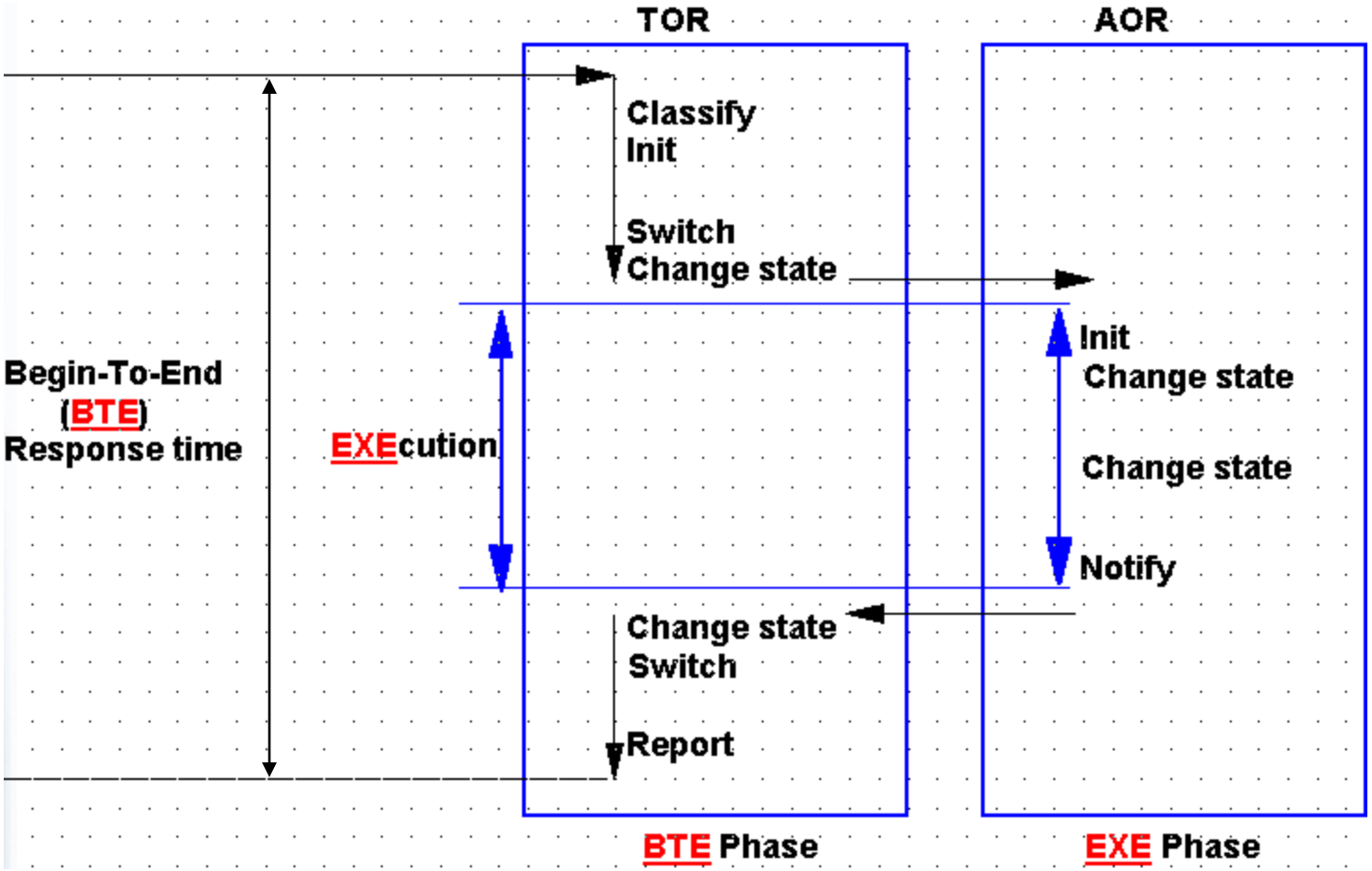
© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

RMF Reports

- **Recommended** because effective reporting for least cost in computer resources highly depends on CICS work classification
- 4 – 12% CPU/CICS region can be saved if CMF based response time reporting is replaced with RMF only reports

