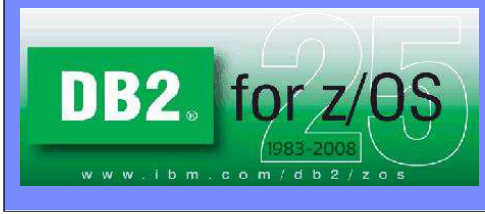
IBM Software Group

OMEGAMON Performance Expert Fundamentals

DB2 Information Management Software



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DB2 for z/OS L2 Performance

e business software

Acknowledgement and Disclaimer

- Measurement data included in this presentation are obtained by the members of the DB2 performance department at the IBM Silicon Valley Laboratory.
- The materials in this presentation are subject to
  - Enhancements at some future date,
  - A new release of DB2, or
  - A Programming Temporary Fix
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- Thanks to Brian and Lance (may he be happy on the outside) for reviewing the material

Product Name Soup

- DB2 Performance monitor (or DB2PM)
- DB2 Performance expert (or DB2PE) = DB2PM +Buffer Pool Analyzer (BPA)
- After Candle acquisition, new name, new brand, ...
- We will only discuss the BATCH component (briefly)

IBM Tivoli OMEGAMON XE for DB2 Performance Expert on z/OS

V4.1.0 announced Aug 15 2006

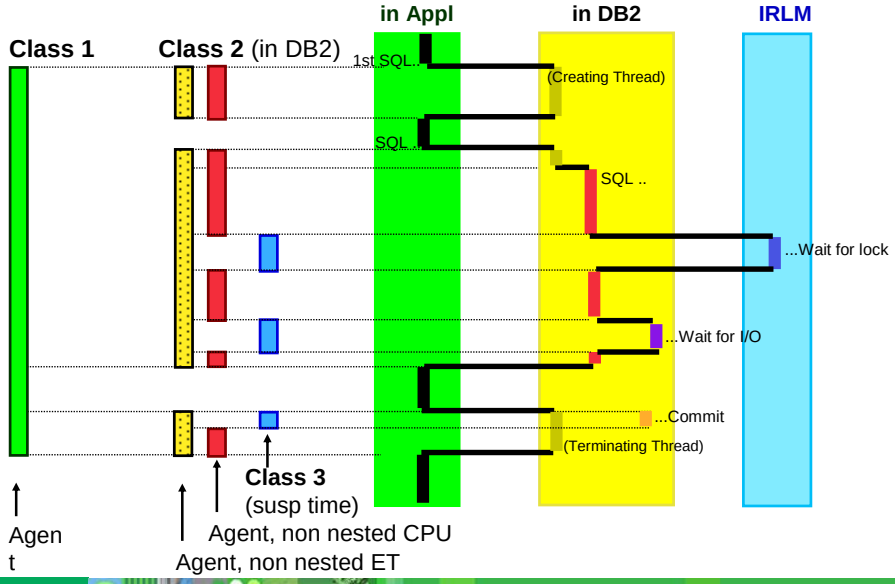
DB2 Performance Reporting

- **Instrumentation interface and trace classes**
- Data Collection
- Working with Batch Reporting
  - Report sets ...
- Performance Database

DB2's Instrumentation Facility Interface

- Trace types
  - Accounting
  - Audit
  - Performance
  - Statistics
  - Monitor
  - Global
- Trace classes
  - Multiple trace classes per trace type
  - IFCID as basic unit of reporting
    - **I**nstrumentation **F**acility **C**omponent **ID**entifier
- Trace destinations
  - SMF - Daily monitoring
  - GTF - High volume
  - OPx - Online monitoring
  - (SRV - Exit to a user-written routine)
- Trace headers (TDATA)
  - CORrelation header
  - CPU header
  - DISTributed header
  - TRAce header
- Qualifications
  - AUTHID
  - PLAN
  - LOCATION
  - IFCID
  - More in V9

DB2 Times Terminology - Accounting Class 1,2,3



DB2 Times Terminology

PLAN

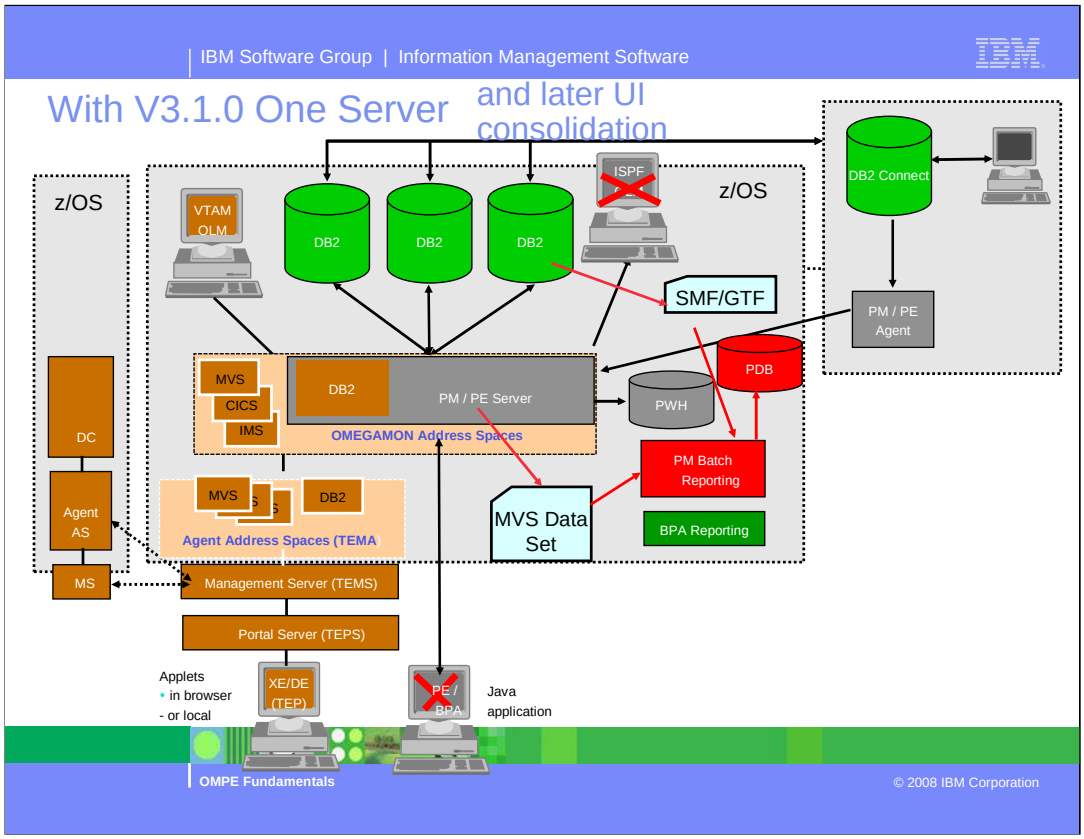
- Class 1 times
  - Application time from connect to DB2 (thread creation) till disconnect (thread termination)
  - Both class 1 elapsed time and class 1 CPU time are reported.
- Class 2 times
  - Time spent within DB2
  - Both class 2 elapsed time and class 2 CPU time are reported.
- Class 3 times
  - Thread suspension time, e.g. for synchronous I/O
- Class 5 times
  - Time spent for IFI calls.
  - Both class 5 elapsed time and class 5 CPU time are reported.

PACKAGE or DBRM

- Class 7 times
  - Like class 2, but on package/DBRM level.
  - Both class 7 elapsed time and class 7 CPU time are reported.
- Class 8 times
  - Like class 3, but on package/DBRM level.

DB2 Performance Reporting

- Instrumentation interface and trace classes
- **Data Collection**
- Working with Batch Reporting
  - Report sets ...
- Performance Database



Remember, this is a phased implementation, so the thought here is that we wanted to limit the impact of the migration, one way to do this was to support all current customer UIs. So phase one brings a consolidation of servers, with the PE server subsumed by the DB2 OMEGAMON address space.

Phase 2, to come later, will have the current DB2PE fat client and ISPF UIs removed and DB2PE instrumentation placed within the OMEGAMON Classic and XE browser UI. We have already demonstrated this UI evolution with the DB2 Connect instrumentation in the OMEGAMON UIs

Collect Report Data using DB2 PE

- Allows collecting IFCIDs in TSO data set.
  - Data is immediately available
  - No need to bother system operator with SMF/GTF handling.
- Handy function to (automatically) collect trace data for problem analysis
- Allows to specify DB2 PM reports instead of DB2 trace classes
- Allows to collect trace data asynchronously
  - Supported start criteria:
    - Time
    - Exception
    - Immediate
  - Supported stop criteria
    - Duration
    - Number of records
    - Thread termination
- Nice for customers - but we usually deal with SMF and/or GTF

Collect Data using GTF / SMF

- Important not to lose trace records or too flood the system with trace records
  - SMF
    - Losing trace records usually not a problem
    - Flooding could be a problem
    - Usually ok for stats and accounting
    - Not often used for performance traces
    - SMF 100 = DB2 statistics
      SMF 101 = DB2 accounting
      SMF 102 = DB2 performance
    - SMF must be active and SMFPRMxx member allows 100-102
      eg. SYS(TYPE(0:255),...)
  - GTF
    - Losing trace records could be a problem
    - GTF data set is used in wrap-around
    - GTF data set cannot use extents
    - Often used for performance trace data
    - GTF can use multiple data sets in parallel
    - GTF can use more buffers
    - Trace only DB2 events