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

RMF's CICS Measurements



Source: Chris Baker, IBM Hursley, UK

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

RMF Workload Activity - 1

```
                                    W O R K L O A D   A C T I V I T Y

      MVS/ESA                  SYSPLEX WSC1              DATE 01/14/1997          INTERVAL 15.00.002   MODE = GOAL
      SP5.2.2                  RPT VERSION 1.2.0         TIME 09.29.00

                                        POLICY ACTIVATION DATE/TIME 01/14/1997 06.50.04

REPORT BY: POLICY=CICSHARE  WORKLOAD=CICSWKLD  SERVICE CLASS=CTRAN1   RESOURCE GROUP=*NONE  PERIOD=1 IMPORTANCE=HIGHEST

-TRANSACTIONS--  TRANSACTION TIME    HHH.MM.SS.TTT
AVG         0.00 ACTUAL                000.00.00.187
MPL         0.00 QUEUED                000.00.00.187
ENDED       4363 EXECUTION             000.00.00.000
END/SEC     4.85 STANDARD DEVIATION    000.00.01.423
#SWAPS         0
EXECUTD        0


          -------------------------------RESPONSE TIME BREAKDOWN IN PERCENTAGE--------------------   ------STATE------
SUB     P TOTAL ACTIVE READY   IDLE  -------------------------WAITING FOR---------------------------   SWITCHED TIME (%)
TYPE                              LOCK    I/O  CONV  DIST  LOCAL  SYSPL  REMOT  TIMER  PROD  MISC    LOCAL SYSPL REMOT
CICS   BTE   760    27.6  12.0    233   0.2   0.1   0.0   0.0   0.0    0.0    0.0    221  45.8   221      0.0   0.0   0.0

         ---RESPONSE TIME---  EX    PERF
         HH.MM.SS.TTT         VEL   INDX
GOALS    00.00.00.500   AVG
ACTUALS  00.00.00.187         N/A   0.4


                                        ----------RESPONSE TIME DISTRIBUTION----------
    ----TIME----    ---NUMBER TRANSACTIONS---      ----PERCENT----  0    10   20   30   40   50   60   70   80   90   100
    HH.MM.SS.TTT    BUCKETS            TOTAL      BUCKETS   TOTAL  ³....³....³....³....³....³....³....³....³....³....³
<   00.00.00.250       4109             4109         94.2    94.2  >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
<=  00.00.00.500        148             4257          3.4    97.6  >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
<=  00.00.01.000         64             4321          1.5    99.0  >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
>   00.00.01.000         42             4363          1.0     100  >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

"Funny" due to long running transactions

Sample RMF post processor (ERBRMFPP) report with option SYSRPTS(WLMGL(SCPER))

Source: Chris Baker, IBM Hursley, UK

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

RMF Workload Activity - 2

```
REPORT BY: POLICY=HPTSPOL1  WORKLOAD=PRODWKLD  SERVICE CLASS=CICSHR   RESOURCE GROUP=*NONE   PERIOD=1 IMPORTANCE=HIGH


-TRANSACTIONS--  TRANSACTION TIME    HHH.MM.SS.TTT
AVG         0.00  ACTUAL              000.00.00.114
MPL         0.00  QUEUED              000.00.00.036
ENDED        216  EXECUTION           000.00.00.078
END/SEC     0.24  STANDARD DEVIATION  000.00.00.270
#SWAPS         0
EXECUTD      216
```

Response time

```
          --------------------------------RESPONSE TIME BREAKDOWN IN PERCENTAGE--------------------   ------STATE------
SUB    P  TOTAL ACTIVE READY  IDLE  -------------------------WAITING FOR--------------------------   SWITCHED TIME (%)
TYPE                               LOCK   I/O  CONV  DIST  LOCAL  SYSPL  REMOT  TIMER  PROD  MISC   LOCAL SYSPL REMOT
CICS   BTE  93.4  10.2   0.0   0.0  0.0    0.0  83.3  0.0    0.0    0.0    0.0    0.0    0.0   0.0    83.3  0.0   0.0
CICS   EXE  67.0  13.2   7.1   0.0  0.0    0.0   0.0  0.0    0.0    0.0    0.0    0.0   46.7   0.0     0.0  0.0   0.0
```

Time in DB2 or IMS or MQ

This is a sample RMF post processor (ERBRMFPP) output with option SYSRPTS(WLMGL(SCPER))

Source: Chris Baker, IBM Hursley, UK

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

CICS Statistics -1

- Written to SMF
- Control:
  CEMT SET STATISTICS
  INTERVAL(hhmmss) **default = 1 hr.**
  (was 3 hours prior to V5.1)
  ENDOFDAY(hhmmss) **default = 000000**
- Can be requested via CEMT for any one of the over 20 specific areas of CICS
- Reports via DFHSTUP and DFH0STAT

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

CICS Statistics - 2

- **Recommendation:**
  INTERVAL(hhmmss) **= hhmmss**
  Modify default to **match** the RMF – SMF data collection interval's duration.
  Same use as DFHSIT STATINT.
- Enables effective analysis of resource utilization statistics collected by SMF-RMF in conjunction with the CICS statistics.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

CICS Statistics - 3

- **Recommendation:** Modify ENDOFDAY(hhmmss) **default = 000000** Modify default to eliminate chance of performance problems at every midnight. Same use as DFHSIT STATEOD.
- Offsetting ENDOFDAY by just a few seconds (≤ 2 * nr. Of CPUs) for limited groups of regions is the recommended solution.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

CICS Statistics – 4

- **Requested** statistics produced by: CEMT PERFORM STATISTICS RECORD ALL or for over 20 specific domains
- **Requested** RESET statistics produced by: CEMT PERFORM STATISTICS RECORD ALL RESETNOW or for specific domains
- **Unsolicited** statistics are produced for dynamically managed resources: buffer pools, terminals, files, etc…

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

CICS Statistics Data Mining

1. DB2
2. Dispatcher Domain* ★
3. Enqueue* ★
4. File Control* ★
5. LSR Buffer Pools * ★
6. Loader
7. Statistics Domain
8. Storage Manager Domain
9. Transactions
10. Temporary storage * ★
11. Transient data * ★
12. VTAM

- * ★ Marked items we will spend most of our time on.
- Possibly interesting but not included due to session time limit are statistics from another 12+ domains. You should not ignore them all the time.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Dispatcher Domain -1

1. Current MXT limit
2. ☠ Nr. Of Times MXT reached
3. Peak tasks??
4. TRANCLASS limit by class
5. ☠ TRANCLASS limit reached by class

NOTE: Limits should only be hit intentionally, and watch out for excessive (about 25% above HWM) MXT as cause of increased WLM /SRM CPU needs!

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Dispatcher Domain –2

- Processor timings by modes of TCB in CICS V4.1:
  - QR = Quasi-reentrant (system & **all applications non-threadsafe processing**)
  - CO = Concurrent (VSAM) mode TCB if SUBTSKS=1
  - FO = File Owning (VSAM)
  - RO = Resource Owning
  - D2 = Used to stop DB2 protected threads
  - SZ = Used by FEPI interface
  - RP = Used to make ONC/RPC calls
  - **EP = Runs event processing (new in v4.1)**
  - J8 = Run JVM in CICS key
  - J9 = Run JVM in user key
  - JM = Shared class cache management

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Dispatcher Domain – 3

- Processor timings by modes of TCB in CICS V4.1:
  - L8 = OPENAPI option and EXECKEY=CICS programs
  - L9 = OPENAPI option and EXECKEY=USER programs
  - SO = Used for calls to TCP/IP sockets interface
  - SL = Used to wait for activity on a set of listening sockets
  - S8 = Secure Sockets Layer (SSL) or LDAP request
  - SP = Used for socket pthread owning task
  - **T8 = Used by tasks to perform system processing in JVM server (new in v4.1)**
  - **TP = Owns and manages the LE enclave, JVM, THRD TCB pool, and T8 TCB of JVM server (new in v4.1)**
  - X8 = Used by tasks which call C or C++ program compiled with XPLINK option and defined with EXECKEY=CICS
  - X9 = Used by tasks which call C or C++ program compiled with XPLINK option and defined with EXECKEY=USER