DB2 Performance Reporting

- Instrumentation interface and trace classes
- Data Collection
- **Working with Batch Reporting**
  - Report sets ...
- Performance Database

Working with Batch Reporting

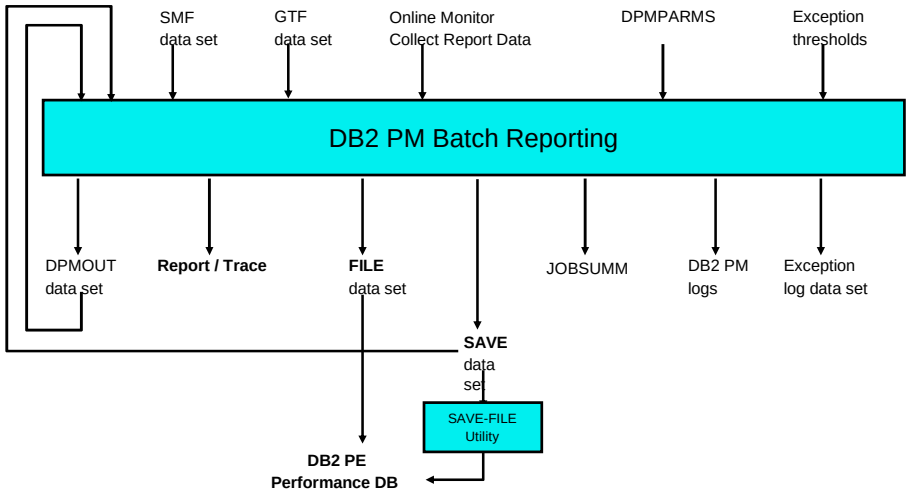
- Batch jobs can be created with
  - ISPF Editor
  - **I**nteractive **R**eport **F**acility of DB2 PM
- DB2 PM Reporting commands
  - One command per report set, subcommands for Reports / Traces / File / Save
  - Plus various options
  - EXEC as last command to start execution
- Reducing the amount of data
  - FROM / TO - Limits the amount of records to be processed by time.
  - INCLUDE / EXCLUDE - Limits the amount of records to be processed by DB2 PM identifiers.
  - TOP (Accounting only) - Shows top resource consumers.
  - Exception Processing

Working with Batch Reporting...

- **Input**
  - DB2 trace data from SMF / GTF/ or TSO seq.dataset (collected and saved from DB2 PM Collect Report Data function)
  - DPMOUT / SAVE (trace) data processed and saved in a former DB2 PM run.
  - Processing parameters (Timezone, Mainpack, Correlation transl.,etc.)
  - Exception thresholds
- **Output**
  - Report
    - accumulated, summarized by DB2 PM identifiers, calculated averages
  - Trace
    - individually DB2 in chronological order
  - DPMLOG
    - execution log shows messages issued during DB2 PM processing
  - JOBSUMM
    - summary about which traces were processed
  - Exception log

Working with Batch Reporting... (Input / Output)

- Generates output SAVE / FILE
  - DB2 load utility format
  - usable for later Reporting



DB2 PM Reports

- Report facility which
  - Takes SMF, GTF or TSO data sets as input (collected by 'Collect Report Data'), SAVEd (DPMOUT) data
  - Generates a variety of customizable reports and traces:
    - Statistics
    - Accounting
    - Subsystem Parameters
    - Locking
    - SQL Activity
    - I/O Activity
    - Utility
    - Audit
    - Record Trace
    - Explain
    - System parms

DB2 PM Reports...

- Many options to select which/how data is being reported
  - Reduce, Include/Exclude, From/to
  - Summarizedby, Orderby
  - Layout
  - ....
- Differentiate mainly between "reports" and " traces"
  - Reports are a summary of a number of events
  - Traces are individual events
- Allows to tailor online the layout of Accounting and Statistics reports and traces

Minimal Batch JCL

```
//PTSTVART JOB (STEEGMA,XXX,090,281926),'BART.STEEGMANS',
//     MSGLEVEL=(1,1),USER=STEEGMA,
//     NOTIFY=STEEGMA,MSGCLASS=H,TIME=60,REGION=256M
/*JOBPARM S=MVS1
//*
//*     DB2PE - REPORT GENERATION
//*
//DB2PMJB EXEC PGM=DB2PM
//STEPLIB DD DISP=SHR,DSN=DB2DUMP.OMPE41.D071028.LEVEL2.TKANMOD
//        DD DISP=SHR,DSN=DB2DUMP.OMPE41.D070411.FINAL.TKANMOD
//*
//* !-------INPUTDSN
//* v
//INPUTDD DD DISP=SHR,DCB=BUFNO=50,
//           DSN=STEEGMA.TRACE.UNICODE.IFC247.SMF
//*
//SYSOUT   DD SYSOUT=*
//JOBSUMDD DD SYSOUT=*,
//             DCB=BLKSIZE=133
//MSGRPTDD DD SYSOUT=*,
//             DCB=BLKSIZE=133
//SYSPRINT DD SYSOUT=*,
//             DCB=BLKSIZE=133
//SYSIN DD *
    ........
```

- Limit output lines

```
//OUT1   DD
  SYSOUT=*,OUTLIM=50000
...
//SYSIN DD *
...
RECTRACE TRACE
   DDNAME(OUT1)
```

- Big input files and using many commands may require you to manually allocate certain workfiles
  Documented in the PE Report Command Reference

Working with Batch Reporting (DB2 PM command sample)

```
//SYSIN   DD  *
* -- Generate DB2 PE reports
 GLOBAL     TIMEZONE(+7:00)
            FROM    (04/21/01,22:01:00.00)
            TO      (04/21/01,23:01:00.00)
            INCLUDE (DB2ID(DSN7))

 ACCOUNTING
     REPORT LAYOUT  (LONG)
            ORDER   (CONNTYPE)
            EXCLUDE (PACKAGE(*))
     TRACE  TOP     (10 ONLY INAPPLET)
            LAYOUT  (LONG)
     REPORT LAYOUT(LONG)
            ORDER(PLANNAME)

 STATISTICS
     REPORT  LAYOUT  (LONG)

 SYSPARMS
     TRACE

EXEC
```

- TIMEZONE +7 means GMT -7H
- Dates are mm/dd/yy by default
- Do as much filtering as possible as early as possible
  Do it in the GLOBAL command if you can

- DB2 PE sorts trace to make sure records are in the correct sequence, but can be time consuming with big traces
  - GLOBAL PRESORTED(ACCEPT) avoids sort and ignores out of sequence records
  - GLOBAL PRESORTED(ENFORCE) avoids sort and terminates when encountering an out of sequence record

JOBSUMM - Job Summary Log

```
                                                    OMEGAMON XE FOR DB2 PERFORMANCE EXPERT (V4)                PAGE: 1
                                                      JOB SUMMARY LOG                                RUN DATE: 10/27/06 07:28:10.12


MSG.ID.    LOCATION          GROUP     SSID  MEMBER    TIMESTAMP
           DESCRIPTION
---------  ----------------------------------------------------------------------------------------------------------------------------
-------
FPEC4060I  BEBBCM_SDTE       SSYSDTE   SDTE  SDTE      09/20/06 13:24:45.21
           DB2 START TRACE NUMBER 05 DB2 SUBSYSTEM ID = SDTE
           TEXT = -START TRACE (PERFM )CLASS (1 2 3 4 6 8 9 12 13 )RMID (* )DEST (SMF )PLAN (* )AUTHID (* )IFCID (247 )
BUFSIZE (* )
FPEC4065I  BEBBCM_SDTE       SSYSDTE   SDTE  SDTE      09/20/06 13:25:13.55
           DB2 STOP TRACE NUMBER 05 DB2 SUBSYSTEM ID = SDTE
           TEXT = -STOP TRACE (PERFM )CLASS (1 2 3 4 6 8 9 12 13 )RMID (* )DEST (SMF )PLAN (* )AUTHID (* )TNO (* )
FPEC4005I  BEBBCM_SDTE       SSYSDTE   SDTE  SDTE
           NUMBER OF RECORDS PROCESSED WITHOUT A CPU HEADER WAS 503
FPEC4010I  BEBBCM_SDTE       SSYSDTE   SDTE  SDTE
           NUMBER OF RECORDS PROCESSED WITHOUT A CORRELATION HEADER WAS 10
FPEC4055W  BEBBCM_SDTE       SSYSDTE   SDTE  SDTE
           DATABASE/PAGESET TRANSLATION ROUTINE WAS UNABLE TO PERFORM 9 TRANSLATIONS
```

JOBSUMM - Job Summary Log ...