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Dispatcher Domain -4

1. Number of MVS waits /TCB
2. Accum. time in MVS wait /TCB
3. Accum. Time dispatched /TCB
4. Accum. CPU time /TCB

Track & Note:

a) Total CPU & consumption rate of region

b) Wait-for-dispatch (incl. measurement distortions) = 3 – 4 (w/o capture ratio)

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Dispatcher Statistics – Summary

DISPATCHER STATISTICS

Dispatcher Start Date and Time. . . . . :	11/24/2002 09:22:44.7563
Address Space CPU Time. . . . . :	02:11:34.1901
Address Space SRB Time. . . . . :	00:02:24.3700
Peak number of dispatcher tasks . . . . . :	149
Peak ICV time (msec). . . . . :	1000
Peak ICVR time (msec) . . . . . :	150000
Peak ICVTSD time (msec) . . . . . :	250
Peak PRTYAGE time (msec). . . . . :	0
Peak MRO (QR) Batching (MROBTCH) value. . . :	1
Number of Excess TCB Scans. . . . . :	1030792M ☹
Excess TCB Scans - No TCB Detached. . . . . :	901943M ☹
Number of Excess TCBs Detached. . . . . :	222681M ☹
Average Excess TCBs Detached per Scan . . . :	0
Number of CICS TCB MODEs. . . . . :	13
Number of CICS TCB POOLs. . . . . :	3

Notes/Recommendations:

- **Excess TCB scans and detaches increase unproductive overhead.**
- **Tune number of TCB-s allocated to minimize overhead.**

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Dispatcher Statistics – V4.1 Summary

DISPATCHER STATISTICS

Dispatcher Start Date and Time. . . . . :	08/23/2014 06:03:32.6499
Address Space CPU Time. . . . . :	00:05:27.182061
Address Space SRB Time. . . . . :	00:00:06.130045
Peak number of dispatcher tasks . . . . . :	69
Peak ICV time (msec). . . . . :	1000
Peak ICVR time (msec) . . . . . :	2500
Peak ICVTSD time (msec) . . . . . :	500
Peak PRTYAGE time (msec). . . . . :	0
Peak MRO (QR) Batching (MROBTCH) value. . . :	1
Number of Excess TCB Scans. . . . . :	239
Excess TCB Scans - No TCB Detached. . . . . :	231
Number of Excess TCBs Detached. . . . . :	12
Average Excess TCBs Detached per Scan . . . :	0
Number of CICS TCB MODEs. . . . . :	21
Number of CICS TCB POOLs. . . . . :	5

Note: Three new TCB modes in V4.1: EP, T8, TP
Report Source: Steve Ware, from UFL Test Region

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Dispatcher Statistics – V4.1 TCB Mode Stats

TCB Mode	Open	TCB Pool	<-- Peak TCBs ---> Attached	In Use	TCB Attaches	Detached Unclean	Detached Stolen	Detached Excess	Detached Other	TCB Steals	TCB Mismatches
QR	No	N/A	1	1	1	0	0	0	0	0	0
RO	No	N/A	1	1	1	0	0	0	0	0	0
CO	Unk	N/A	0	0	0	0	0	0	0	0	0
SZ	Unk	N/A	0	0	0	0	0	0	0	0	0
RP	Unk	N/A	0	0	0	0	0	0	0	0	0
FO	No	N/A	1	1	1	0	0	0	0	0	0
SL	No	N/A	1	1	1	0	0	0	0	0	0
SO	No	N/A	1	1	1	0	0	0	0	0	0
SP	No	N/A	1	1	1	0	0	0	0	0	0
EP	No	N/A	1	1	1	0	0	0	0	0	0
TP	Unk	N/A	0	0	0	0	0	0	0	0	0
D2	No	N/A	1	1	1	0	0	0	1	0	0
JM	No	N/A	0	0	0	0	0	0	0	0	0
S8	Yes	SSL	1	1	1	0	0	0	0	0	0
L8	Yes	Open	12	10	35	1	0	12	22	0	0
L9	Unk	N/A	0	0	0	0	0	0	0	0	0
J8	Unk	N/A	0	0	0	0	0	0	0	0	0
J9	Unk	N/A	0	0	0	0	0	0	0	0	0
X8	Unk	N/A	0	0	0	0	0	0	0	0	0
X9	Unk	N/A	0	0	0	0	0	0	0	0	0
T8	Unk	N/A	0	0	0	0	0	0	0	0	0

Recommendations:

- Monitor & minimize Detached Unclean, Stolen, Excess, and Other.

- Monitor & minimize TCB Steals and Mismatches.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

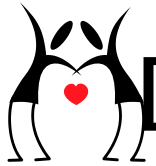
Dispatcher Statistics – Time by TCB Mode

DISPATCHER STATISTICS (Note: Columns 2 – 5 deleted to improve legibility)

TCB Mode	MVS Waits	Total Time in MVS wait	Total Time Dispatched	Total CPU Time / TCB
QR	13051397	000-18:18:33.24	000-01:49:46.74	000-01:12:02.27
RO	48658	000-20:05:12.28	000-00:02:46.27	000-00:01:00.80
CO	0	000-00:00:00.00	000-00:00:00.00	000-00:00:00.00
SZ	0	000-00:00:00.00	000-00:00:00.00	000-00:00:00.00
RP	0	000-00:00:00.00	000-00:00:00.00	000-00:00:00.00
FO	800	000-19:00:52.61	000-00:00:44.05	000-00:00:06.50
SL	1	000-00:00:00.00	000-00:00:00.00	000-00:00:00.00
SO	2	000-00:00:00.00	000-00:00:00.00	000-00:00:00.00
S8	0	000-00:00:00.00	000-00:00:00.00	000-00:00:00.00
D2	2419	000-20:18:01.28	000-00:00:03.26	000-00:00:00.43
L8	16952578	007-03:07:31.31	000-05:36:18.48	000-01:13:35.37
H8	0	000-00:00:00.00	000-00:00:00.00	000-00:00:00.00
J8	0	000-00:00:00.00	000-00:00:00.00	000-00:00:00.00

Recommendation: If QR TCB "Total Time Dispatched" is more than 1.5 times "Total CPU Time/TCB," determine response time degradation and seek increased importance in WLM Service Policy if degradation is significant.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com



Dispatcher Statistics – TCB Pools