- IFCID 105 OBID translation
- from OBID into object name
- IFCID 106 ZPARM info

GROUP: SSYSDTE — IFCID FREQUENCY DISTRIBUTION LOG

MEMBER: SDTE

SUBSYSTEM: SDTE

DB2 VERSION: V8

ACTUAL FROM: 09/20/06 13:20:43.16

TO: 09/20/06 13:25:33.30

IFCID	INPUT COUNT	INPUT PCT OF TOTAL	PROCESSED COUNT	PROCESSED PCT OF TOTAL	IFCID	INPUT COUNT	INPUT PCT OF TOTAL	PROCESSED COUNT	PROCESSED PCT OF TOTAL
1	2	0.39%	2	0.39%	80	4	0.79%	4	0.79%
2	2	0.39%	2	0.39%	81	4	0.79%	4	0.79%
3	6	1.19%	6	1.19%	82	4	0.79%	4	0.79%
4	1	0.19%	1	0.19%	83	5	0.99%	5	0.99%
5	1	0.19%	1	0.19%	88	3	0.59%	3	0.59%
6	19	3.77%	19	3.77%	89	3	0.59%	3	0.59%
7	19	3.77%	19	3.77%	98	22	4.37%	22	4.37%
13	1	0.19%	1	0.19%	99	22	4.37%	22	4.37%
14	1	0.19%	1	0.19%	100	47	9.34%	47	9.34%
15	29	5.76%	29	5.76%	101	36	7.15%	36	7.15%
16	2	0.39%	2	0.39%	105	6	1.19%	6	1.19%
18	31	6.16%	31	6.16%	106	2	0.39%	2	0.39%
20	4	0.79%	4	0.79%	107	1	0.19%	1	0.19%
22	1	0.19%	1	0.19%	112	1	0.19%	1	0.19%
29	5	0.99%	5	0.99%	127	1	0.19%	1	0.19%
30	5	0.99%	5	0.99%	128	1	0.19%	1	0.19%
44	66	13.12%	66	13.12%	177	3	0.59%	3	0.59%
45	66	13.12%	66	13.12%	202	1	0.19%	1	0.19%
53	4	0.79%	4	0.79%	213	3	0.59%	3	0.59%
58	8	1.59%	8	1.59%	214	3	0.59%	3	0.59%
60	5	0.99%	5	0.99%	218	4	0.79%	4	0.79%
61	1	0.19%	1	0.19%	225	2	0.39%	2	0.39%
63	3	0.59%	3	0.59%	230	1	0.19%	1	0.19%
64	2	0.39%	2	0.39%	239	3	0.59%	3	0.59%
72	4	0.79%	4	0.79%	247	13	2.58%	13	2.58%
73	4	0.79%	4	0.79%	254	2	0.39%	2	0.39%
74	4	0.79%	4	0.79%	261	3	0.59%	3	0.59%
75	4	0.79%	4	0.79%	350	3	0.59%	3	0.59%

TOTAL INPUT TRACE RECORDS = 503

TOTAL PROCESSED TRACE RECORDS = 503

Statistics Report Set

- Based on DB2 Statistics records (IFCID 1,2, 225).
- Used as a prime indicator for **subsystem-related** problems.
- Contains information about
  - SQL usage (DML, DCL, DDL, direct row access)
  - Stored proc, triggers, UDFs
  - EDM pool
  - Subsystem services
  - Open/Close activity
  - Log activity
  - Plan/package processing
  - DB2 commands
  - RID list processing, Dynamic statement cache
  - Authorization management
  - Locking activity / Data-sharing locking
  - Query parallelism
  - *CPU times*
  - DB2 IFI requests, IFC, and data capture
  - DB2 latch counters
  - Buffer pool and Group buffer pool activity
  - DDF activity
  - *Storage statistics*
- Many of the DB2 statistics counters are running counters.
- So you need at least 2 stats records for a trace or report
  - Traces show *delta* records between 2 subsequent DB2 stats records.
  - Reports summarize statistics over user-defined intervals.

Statistics Report Set

```
    LOCATION: BEBBCM_SDTE              OMEGAMON XE FOR DB2 PERFORMANCE EXPERT (V4)                    PAGE: 1-8
      GROUP: SSYSDTE                           STATISTICS TRACE - LONG
     MEMBER: SDTE
  SUBSYSTEM: SDTE
DB2 VERSION: V8

---- HIGHLIGHTS ------------------------------------------------------------------------------
INTERVAL START: 09/20/06 13:22:55.80   INTERVAL ELAPSED:     1:49.410617    TOTAL COMMITS:       4
INTERVAL END  : 09/20/06 13:24:45.21   TOTAL THREADS   :               2

CPU TIMES                          TCB TIME         SRB TIME       TOTAL TIME          /THREAD          /COMMIT
-------------------------------  ---------------  ---------------  ---------------  ---------------  ---------------
SYSTEM SERVICES ADDRESS SPACE          0.040817         0.011029         0.051847         0.025923         0.012962
DATABASE SERVICES ADDRESS SPACE        0.005271         0.005435         0.010706         0.005353         0.002676
IRLM                                   0.000005         0.025440         0.025444         0.012722         0.006361
DDF ADDRESS SPACE                      0.000131         0.000093         0.000223         0.000112         0.000056

TOTAL                                  0.046223         0.041997         0.088221         0.044110         0.022055


   LOCATION: BEBBCM_SDTE               OMEGAMON XE FOR DB2 PERFORMANCE EXPERT (V4)                    PAGE: 1-9
     GROUP: SSYSDTE                            STATISTICS REPORT - LONG                  REQUESTED FROM: NOT SPECIFIED
    MEMBER: SDTE                                                                                    TO: NOT SPECIFIED
 SUBSYSTEM: SDTE                                                                     INTERVAL FROM: 09/20/06 13:22:55.80
DB2 VERSION: V8                                SCOPE: MEMBER                                        TO: 09/20/06 13:24:45.21

---- HIGHLIGHTS ------------------------------------------------------------------------------
INTERVAL START  : 09/20/06 13:22:55.80   SAMPLING START: 09/20/06 13:22:55.80   TOTAL THREADS      :     2.00
INTERVAL END    : 09/20/06 13:24:45.21   SAMPLING END  : 09/20/06 13:24:45.21   TOTAL COMMITS      :     4.00
INTERVAL ELAPSED:          1:49.410617   OUTAGE ELAPSED:             0.000000   DATA SHARING MEMBER:      N/A

CPU TIMES                          TCB TIME         SRB TIME       TOTAL TIME          /THREAD          /COMMIT
-------------------------------  ---------------  ---------------  ---------------  ---------------  ---------------
SYSTEM SERVICES ADDRESS SPACE          0.040817         0.011029         0.051847         0.025923         0.012962
DATABASE SERVICES ADDRESS SPACE        0.005271         0.005435         0.010706         0.005353         0.002676
IRLM                                   0.000005         0.025440         0.025444         0.012722         0.006361
DDF ADDRESS SPACE                      0.000131         0.000093         0.000223         0.000112         0.000056

TOTAL                                  0.046223         0.041997         0.088221         0.044110         0.022055
```

- Total THREADS and Total COMMITS does NOT INCLUDE DDF (DBAT) work

Statistics Report Set

DBM1 AND MVS STORAGE BELOW 2 GB		QUANTITY
TOTAL DBM1 STORAGE BELOW 2 GB	(MB)	567.98
TOTAL GETMAINED STORAGE	(MB)	487.16
VIRTUAL BUFFER POOLS	(MB)	N/C
VIRTUAL POOL CONTROL BLOCKS	(MB)	N/C
EDM POOL	(MB)	52.49
COMPRESSION DICTIONARY	(MB)	0.62
CASTOUT BUFFERS	(MB)	0.00
DATA SPACE LOOKASIDE BUFFER	(MB)	N/C
HIPERPOOL CONTROL BLOCKS	(MB)	N/C
DATA SPACE BP CONTROL BLOCKS	(MB)	N/C
TOTAL VARIABLE STORAGE	(MB)	68.02
TOTAL AGENT LOCAL STORAGE	(MB)	32.42
TOTAL AGENT SYSTEM STORAGE	(MB)	23.89
NUMBER OF PREFETCH ENGINES		123.00
NUMBER OF DEFERRED WRITE ENGINES		300.00
NUMBER OF CASTOUT ENGINES		0.00
NUMBER OF GBP WRITE ENGINES		0.00
NUMBER OF P-LOCK/NOTIFY EXIT ENGINES		0.00
TOTAL AGENT NON-SYSTEM STORAGE	(MB)	8.52
TOTAL NUMBER OF ACTIVE USER THREADS		6.00
RDS OP POOL	(MB)	2.24
RID POOL	(MB)	2.29
PIPE MANAGER SUB POOL	(MB)	0.00
LOCAL DYNAMIC STMT CACHE CNTL BLKS	(MB)	16.68
THREAD COPIES OF CACHED SQL STMTS	(MB)	0.09
IN USE STORAGE	(MB)	N/A
STATEMENTS COUNT		N/A
HWM FOR ALLOCATED STATEMENTS	(MB)	N/A
STATEMENT COUNT AT HWM		N/A
DATE AT HWM		N/A
TIME AT HWM		N/A
BUFFER & DATA MANAGER TRACE TBL	(MB)	6.59
TOTAL FIXED STORAGE	(MB)	1.18
TOTAL GETMAINED STACK STORAGE	(MB)	11.62
STORAGE CUSHION	(MB)	119.58

DBM1 AND MVS STORAGE BELOW 2 GB CONTINUED		QUANTITY
24 BIT LOW PRIVATE	(MB)	0.22
24 BIT HIGH PRIVATE	(MB)	1.55
31 BIT EXTENDED LOW PRIVATE	(MB)	26.09
31 BIT EXTENDED HIGH PRIVATE	(MB)	586.06
EXTENDED REGION SIZE (MAX)	(MB)	1846.00
EXTENDED CSA SIZE	(MB)	79.84
AVERAGE THREAD FOOTPRINT	(MB)	1.50
MAX NUMBER OF POSSIBLE THREADS		740.42