```
TCB Pool. . . . . . . . . . . . . . . . . . . . . . . :   OPEN
Peak TCBs attached in this TCB Pool . . . . . . . . :     12   Peak TCBs in use in this TCB Pool . . . . . . . . :     10
Max TCB Pool limit (MAXOPENTCBS). . . . . . . . . . :     32   Times at Max TCB Pool Limit (MAXOPENTCBS) . . . :      0
Total Requests delayed by Max TCB Pool Limit. . . . :      0   Total Number of TCB Mismatch waits. . . . . . . :      0
Total Max TCB Pool Limit delay time . . . . . . . . : 000-00:00:00   Total TCB Mismatch wait time. . . . . . . . . . : 000-00:00:00
Average Max TCB Pool Limit delay time . . . . . . . : 000-00:00:00   Average TCB Mismatch wait time. . . . . . . . . : 000-00:00:00
Peak Requests delayed by Max TCB Pool Limit . . . . :      0   Peak TCB Mismatch waits . . . . . . . . . . . . :      0
                                                               Requests Delayed by MVS storage constraint. . . :      0
                                                               Total MVS storage constraint delay time . . . . : 00:00:00.0000
-------------------------------------------------------------------------------------------------------------------------------
TCB Pool. . . . . . . . . . . . . . . . . . . . . . . :    JVM
Peak TCBs attached in this TCB Pool . . . . . . . . :      0   Peak TCBs in use in this TCB Pool . . . . . . . . :      0
Max TCB Pool limit (MAXJVMTCBS) . . . . . . . . . . :      5   Times at Max TCB Pool Limit (MAXJVMTCBS). . . . :      0
  NOTE: Deleted next 6 lines with zero values.
-------------------------------------------------------------------------------------------------------------------------------
TCB Pool. . . . . . . . . . . . . . . . . . . . . . . :     XP
Peak TCBs attached in this TCB Pool . . . . . . . . :      0   Peak TCBs in use in this TCB Pool . . . . . . . . :      0
Max TCB Pool limit (MAXXPTCBS). . . . . . . . . . . :      5   Times at Max TCB Pool Limit (MAXXPTCBS) . . . . :      0
  NOTE: Deleted next 6 lines with zero values.
-------------------------------------------------------------------------------------------------------------------------------
TCB Pool. . . . . . . . . . . . . . . . . . . . . . . :    SSL
Peak TCBs attached in this TCB Pool . . . . . . . . :      1   Peak TCBs in use in this TCB Pool . . . . . . . . :      1
Max TCB Pool limit (MAXSSLTCBS) . . . . . . . . . . :      8   Times at Max TCB Pool Limit (MAXSSLTCBS). . . . :      0
  NOTE: Deleted next 6 lines with zero values.
-------------------------------------------------------------------------------------------------------------------------------
TCB Pool. . . . . . . . . . . . . . . . . . . . . . . :   THRD
Peak TCBs attached in this TCB Pool . . . . . . . . :      0   Peak TCBs in use in this TCB Pool . . . . . . . . :      0
Max TCB Pool limit (MAXTHRDTCBS . . . . . . . . . . :      0   Times at Max TCB Pool Limit (MAXTHRDTCBS. . . . :      0
  NOTE: Deleted next 6 lines with zero values.
```

Recommendation: If “Total Requests delayed by Max TCB Pool Limit” is non-zero, monitor and minimize total and average delay time by increases of the TCB pool limit.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

File Control Statistics

1. FC Calls total by type: Get, Get Upd, Browse, Update, Add, Delete, Brws Upd
2. VSAM Data component IOs
3. VSAM Index component I/Os

Recommendation: Tuning Objective is to Maximize ratio of:
ΣCalls / (Data + Index I/Os)

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

VSAM File Control Statistics

File Name	Get Requests	Get Upd Requests	Browse Requests	Update Requests	Add Requests	Delete Requests	Brws Upd Requests	VSAM EXCP Requests Data	VSAM EXCP Requests Index	RLS req Timeouts	
AAAB2SP	34238	0	0	0	0	0	0	22	1	0	
BBBACTV	0	27	0	27	376636	0	0	382501	0	0	
CCCFNDD	65928	0	0	0	0	0	0	15089	6228	0	
DDDIAFD	4767	0	25159	0	0	0	0	12609	148	0	
EEEINTX	27088	0	8124	0	0	0	0	3	2	0	☺
FFFPNDD	17969	5310	0	5310	166	0	0	9905	799	0	
GGGSCRX	488	0	0	0	0	0	0	18	59	0	
HHHSEGH	33043	43	1712	43	43	0	0	1597	841	0	☺
IIISEG1	48931	6925	531	2810	6739	4115	0	15537	2862	0	
JJJSEG2	23634	745	0	205	745	540	0	1291	1	0	
KKKTBLS	537	0	75997	0	0	0	0	525	26	0	☺
LLLTEST	0	0	0	0	41741	0	0	43761	0	0	
MMMULHD	54891	43	0	43	0	0	0	806	453	0	☺
NNNUNLD	32679	1640	0	1586	53	0	0	7319	2670	0	
OOOPCFIL	37752	0	0	0	0	0	0	21	1	0	☺
TOTALS	427489	18626	155690	13864	459660	4655	0	536868	15546	0	

Notes & Recommendations:

1. Totals are greater than all files shown because many files deleted from sample.
2. Focus your tuning to minimize/eliminate VSAM EXCP Requests.
3. ☺ shown next to files with superior performance (least EXCP-s/Request).
4. BBB tuning options: faster IO service, application changes, file attributes,…
5. CCC, DDD, III, NNN appear to be good candidates for data in memory tuning.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

LSR Buffer Pools

1. Buffer size
2. Number of buffers
3. Look-aside hits (This = saved I/Os)
4. Buffer reads (I/Os required)
5. User-initiated buffer writes (bad for LSR!)
6. ☠ Number of requests waited for strings

- **Recommendations:** Maximize 3 & minimize 4 by adding buffers; isolate 5s; minimize 6s!!!

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

LSR Pools Statistics

LSRPOOLS

Total number of pools built	17
Peak requests that waited for string	2
Total requests that waited for string	125
Peak concurrently active strings	6

Shared Buffers

Pool Number	Look-asides	Reads	User writes	Non-user writes
1	644389	48039	4596	0
2	53249	824	0	0
3	234800	2568	139	0
4	83125	5164	5620	0
5	187335	21327	1658	0
6	23980	10	24460	0
7	397988	7033	12882	0
8	86917	1443	1507	0
TOTALS	1711783	86408	50862	0

Recommendations: (1) Minimize/eliminate waits for strings. (2) Add buffers until reads are being reduced significantly. (3) Use multiple LSR pools to separate data from index and good from poor buffer candidates.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Temp. Stor. Statistics

TEMPORARY STORAGE			
Put/Putq main storage requests	:	78701	<
Get/Getq main storage requests	:	70899	<
Peak storage for temp. storage (main)	:	135916	<
Put/Putq auxiliary storage requests	:	78756	<
Get/Getq auxiliary storage requests	:	135961	<
Peak temporary storage names in use	:	66	
Number of entries in longest queue	:	58	
Times queues created	:	131425	
Control interval size	:	4096	
Available bytes per control interval	:	4032	
Segments per control interval	:	63	
Bytes per segment	:	64	
Writes more than control interval	:	3	
Longest auxiliary temp storage record	:	32080	
Number of control intervals available	:	3599	
Peak control intervals in use	:	13	
Times aux. storage exhausted	:	0	<
Number of temp storage compressions	:	1507	<
Temporary storage buffers	:	6	<
Buffer waits	:	0	<
Peak users waiting on buffer	:	0	<
Buffer writes	:	22	<
Forced writes for recovery	:	0	<
Buffer reads	:	25	<
Format writes	:	0	<
Temporary storage strings	:	6	<
Peak number of strings in use	:	1	<
Times string wait occurred	:	0	<
Peak number of users waiting on string	:	0	<
I/O errors on TS dataset	:	0	<
Shared pools defined	:	0	
Shared pools currently connected	:	0	
Shared read requests	:	0	
Shared write requests	:	0	

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Temporary Storage

- **Recommendation:** Tune CICS Temporary Storage to minimize IO-s and activities that can waste CPU capacity.
  1. Minimize auxiliary storage requests by adding enough buffers and modifying applications that force TS activity to AUX.
  2. Avoid causing spanned TS records via proper CI size.
  3. Reduce/eliminate buffer and string waits.
  4. Avoid format writes with properly sized TS file.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Transient Data Statistics

TRANSIENT DATA			
Control interval size	:	4096	
Peak control intervals used	:	2	
Times NOSPACE occurred	:	0	<
Writes to intrapartition dataset	:	0	
Reads from intrapartition dataset	:	0	
Formatting writes	:	0	
I/O errors	:	0	<
Intrapartition buffers	:	3	
Peak intra. buffers containing valid data	:	1	
Intrapartition accesses	:	5	
Peak concurrent intrapartition accesses	:	1	
Intrapartition buffer waits	:	0	<☠
Peak intrapartition buffer waits	:	0	<☠
Times string accessed	:	0	
Peak concurrent string accesses	:	0	
Intrapartition string waits	:	0	<☠
Peak string waits	:	0	<☠

Recommendation: Minimize most, if not all, buffer and string waits.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Enqueue Statistics

ENQUEUE STATISTICS

ENQ Poolname	ENQs Issued	ENQs Waited	Enqueue Waiting time	Sysplex Waited	Sysplex Waiting time
DISPATCH	0	0	000-00:00:00	0	000-00:00:00
EXECADDR	13704	5	000-00:04:00	0	000-00:00:00
EXECPLEX	0	0	000-00:00:00	0	000-00:00:00
EXECSTRN	179816	1889	000-01:02:16	0	000-00:00:00
FCDSESWR	376788	29906	000-00:05:55	0	000-00:00:00
FCDSLDMD	0	0	000-00:00:00	0	000-00:00:00
FCDSRECD	403085	0	000-00:00:00	0	000-00:00:00
FCDSRNGE	0	0	000-00:00:00	0	000-00:00:00

Recommendation: If Enqueue or Sysplex "Waiting time" is significant portion of transaction response time, they must be investigated to determine the causes.

Best opportunity for tuning? EXECSTRN highest avg. wait/req

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

DB2ENTRY Statistics - 1

DB2ENTRY STATISTICS - REQUESTS

DB2Entry Name	Call Count	Signon Count	Partial Signon	Commit Count	Abort Count	Single Phase	Thread Reuse	Thread Terms	Thread Waits/Overfl
AMD2	2730679	24238	8147	0	26	24222	23644	594	0
MDI	0	0	0	0	0	0	0	0	0
MDI1	0	0	0	0	0	0	0	0	0
MDI2	0	0	0	0	0	0	0	0	0
MNIF	1213	31	4	0	0	31	0	0	31
MT1010MQ	43872	871	868	30	3	841	0	871	0
MT4I	2814	22	15	68	0	4	0	0	22

Note: Many repetitive lines deleted from here

TOTALS	2778578	25162	9034	98	29	25098	23644	1465	53

☠☹

Recommendations:

- "Thread Waits/Overfl" objective of less than 1% of total or ZERO.
- If "Thread Waits/Overfl" non-ZERO , then thread waits must be checked to minimize or eliminate them.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

DB2ENTRY Statistics - 2

DB2ENTRY STATISTICS - PERFORMANCE

DB2Entry Name	Thread Limit	Thread HWM	Pthread Limit	Pthread HWM	Task HWM	Task Total	Readyq HWM
AMD2	20	9	20	8	9	24238	0
MDI	3	0	0	0	0	0	0
MDI1	3	0	0	0	0	0	0
MDI2	0	0	0	0	0	0	0
MNIF	0	0	0	0	2	31	0
MT1010MQ	10	3	0	0	3	871	0

Note: Many lines deleted from here

TOTALS 25162

Recommendations:

- All HWM (High Water Mark) statistics should be at **least 20% less** than the Limit values.
- If HWM = Limit for threads, then thread waits must be checked to minimize or eliminate them.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Loader Statistics