- AVG thread footprint and max number of possible threads is NOT from IFCID 225
- Calculated by PE with input from DB2 development

Statistics Report Set

```
DBM1 STORAGE ABOVE 2 GB                            QUANTITY    REAL AND AUXILIARY STORAGE                         QUANTITY
-------------------------------------------- ------------------    -------------------------------------------- ------------------
FIXED STORAGE                           (MB)            N/A    REAL STORAGE IN USE                      (MB)            476.22
GETMAINED STORAGE                       (MB)            N/A    AUXILIARY STORAGE IN USE                 (MB)            177.61
   COMPRESSION DICTIONARY               (MB)            N/A
   CACHED DYNAMIC SQL STATEMENTS (MAX)  (MB)            N/A
   DBD CACHE (MAX)                      (MB)            N/A
VARIABLE STORAGE                        (MB)            N/A
VIRTUAL BUFFER POOLS                    (MB)            N/A
VIRTUAL POOL CONTROL BLOCKS             (MB)            N/A
CASTOUT BUFFERS                         (MB)            N/A
STAR JOIN MEMORY POOL                   (MB)            N/A
```

- STATISTICS FILE SPREADSHEETDD(ddname)
- New with PK31073
- Allows to write IFCID 225 data out in CSV file format

```
   LOCATION: DBP1                              DB2 PERFORMANCE EXPERT (V2)                        PAGE: 1-69
      GROUP: N/P                                   RECORD TRACE - LONG                 REQUESTED FROM: ALL      09:29:00.00
     MEMBER: N/P                                                                                  TO: DATES    11:01:00.00
  SUBSYSTEM: DBP1                                                                        ACTUAL FROM: 10/24/06 09:51:25.37
DB2 VERSION: V7                                                                            PAGE DATE: 10/24/06
PRIMAUTH CONNECT   INSTANCE      END_USER        WS_NAME                         TRANSACT
ORIGAUTH CORRNAME  CONNTYPE      RECORD TIME     DESTNO ACE IFC  DESCRIPTION     DATA
PLANNAME CORRNMBR                TCB CPU TIME               ID
-------- -------- ----------- ---------------- ------ --- --- -------------- --------------------
SYSOPR   DBP1     BF85E6B1B32B 'BLANK'         'BLANK'
SYSOPR   016.WVSM 'BLANK'     10:30:01.54624237 954594   1   1 SYSTEM STATS
'BLANK'  T 01                       2.20849273
         |-------------------------------------------------------------------------------------------
         |                                                    QSST DATA
         |QSSTGPLF       14674   QSSTFPLF       14607   QSSTFREF          14   QSSTEXPF       14324   QSSTCONF       13823
         |QSSTGPLV      755895   QSSTFPLV      754770   QSSTFREV     1599541   QSSTEXPV     2174139   QSSTCONV      571171
         |QSSTGETM      112503   QSSTFREM      109695   QSSTRCNZ           0   QSSTCONT           0   QSSTCRIT           0
         |QSSTABND           0
         |......................................................................................................................
```

- Raw record trace also contains the QSST data that you also have in a dump
- Does NOT get formatted by statistics trace or report

Accounting Report Set

- Based on DB2 accounting records (IFCID 3, 239)
- Contains local and distributed DB2 activity associated with a thread.
- Contains DBRM/package accounting information.
- Contains information about
  - Identification of thread
  - Elapsed, CPU, and wait times
  - SQL statements counters
  - RID list processing
  - Query parallelism
  - Group buffer pool and buffer pool activity
  - Data-sharing locking
  - Stored Procedures
  - Locking activity
  - Resource limit facility (RLF)
  - Distributed data facility (DDF)
  - Packages & DBRMs executed
- Can identify TOP resource consumers.
- Short and long flavor
- Report and trace
  - Traces more useful for dynamic SQL (as stmt usually changes)
- Used as a prime indicator for thread-related problems.

Accounting Report Set

- Get an idea about what's running – CONNTYPE report (no package info at this time)
  - One set of accounting information per DB2 connection type
    - TSO
    - DB2CALL
    - CICS
    - BATCH (DLI batch)
    - IMS-BMP …
    - DB2-PRIV
    - DRDA
    - UTILITY
    - RRS

```
//SYSIN    DD  *
  GLOBAL
  TIMEZONE (+5:00)
     INCLUDE (DB2ID(DB2A))
  ACCOUNTING
   REPORT
    ORDER(CONNTYPE) DDNAME(ACRPCN)
    EXCLUDE(PACKAGE(*))
    LAYOUT (LONG)
```

```
   LOCATION: DP3G                        OMEGAMON XE FOR DB2 PERFORMANCE EXPERT (V4)                    PAGE: 1-1
      GROUP: DSNDP3G                              ACCOUNTING REPORT - LONG                  REQUESTED FROM: NOT
SPECIFIED
     MEMBER: DP33                                                                                       TO: NOT
SPECIFIED
  SUBSYSTEM: DP33                                    ORDER: CONNTYPE                          INTERVAL FROM:
07/09/08 18:00:00.00
DB2 VERSION: V8                                      SCOPE: MEMBER                                     TO:
07/09/08 19:59:59.96

CONNTYPE: CICS

ELAPSED TIME DISTRIBUTION                                              CLASS 2 TIME DISTRIBUTION
-------------------------------------------------------------------    ------------------------------------------------
-----------------
APPL    |================================================> 99%       CPU     |==============> 28%
DB2     |                                                             NOTACC  |
SUSP    |> 1%                                                         SUSP    |=====================================>
72%
```

ORDER processing

- Like GROUP BY processing in SQL

Table 2. Performance Expert identifiers used with ORDER subcommand option

Performance Expert Identifier	ACCT	AUD	I/O	LOCK	SQL	STAT	UTIL
BPID (Buffer pool ID)			●				
CLASS (DB2 trace class)	●	●	●	●	●		●
CONNECT (Connection ID)	●	●	●	●	●		●
CONNTYPE (Connection type)	●	●	●	●	●		●
CORRNAME (Correlation name)	●	●	●	●	●		●
CORRNMBR (Correlation number)	●	●	●	●	●		●
DATABASE (Database name)			●	●			
ENDUSER (End user ID)	●	●		●	●		
INSTANCE (Instance number)							●
INTERVAL (Interval)	●		●			●	
MAINPACK (Main package)	●						
OBJECT (Object type)		●					
ORIGAUTH (Original authorization ID)	●	●	●	●	●		●
PACKAGE (Package information) or PROGRAM (Program information)	●						
PAGESET (Page set name)			●	●			
PLANNAME (Plan name)	●	●	●	●	●		●
PRIMAUTH (Primary authorization ID) or AUTHID (Authorization ID)	●		●	●	●		●
REQLOC (Requester location)	●	●	●	●	●		●
TRANSACT (End user transaction name)	●	●		●	●		
WSNAME (End user workstation name)	●	●		●	●		

Accounting Report Layout(long) extract

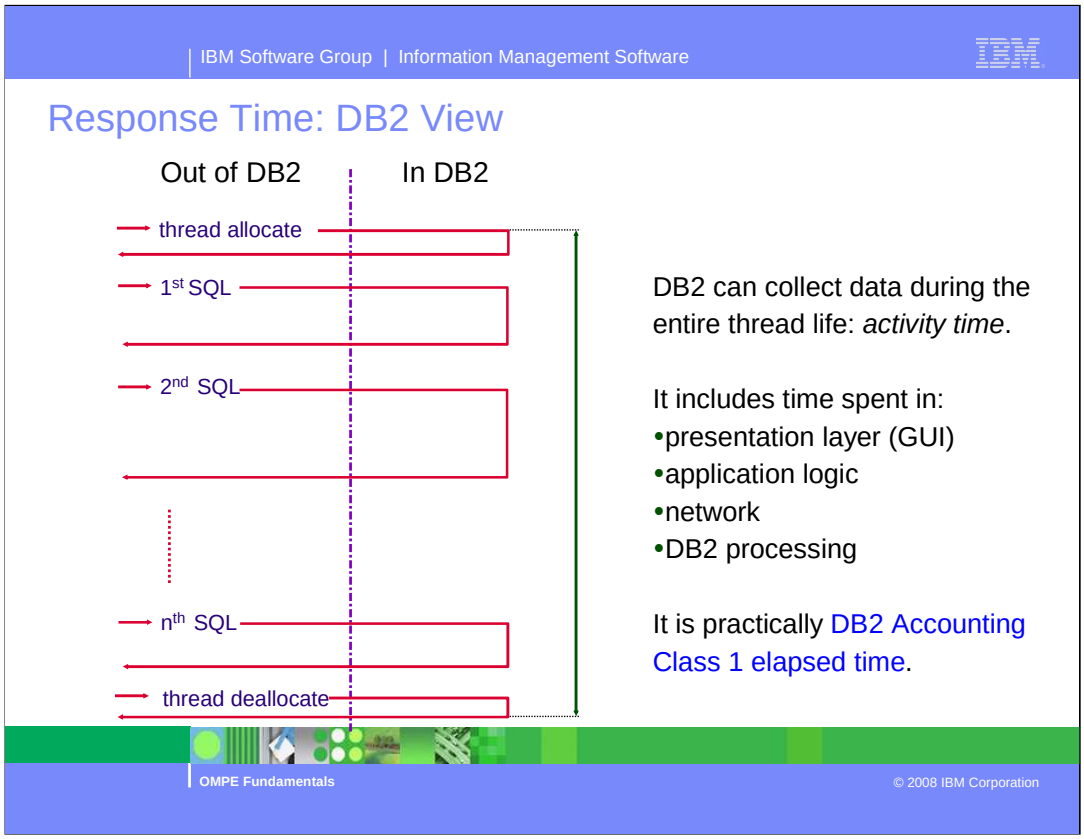
```
   LOCATION: DB2P                          DB2 PERFORMANCE EXPERT (V2)                          PAGE: 1-15
      GROUP: N/P                            ACCOUNTING REPORT - LONG                REQUESTED FROM: ALL      18:10:29.45
     MEMBER: N/P                                                                              TO: DATES    18:25:30.19
  SUBSYSTEM: DB2P                                ORDER: CONNTYPE                     INTERVAL FROM: 07/21/06 18:10:29.58
DB2 VERSION: V7                                  SCOPE: MEMBER                              TO: 07/21/06 18:25:30.08

CONNTYPE: DRDA

ELAPSED TIME DISTRIBUTION                                        CLASS 2 TIME DISTRIBUTION
-------------------------------------------------------------    ------------------------------------------------------------
APPL   |==================================================> 100%  CPU    |=======> 15%
DB2    |                                                        NOTACC |=> 3%
SUSP   |=> 2%                                                   SUSP   |========================================> 82%

AVERAGE       APPL(CL.1)  DB2 (CL.2)  IFI (CL.5)    CLASS 3 SUSPENSIONS   AVERAGE TIME  AV.EVENT    HIGHLIGHTS
------------  ----------  ----------  ----------    --------------------  ------------  --------    --------------------------
ELAPSED TIME    6.448931    0.129922         N/P    LOCK/LATCH(DB2+IRLM)      0.002757      0.99    #OCCURRENCES    :    12261
 NONNESTED      6.258099    0.010702         N/A    SYNCHRON. I/O             0.078429     26.13    #ALLIEDS        :        0
 STORED PROC    0.190832    0.119219         N/A     DATABASE I/O             0.074907     25.33    #ALLIEDS DISTRIB:        0
 UDF            0.000000    0.000000         N/A     LOG WRITE I/O            0.003522      0.79    #DBATS          :    12261
 TRIGGER        0.000000    0.000000         N/A    OTHER READ I/O            0.024741      1.30    #DBATS DISTRIB. :        0
                                                    OTHER WRTE I/O            0.000247      0.01    #NO PROGRAM DATA:       18
CPU TIME        0.022237    0.019570         N/P    SER.TASK SWTCH            0.000162      0.04    #NORMAL TERMINAT:    12261
 AGENT          0.022237    0.019570         N/A     UPDATE COMMIT            0.000125      0.03    #ABNORMAL TERMIN:        0
  NONNESTED     0.004760    0.004304         N/P     OPEN/CLOSE               0.000000      0.00    #CP/X PARALLEL. :        0
  STORED PRC    0.017478    0.015267         N/A     SYSLGRNG REC             0.000033      0.00    #IO PARALLELISM :        0
  UDF           0.000000    0.000000         N/A     EXT/DEL/DEF              0.000000      0.00    #INCREMENT. BIND:    10183
  TRIGGER       0.000000    0.000000         N/A     OTHER SERVICE            0.000004      0.00    #COMMITS        :    13132
 PAR.TASKS      0.000000    0.000000         N/A    ARC.LOG(QUIES)            0.000000      0.00    #ROLLBACKS      :      110
                                                    ARC.LOG READ              0.000000      0.00    #SVPT REQUESTS  :       26
SUSPEND TIME    0.005267    0.106344         N/A    DRAIN LOCK                0.000000      0.00    #SVPT RELEASE   :        2
 AGENT              N/A    0.106344         N/A    CLAIM RELEASE             0.000000      0.00    #SVPT ROLLBACK  :        0
 PAR.TASKS          N/A    0.000000         N/A    PAGE LATCH                0.000008      0.05    MAX SQL CASC LVL:        5
 STORED PROC    0.005267         N/A         N/A    NOTIFY MSGS               0.000000      0.00    UPDATE/COMMIT   :    15.65
 UDF            0.000000         N/A         N/A    GLOBAL CONTENTION         0.000000      0.00    SYNCH I/O AVG.  : 0.003002
                                                    COMMIT PH1 WRITE I/O      0.000000      0.00
NOT ACCOUNT.        N/A    0.003817         N/A    ASYNCH CF REQUESTS        0.000000      0.00
DB2 ENT/EXIT        N/A        8.46         N/A    TOTAL CLASS 3             0.106344     28.51
EN/EX-STPROC        N/A      253.60         N/A
EN/EX-UDF           N/A        0.00         N/A
```

- Time to get the SP/UDF going
  - Waiting for WLM to start the AS
  - Wait for an available TCB to run on

Accounting Trace Layout(long) extract

```
    LOCATION: BEBBCM_SDTE              OMEGAMON XE FOR DB2 PERFORMANCE EXPERT (V4)                    PAGE: 1-12
       GROUP: SSYSDTE                         ACCOUNTING TRACE - LONG                  REQUESTED FROM: NOT SPECIFIED
      MEMBER: SDTE                                                                                TO: NOT SPECIFIED
   SUBSYSTEM: SDTE                                                                    ACTUAL FROM: 09/20/06 13:24:55.82
DB2 VERSION: V8

---- IDENTIFICATION --------------------------------------------------------------------------------------------------
ACCT TSTAMP: 09/20/06 13:24:55.82    PLANNAME: DSNREXX        WLM SCL: 'BLANK'         CICS NET: N/A
BEGIN TIME : 09/20/06 13:24:52.84    PROD TYP: N/P                                     CICS LUN: N/A
END TIME   : 09/20/06 13:24:55.82    PROD VER: N/P            LUW NET: BEKB0300        CICS INS: N/A
REQUESTER  : BEBBCM_SDTE             CORRNAME: EIDESDTE       LUW LUN: A0SDTE
MAINPACK   : DSNREXX                 CORRNMBR: 'BLANK'        LUW INS: BF6F2D0FE57A    ENDUSER : 'BLANK'
PRIMAUTH   : EI0006N                 CONNTYPE: DB2CALL        LUW SEQ:            1    TRANSACT: 'BLANK'
ORIGAUTH   : EI0006N                 CONNECT : DB2CALL                                 WSNAME  : 'BLANK'

MVS ACCOUNTING DATA   : EDB2
ACCOUNTING TOKEN(CHAR): N/A
ACCOUNTING TOKEN(HEX) : N/A

ELAPSED TIME DISTRIBUTION                                    CLASS 2 TIME DISTRIBUTION
-------------------------------------------------------------  ------------------------------------------------------------
APPL   |                                                     CPU    |> 1%
DB2    |=========================> 52%                       NOTACC |=========================> 52%
SUSP   |======================> 47%                          SUSP   |======================> 47%

TIMES/EVENTS  APPL(CL.1)  DB2 (CL.2)  IFI (CL.5)    CLASS 3 SUSPENSIONS   ELAPSED TIME    EVENTS    HIGHLIGHTS
------------  ----------  ----------  ----------    --------------------  ------------  --------  --------------------------
ELAPSED TIME    2.983795    2.976362         N/P    LOCK/LATCH(DB2+IRLM)      0.000000         0    THREAD TYPE   : ALLIED
 NONNESTED      2.983795    2.976362         N/A    SYNCHRON. I/O             0.129328        16    TERM.CONDITION: NORMAL
 STORED PROC    0.000000    0.000000         N/A     DATABASE I/O             0.129328        16    INVOKE REASON : DEALLOC
 UDF            0.000000    0.000000         N/A     LOG WRITE I/O            0.000000         0    COMMITS       :          1
 TRIGGER        0.000000    0.000000         N/A    OTHER READ I/O            0.197046         1    ROLLBACK      :          0

CP CPU TIME     0.018188    0.017090                                                                 SVPT REQUESTS :          0
 AGENT          0.018188    0.017090                                                                 SVPT RELEASE  :          0
  NONNESTED     0.018188    0.017090                                                                 SVPT ROLLBACK :          0
  STORED PRC    0.000000    0.000000                                                                 INCREM.BINDS  :          0
  UDF           0.000000    0.000000                                                                 UPDATE/COMMIT :       1.00
  TRIGGER       0.000000    0.000000                                                                 SYNCH I/O AVG.:   0.008083
 PAR.TASKS      0.000000    0.000000                                                                 PROGRAMS      :          1
                                                                                                     MAX CASCADE   :          0
 IIPCP CPU      0.000000         N/A                                                                 PARALLELISM   : NO

IIP CPU TIME    0.000000    0.000000         N/A    PAGE LATCH                0.000000         0
                                                    NOTIFY MSGS               0.000000         0
```

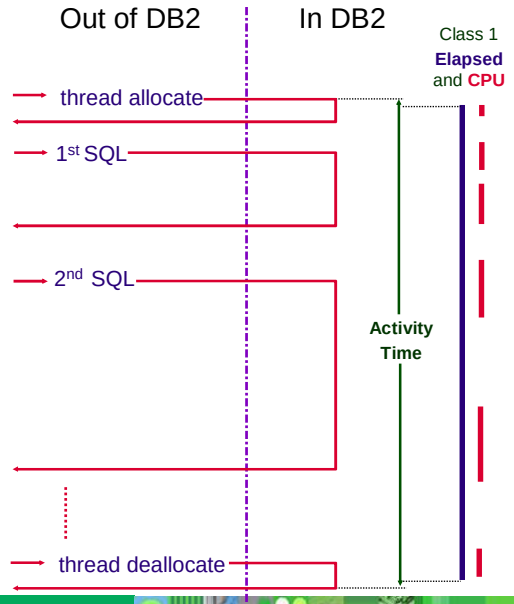
- zIIP CPU
  - IIPCP CPU eligible but did not run on a zIIP
    - Included in CP CPU time
  - IIP CPU run on a zIIP



Continuation from previous page...
Most of its fields are maintained subject to an additional IFCID being active: 318. It needs to be started explicitly, via user defined class of the DB2 performance trace. Suspension timers are additionally conditioned by the DB2 accounting trace class 3 being active. As the statement text can be large, only 60 characters of it are available in IFCID 316, the rest can be retrieved by IFCID 317.