```
LOADER STATISTICS

Library load requests . . . . . :              3944
Total loading time. . . . . :  000-00:00:46.26
Average loading time. . . . . :     00:00.011728
Program uses. . . . . :           1063584
Requests that waited. . . . . :                    <-        3
Peak waiting Loader requests. . . . . :            <-        1
Times at peak . . . . . :                          <-        3
Total waiting time. . . . . :  000-00:00:00.05
Times DFHRPL Library re-opened. . . . . :             0

LOADER DSA STATISTICS
CDSA
  Programs removed by compression . . . . . :         0
  Total Not In Use queue membership time. . . . :000-00:00:00.00
  Average Not In Use queue membership time. . . . :   00:00.000000
  Reclaims from Not In Use queue. . . . . :         731 ☺
  Programs loaded but Not In Use. . . . . :          15 ☹
ECDSA
  Programs removed by compression . . . . . :         0
  Total Not In Use queue membership time. . . . :000-00:00:00.00
  Average Not In Use queue membership time. . . . :   00:00.000000
  Reclaims from Not In Use queue. . . . . :         135 ☺
  Programs loaded but Not In Use. . . . . :           9 ☹
```

NOTE: Section for SDSA, ESDSA, RDSA, ERDSA were omitted to improve legibility

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Statistics Domain Statistics