Collection and reporting of most of the 316 fields are preconditioned by the activation of IFCID 318. When IFCID 318 is deactivated, the collection ends and all the associated counters are initialized. So, in case that the values are retrieved (IFCID

Accounting Class 1 Data



For local applications DB2 provides an accumulative timer which includes both CPU spent in application and CPU spent in DB2.

Activity Time is very close to Class 1 Elapsed Time

- For local applications
  - (Elapsed - CPU) time can point to application inefficiencies.
  - Be careful with thread reuse
- For distributed applications that value is not relevant.

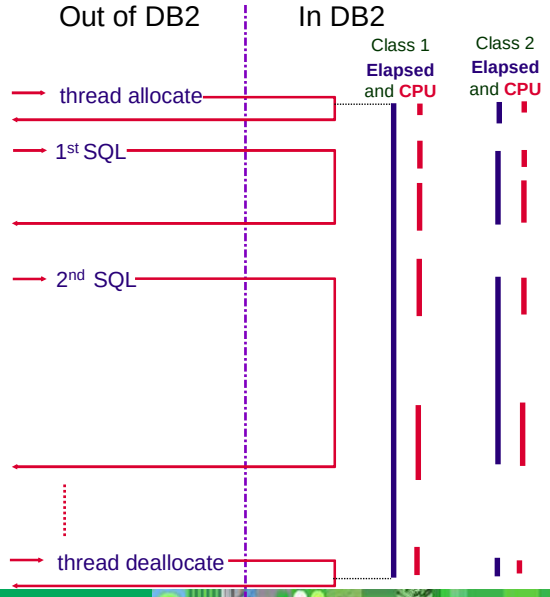
Accounting class 1 data is collected and externalized via DB2 Accounting trace class 1. It includes most of the accounting data, but no time distribution. The data that is included is SQL statistics (such as the number of SELECTs, INSERTs etc.), locking activity (the number of various lock requests, suspensions, time-outs, deadlocks), buffer pools statistics (the number of getpages, synchronous reads, various types of prefetches, writes, sort activity) parallelism data, DDF statistics and many others. The timers that are available via class 1 are elapsed and CPU time as seen from the application, i.e. including both the time spent in DB2 and time spent in application (only after the thread allocation and before thread deallocation).

For the applications that exploit thread reuse (such as CICS and IMS) or maintain very long connections (such as SAP), the class 1 data typically includes time spent in the network and the users think time which makes it less relevant for monitoring and tuning purposes.

The accounting trace class 1 is the vehicle for externalizing accounting records and its cost is generated mostly by writing the records out. Therefore it is proportional to the number of records cut. For the applications with long living threads that cost is negligible, and in general typically very low. In some extreme cases it could go up to 5%.

The accounting class 1 trace can be started at DB2 start (via system parameter SMFACCT) or at any time via START TRACE(A) CLASS(1). The former method is recommended in order to reduce the administration overhead, especially when the cost of running is low.

Accounting Class 2 Data



Class 2 timers are accumulative

Time spent out of DB2 =
Class 1 Elapsed - Class 2 Elapsed

Waiting in DB2 =
Class 2 Elapsed - Class 2 CPU

Class 7 is used for
package/DBRM scope reporting
It is equivalent to Class 2

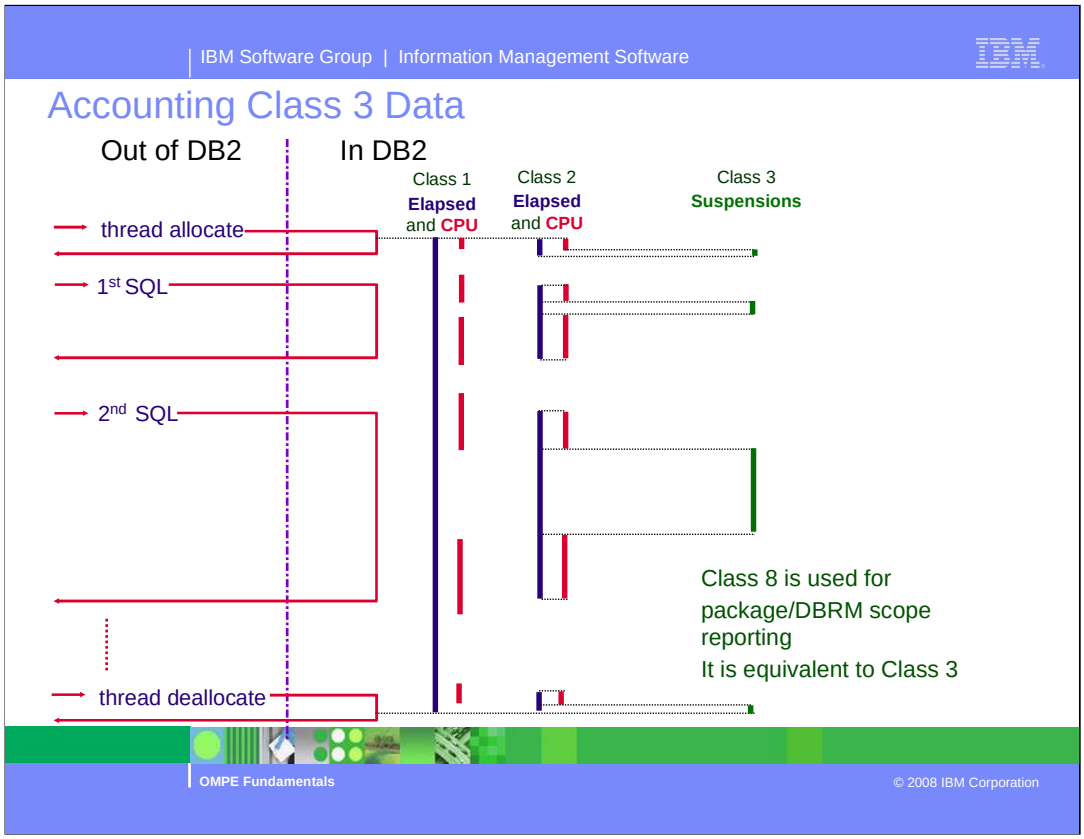
Accounting Class 2 data is collected by the DB2 accounting trace class 2. Unlike class 1 trace it includes the elapsed and CPU times spent solely in DB2. The timers start whenever the application accesses DB2 and get stopped at exists from DB2. The are accumulative in nature, i.e. they show the elapsed and CPU time spend in DB2 since the thread allocation.

Obviously, the trace cost is proportional to number of DB2 entry/exit events. The typical workloads that can drive this cost relatively higher is mass inserts or fetch activity (for each insert or fetch there is one entry into and one exit from DB2). For such workloads the overhead of running the trace can go up to 10%.

It can be stared at DB2 start (via system parameter SMFACCT) or at any time by START TRACE(A) CLASS(2). Due to its potentially higher cost the recommendation is to start is manually and observe the associated overhead. If it is low, the trace should be activated by means of the system parameter. Otherwise, use it only during performance monitoring session.

Note that class 2 trace provide the data at the plan (entire application) level. As many applications are modular, consisting of a number of separate programs that are bound into separate DBRMs and packages, it is very often beneficial to have the same data on a per-program basis. In order to get that data, the accounting trace class 7 needs to be exploited. It is equivalent to the trace class 2, only at the package, i.e. DBRM level. Its value is especially important when monitoring imbedded activity, such as triggers, external user defined functions and stored procedures.

Note that there is also Class 5 accounting trace which collects and reports elapsed and CPU times spent in IFI, i.e. attributed to monitors and data capture processing.



Accounting class 3 data provide detail distribution of suspension times and events. DB2 collects it by means of the accounting trace class 3. Like in the class 2 case, if the same data is needed at the program (i.e. packages and DBRM) level, a separate class (8) is available that provides equivalent information.

The suspension timers are started when a suspension event is encountered and stopped after the suspension is resolved. The are accumulative in nature as well. Consequently, the class 3 (and 8) cost is proportional to the number of suspensions. The suspensions type that has the largest potential to drive the cost of classes 3 and 8 is the DB2 internal latch suspensions. The most common reason for a high number of internal DB2 latch contentions is log contention (an update rate with which your log buffer and more probably log device cannot cope with). Another reason could be EDM pool latch contentions caused by a small EDM pool. If the number of internal DB2 latch suspensions is more than 1000/sec, cost of classes 3 and 8 can grow very high. If that happens, firstly try to get rid of the cause of the problem (i.e. reduce the number of latch suspensions), but in the meantime switch off Classes 3 and 8 in order to get your system more CPU for more productive work. Otherwise the overhead could be so large that having the trace on would hurt more than it would do any good. Typically, the class 3 cost is not higher than 3% (providing the number of internal latch suspensions is at the normal level).

It can be started at DB2 start (via system parameter SMFACCT) or at any time by START TRACE(A) CLASS(3).

DB2 reports both the accumulated time spent being suspended and the number of these events. This allows calculating an average suspension duration. Note that the divisor (the number of events) needs to be first divided by 2, because DB2 increments the counter twice for each suspension.

Elapsed Time Distribution

Thread activity time	=	Class 1 elapsed
Elapsed time spent out of DB2	=	Class 1 elapsed - Class 2 elapsed
Elapsed time spent in DB2	=	Class 2 elapsed
Processing time	=	Class 2 CPU
Waiting time	=	Class 2 elapsed - Class 2 CPU
Suspended time	=	Class 3 suspension time
Not accounted time	=	Waiting time - Suspended time

The following foil demonstrates the thread activity (the part of the application associated with DB2 processing) elapsed time distribution.

The thread activity time coincides with the class 1 elapsed time. It is further broken down into the time spent in DB2 and time spent in application. Note that only the times after the thread allocation and before the thread deallocation are reported, because this is when the DB2 timers are active and know the application.

The time spent in DB2 can be divided into time spent processing (CPU time) and time spent waiting for some kind of suspension. Which kind of suspensions were involved in these waits is visible from the class 3 accounting trace data which specifies which suspension events happened in the thread lifetime: I/O, locking, dataset operations (such as extensions, formatting), commits (with logging) etc. In most cases this information provide very useful pointers to where the performance problem causes might be.

There is a part of the waiting in DB2 that cannot be attributed to any suspension event. DB2 is a formal subsystem of z/OS and in some cases the operating system events can cause waits of which DB2 is not aware of. For example, CPU contention or paging can cause that the elapsed time spent in DB2 increases, but no other counter (CPU nor suspension) gets incremented. This time is called 'not accounted' time and in most cases points to some operating system specific constraints.

By analyzing the elapsed time distribution one can identify where the most time is spent and knowing which processes are done during which time look into these processes for potential performance improvements.

Accounting Report Layout(long) extract

NORMAL TERM.	AVERAGE	TOTAL
NEW USER	0.00	0
DEALLOCATION	0.00	0
APPL.PROGR. END	0.00	0
RESIGNON	0.00	0
DBAT INACTIVE	0.00	0
TYPE2 INACTIVE	0.00	0
RRS COMMIT	0.00	0
END USER THRESH	0.10	95
BLOCK STOR THR	0.00	0
STALENESS THR	0.00	0

- New user / Resignon / DBAT inactive indicate thread reuse
- Rollup accounting active and records rolled up in the trace
- Then averages are calculated base on total "transactions", not # occurrences

Accounting Report Set (long) - pre V8 package accgt

```
--------------------------------------------------------------------------------
|PROGRAM NAME                          CLASS 7 CONSUMERS                       |
|FIJDCAIB          |=> 3%                                                      |
|FIMDCHR           |                                                           |
|FIMDEXR           |                                                           |
|FIMDIRQ           |                                                           |
|FIMDLIST          |===> 6%                                                    |
|FIMDMRPB          |==========================> 53%                            |
|FIMDMTO1          |=> 2%                                                      |
|FIMDMTO2          |                                                           |
|FIMDMTO3          |=> 2%                                                      |
|FIMDMTO4          |=====> 11%                                                 |
|FIMDPH0           |                                                           |
|FIMDPH1           |===========> 22%                                           |
|FIMDREP           |                                                           |
--------------------------------------------------------------------------------
```

FIMDMRPB	VALUE
TYPE	PACKAGE
LOCATION	SYSDSN8
COLLECTION ID	FIJ1
PROGRAM NAME	FIMDMRPB
OCCURRENCES	2
SQL STMT - AVERAGE	10975.00
SQL STMT - TOTAL	21950
STOR PROC EXECUTED	0
UDF EXECUTED	0
USED BY STOR PROC	0
USED BY UDF	0
USED BY TRIGGER	0
SUCC AUTH CHECK	0

FIMDMRPB	TIMES
ELAP-CL7 TIME-AVG	6.680010
CPU TIME	1.227790
AGENT	1.227790
PAR.TASKS	0.000000
SUSPENSION-CL8	5.380605
AGENT	5.380605
PAR.TASKS	0.000000
NOT ACCOUNTED	0.071615
AVG.DB2 ENTRY/EXIT	21978.00
DB2 ENTRY/EXIT	43956
CPU SERVICE UNITS	5513.00
AGENT	5513.00
PAR.TASKS	0.00

FIMDMRPB	AVERAGE TIME	AVG.EV	TIME/EVENT
LOCK/LATCH	0.003073	46.50	0.000066
SYNCHRONOUS I/O	3.218596	554.00	0.005810
OTHER READ I/O	1.379313	136.50	0.010105
OTHER WRITE I/O	0.451942	17.00	0.026585
SERV.TASK SWITCH	0.327681	13.50	0.024273
ARCH.LOG(QUIESCE)	0.000000	0.00	N/C
ARCHIVE LOG READ	0.000000	0.00	N/C
STORED PROC SCHED	0.000000	0.00	N/C
UDF SCHEDULE	0.000000	0.00	N/C
DRAIN LOCK	0.000000	0.00	N/C
CLAIM RELEASE	0.000000	0.00	N/C
PAGE LATCH	0.000000	0.00	N/C
NOTIFY MESSAGES	0.000000	0.00	N/C
GLOBAL CONTENTION	0.000000	0.00	N/C
TOTAL CL8 SUSPENS.	5.380605	767.50	0.007011

Accounting package sections (acctg trace)

```
   ------------------------------------------------------------------------
   |PROGRAM NAME                      CLASS 7 CONSUMERS                   |
   |REPORT1           |==========================> 56%                    |
   |RETRSET           |======================> 44%                       |
   ------------------------------------------------------------------------

REPORT1             VALUE                REPORT1                    TIMES    REPORT1                    TIME  EVENTS    TIME/EVENT
------------------  -------------------  -------------------  ------------  -------------------  ------------  ------  ------------
TYPE                PACKAGE              ELAPSED TIME - CL7      0.307480   LOCK/LATCH              0.000000       0           N/C
LOCATION            VGIDV0G              CP CPU TIME             0.009147   SYNCHRONOUS I/O         0.010964       2      0.005482
COLLECTION ID       UPGMPACK               AGENT                 0.009147   OTHER READ I/O          0.000000       0           N/C
PROGRAM NAME        REPORT1                PAR.TASKS             0.000000   OTHER WRITE I/O         0.000000       0           N/C
CONSISTENCY TOKEN   17F3161407E055CF     IIP CPU TIME            0.000000   SERV.TASK SWITCH        0.230648      13      0.017742
ACTIVITY TYPE       NONNESTED            SUSPENSION-CL8          0.241612   ARCH.LOG(QUIESCE)       0.000000       0           N/C
ACTIVITY NAME       'BLANK'                AGENT                 0.241612   ARCHIVE LOG READ        0.000000       0           N/C
SCHEMA NAME         'BLANK'                PAR.TASKS             0.000000   DRAIN LOCK              0.000000       0           N/C
SQL STATEMENTS                  100     NOT ACCOUNTED           0.056721   CLAIM RELEASE           0.000000       0           N/C
SUCC AUTH CHECK     NO                                                      PAGE LATCH              0.000000       0           N/C
                                         CP CPU SU                    184   NOTIFY MESSAGES         0.000000       0           N/C
                                           AGENT                      184   GLOBAL CONTENTION       0.000000       0           N/C
                                           PAR.TASKS                    0   TOTAL CL8 SUSPENS.      0.241612      15      0.016107
                                         IIP CPU SU                     0

                                         DB2 ENTRY/EXIT               251


REPORT1                   ELAPSED TIME    EVENTS    REPORT1                   ELAPSED TIME    EVENTS
------------------------  ------------  --------    ------------------------  ------------  --------
GLOBAL CONTENTION L-LOCKS      0.000000         0    GLOBAL CONTENTION P-LOCKS      0.000000         0
 PARENT (DB,TS,TAB,PART)       0.000000         0     PAGESET/PARTITION             0.000000         0
 CHILD  (PAGE,ROW)             0.000000         0     PAGE                          0.000000         0
 OTHER                         0.000000         0     OTHER                         0.000000         0
```