```
STATISTICS DOMAIN STATISTICS
Total number of Interval Collections . . . . . :          6
Total number of SMF writes . . . . . . . . . . :        335
Total number of SMF writes suppressed. . . . . :          0
Total number of SMF errors . . . . . . . . . . :          0
Total number of INT statistics records . . . . :        144
Total number of EOD statistics records . . . . :         47
Total number of USS statistics records . . . . :        151
Total number of REQ statistics records . . . . :          0
Total number of RRT statistics records . . . . :          0
Statistics Settings
Statistics Interval . . . . . : 03:00:00 <
Statistics End-of-Day Time. . . . . : 00:00:00 <
Statistics Recording. . . . . :         ON <
```

Recommendations:

1. Use INTERVAL for important periods
2. Use END-OF-DAY to avoid CPU spike if EOD default left at midnight
3. Use utility supplied with CICS to produce the time offsets.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Storage Manager

1. DSA & EDSA+others size
2. DSA & EDSA+others used
3. DSA & EDSA (D&E) + others cushion sizes
4. *D&E=0 Times no storage returned*
5. *D&E=0 Times requests suspended*
6. *D&E=0 Times cushion released*
7. *D&E=0 Times short-on-storage (SOS)*
8. *Total time SOS*

Recommendation: Avoid/minimize 4, 5, 6, 7, & 8!!!

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Storage Manager Statistics - 1

STORAGE MANAGER STATISTICS

Global Statistics

Storage protection	:	ACTIVE
Transaction isolation	:	INACTIVE
Reentrant programs	:	NOPROTECT
Current DSA limit	:	7168K
Current DSA total	:	2816K
Peak DSA total	:	2816K
Current EDSA limit	:	160M
Current EDSA total	:	79M
Peak EDSA total	:	79M

Subspace Statistics

Total unique subspace users	:	0
Peak unique subspace users	:	0
Total common subspace users	:	0
Peak common subspace users	:	0

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Storage Manager Statistics - 2

Dynamic Storage Areas (below 16M)

		CDSA	UDSA	SDSA	RDSA
Current DSA size	:	1536K	768K	256K	256K
Peak DSA Size	:	1536K	768K	256K	256K
Cushion Size	:	64K	64K	64K	64K
Peak free storage	:	632K	768K	256K	256K
Lowest free storage	:	28K	60K	92K	56K
Getmain Requests	:	350285	93182	102691	20
Freemain Requests	:	349912	93186	102678	0
Times no storage returned	:	0	0	0	0
Times request suspended	:	0	0	0	0
Peak requests suspended	:	0	0	0	0
Purged while waiting	:	0	0	0	0
Times cushion released	:	0	0	0	0
Times went short on storage	:	0	0	0	0
Total time SOS	:	000-00:00:00.00	000-00:00:00.00	000-00:00:00.00	000-00:00:00.00
Storage violations	:	0	0	0	0
Access	:	CICS	USER	USER	CICS
Current extents	:	6	3	1	1
Extents added	:	6	3	1	1
Extents released	:	0	0	0	0

Recommendation: Avoid any storage related stress conditions as reported by the four items circled above.
Same exact report produced for above the line and above the bar areas.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Transaction Class Report

TRANSACTION CLASS STATISTICS

Tclass	Max	Purge	<-------- T O T A L -------->						Peak	Peak	Times	Times	Average
Name	Act	Thresh	Attaches	AccptImm	PurgdImm	Queued	PurgQ'd	Queuing-Time	Act	Queued	Max Act	PurgeThr	Queuing-Time
AMD2CLS	80	30	34238	34238	0	0	0	000-00:00:00	49	0	0	0	000-00:00:00
DFHCOMCL	10	0	0	0	0	0	0	000-00:00:00	0	0	0	0	000-00:00:00
DFHEDFTC	10	0	0	0	0	0	0	000-00:00:00	0	0	0	0	000-00:00:00
DFHTCIND	10	0	0	0	0	0	0	000-00:00:00	0	0	0	0	000-00:00:00
DFHTCL01	1	0	0	0	0	0	0	000-00:00:00	0	0	0	0	000-00:00:00
DFHTCL02	1	0	0	0	0	0	0	000-00:00:00	0	0	0	0	000-00:00:00
DFHTCL03	1	0	0	0	0	0	0	000-00:00:00	0	0	0	0	000-00:00:00
MNYTCL01	1	0	0	0	0	0	0	000-00:00:00	0	0	0	0	000-00:00:00
MNYTCL02	1	0	0	0	0	0	0	000-00:00:00	0	0	0	0	000-00:00:00
MNYTCL03	3	0	0	0	0	0	0	000-00:00:00	0	0	0	0	000-00:00:00
MNYTCL04	1	0	0	0	0	0	0	000-00:00:00	0	0	0	0	000-00:00:00
MNYTCL05	1	0	0	0	0	0	0	000-00:00:00	0	0	0	0	000-00:00:00
MNYTCL06	1	0	0	0	0	0	0	000-00:00:00	0	0	0	0	000-00:00:00
MNYTCL07	1	0	0	0	0	0	0	000-00:00:00	0	0	0	0	000-00:00:00
MNYTCL08	1	0	0	0	0	0	0	000-00:00:00	0	0	0	0	000-00:00:00
SYCHCLS	80	30	3632	3632	0	0	0	000-00:00:00	48	0	0	0	000-00:00:00
TOTALS			37870	37870	0	0	0	000-00:00:00			0	0	000-00:00:00

Recommendation: Queue Time should only be caused **intentionally** and otherwise minimized via tuning activity. If you cause waits in CICS, WLM can never help your loved one.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

VTAM Statistics

VTAM STATISTICS

Times at RPL maximum	1	<
Peak RPLs posted	2	
Short on storage count	0	<
Dynamic opens count	0	
Average LUs in session	8	<
HWM LUs in session	28	<
PS inquire count	0	
PS nib count	0	
PS opndst count	0	
PS unbind count	0	
PS error count	0	

Recommendations:

1. Minimize “Times at RPL maximum”
2. Track Average and HWM LUs in session.

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

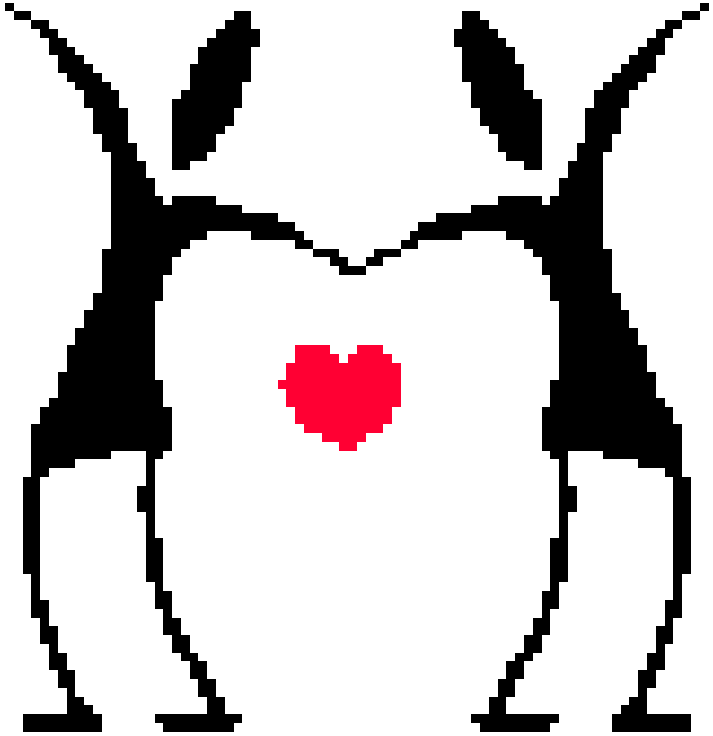
References

- CICS Performance Guide, SC37-7033
- CICS Information Center – IBM CICS Transaction Server for z/OS, Version 4.1

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com

Session End / Questions?

CICS



YOU

© 2014 Gelb Information Systems Corp.
Any questions? Email to: ivan@gelbis.com