Accounting package (trace) - new V8 sections

```
REPORT1                   TOTAL
------------------      --------
SELECT                         0
INSERT                         0
UPDATE                         0
DELETE                         0

DESCRIBE                       0
PREPARE                        0
OPEN                           0
FETCH                          0
CLOSE                          0

LOCK TABLE                     0
CALL                           0

REPORT1                   TOTAL
------------------      --------
BPOOL HIT RATIO (%)            0
GETPAGES                       0
BUFFER UPDATES                 0
SYNCHRONOUS WRITE              0
SYNCHRONOUS READ               0
SEQ. PREFETCH REQS             0
LIST PREFETCH REQS             0
DYN. PREFETCH REQS             0
PAGES READ ASYNCHR.            0
```

```
REPORT1                   TOTAL
----------------------  --------
TIMEOUTS                       0
DEADLOCKS                      0
ESCAL.(SHARED)                 0
ESCAL.(EXCLUS)                 0
MAX PG/ROW LOCKS HELD          0
LOCK REQUEST                   0
UNLOCK REQUEST                 0
QUERY REQUEST                  0
CHANGE REQUEST                 0
OTHER REQUEST                  0
TOTAL SUSPENSIONS              0
 LOCK SUSPENS                  0
 IRLM LATCH SUSPENS            0
 OTHER SUSPENS                 0
```

- More detailed SQL stmt type info / Total BP info / locking info at package level
- This info will be enabled/disabled with accounting class(10) after PK28561
- OMPE always prints these sections even if class 10 is not active (with zero totals as shown above)

Accounting Top processing

- TOP fields - plan related
  - INAPPLET
  - INDB2ET
  - OUTDB2ET
  - INAPPLPT
  - INDB2PT
  - OUTDB2PT
  - INAPPLWT
  - INDB2WT
  - OUTDB2WT
  - TOTSUSTM
  - DMLSTAT
  - DDLSTAT
  - UPDPERCM
  - CMPERUPD
  - TOTSUSP
  - GETPAGES
  - NOTACCT
  - BUFUPDTS
  - SYNCREAD
  - TOTPREF
- TOP fields - package related
  - PINDBET
  - PINDBPT
  - PTSUSTME
  - PNOTACCT

Accounting Top processing example

- Generate an accounting trace report of
  - ONLY the TOP 20
  - DRDA transactions
  - That used the most class2 CPU time
  - Write report to a DDNAME ACTRDRDA
  - Only for DB2A
  - Adjust the time by (subtracting) 5 hours
  - If package information (IFCID 239) is present also package info Check if rollup is active

```
//SYSIN    DD  *
  GLOBAL
  TIMEZONE (+5:00)
     INCLUDE (DB2ID(DB2A))
    ACCOUNTING
     TRACE
      LAYOUT (LONG)
      INCLUDE (CONNTYPE(DRDA))
       TOP (20 ONLY INDB2PT)
DDNAME(ACTRDRDA))
```

```
   LOCATION: DP3G                    OMEGAMON XE FOR DB2 PERFORMANCE EXPERT (V4)                    PAGE: 1-1
      GROUP: DSNDP3G                           ACCOUNTING TRACE - LONG                  REQUESTED FROM: NOT SPECIFIE
     MEMBER: DP33                                                                                TO: NOT SPECIFIE
  SUBSYSTEM: DP33                                                                        ACTUAL FROM: 07/09/08 19:
DB2 VERSION: V8

TOP FIELD: PROCESSING (CL.2) TIME SPENT IN DB2                  TOP NUMBER REQUESTED:   20

---- IDENTIFICATION ------------------------------------------------------------------------------------------------
ACCT TSTAMP: 07/09/08 19:32:45.90    PLANNAME: DISTSERV        WLM SCL: DDFDB2          CICS NET: N/A
BEGIN TIME : 07/09/08 19:03:20.45    PROD TYP: N/P                                      CICS LUN: N/A
END TIME   : N/P                     PROD VER: N/P             LUW NET: DP33            CICS INS: N/A
REQUESTER  : DP3G                    CORRNAME: javaw.ex        LUW LUN: DP33
MAINPACK   : *ROLLUP*                CORRNMBR: e               LUW INS: C2A6A1712E7D    ENDUSER : rw110
PRIMAUTH   : RW110                   CONNTYPE: DRDA            LUW SEQ:            1    TRANSACT: javaw.exe
ORIGAUTH   : RW110                   CONNECT : SERVER                                   WSNAME  : DSDLDAVISB1
```

INCLUDE / EXCLUDE options

Table 3. Performance Expert identifiers used with INCLUDE and EXCLUDE subcommand option

Performance Expert identifier	ACCT	AUD	I/O	LOCK	RT	SQL	STAT	UTIL	GLOB
ACE (Agent control element address)					t,f	r,t,p			all
CLASS (DB2 trace class)					t,f				all
CONNECT (Connection ID)	r,t,p,f	r,t,p,f	t,p	r,t,p,f	t,f	r,t,p		r,t,p	all
CONNTYPE (Connection type)	r,t,p,f	r,t,p,f	t,p	r,t,p,f	t,f	r,t,p		r,t,p	all
CORRNAME (Correlation name)	r,t,p,f	r,t,p,f	t,p	r,t,p,f	t,f	r,t,p		r,t,p	all
CORRNMBR (Correlation number)	r,t,p,f	r,t,p,f	t,p	r,t,p,f	t,f	r,t,p		r,t,p	all
DATABASE (Database name)			t,p	r,t,p,f					all
DATASET (Data set name)			t,p						all
ENDUSER (End user ID)	r,t,p,f	r,t,p,f		r,t,p,f	t,f	r,t,p,f			
FIELD (Comparison with data in a record field)					t,f				all
GROUP (Group name)	r,t,p,f	r,t,p,f	t,p	r,t,p,f	t,f	r,t,p	r,t,p,f	r,t,p	all
IFCID (Instrumentation Facility Component Identifier)					t,f	r,t,p			all
INSTANCE (Instance number)	r,t,f	r,t,p,f		t,f	t,f	r,t,p		r,t,p	all
LOCATION (Location name)	r,t,p,f	r,t,p,f	t,p	r,t,p,f	t,f	r,t,p	r,t,p,f	r,t,p	all
MAINPACK (Main package)	r,t,p,f								
MEMBER (Member name)	r,t,p,f	r,t,p,f	t,p	r,t,p,f	t,f	r,t,p	r,t,p,f	r,t,p	all
ORIGAUTH (Original authorization ID)	r,t,p,f	r,t,p,f	t,p	r,t,p,f	t,f	r,t,p		r,t,p	all
PACKAGE (Package information) or PROGRAM (Program information)	r,t,p,f								
PAGESET (Page set name)			t,p	r,t,p,f					all
PLANNAME (Plan name)	r,t,p,f	r,t,p,f	t,p	r,t,p,f	t,f	r,t,p		r,t,p	all

Table 3. Performance Expert identifiers used with INCLUDE and EXCLUDE subcommand option (continued)

Performance Expert identifier	ACCT	AUD	I/O	LOCK	RT	SQL	STAT	UTIL	GLOB
PRIMAUTH (Primary authorization ID) or AUTHID (Authorization ID)	r,t,p,f	r,t,p,f	r,p	r,t,p,f	t,f	r,t,p		r,t,p	all
REQLOC (Requester location)	r,t,p,f	r,t,p,f	r,p	r,t,p,f	t,f	r,t,p		r,t,p	all
RESOURCETYPE (Resource type)				r,t,p,f					
RMID (Resource manager identifier)					t,f				all
SQLCODE					t,f	t			
SUBSYSTEMID (Subsystem ID)	r,t,p,f	r,t,p,f	r,p	r,t,p,f	t,f	r,t,p	r,t,p,f	r,t,p	all
THREADTYPE (Thread type)	r,t,p,f	r,t,p,f	r,p	r,t,p,f	t,f	r,t,p		r,t,p	
TRANSACT (End user transaction name)	r,t,p,f	t,p,f	r,t,p,f	t,f	r,t,p,f				
TYPE (Event type)				r,t,f					
WSNAME (End user workstation name)	r,t,p,f	t,p,f		r,t,p,f	t,f	r,t,p,f			

Note: The use of PLANNAME as a filter for Accounting reports in a DDF environment can cause unexpected results. See "Special considerations for DDF trace data" on page 37.

Accounting Trace (short)

```
   LOCATION: SYSDSN7                        DB2 PERFORMANCE MONITOR (V7)                          PAGE: 1-1
      GROUP: DSN7                             ACCOUNTING TRACE - SHORT                  REQUESTED FROM: NOT SPECIFIED
     MEMBER: SG71                                                                              TO: NOT SPECIFIED
  SUBSYSTEM: SG71                                                                    ACTUAL FROM: 04/24/01 08:21:22.85
DB2 VERSION: V7                                                                        PAGE DATE: 04/24/01

PRIMAUTH CORRNAME CONNECT   ACCT TIMESTAMP COMMITS   OPENS UPDATES INSERTS  EL. TIME(CL1)  EL. TIME(CL2) GETPAGES SYN.READ LOCK SUS
PLANNAME CORRNMBR THR.TYPE TERM. CONDITION SELECTS FETCHES DELETES PREPARE  CPU TIME(CL1)  CPU TIME(CL2) BUF.UPDT TOT.PREF LOCKOUTS
-------- -------- -------- ---------------- ------- ------- ------- ------- -------------- -------------- -------- -------- --------

JEN      JENJBMRM BATCH    08:21:22.855435      17    2429     322    2104      18.854923      12.994234    42692     1057       10
FIJ1BAT  'BLANK'  ALLIED   NORM DEALLOC       3505    6288     233       0       3.657565       2.598451    17997      351        0

   ------------------------------------------------------------------------------
   |PROGRAM NAME        TYPE      SQLSTMT  CL7 ELAP.TIME   CL7 CPU TIME  CL8 SUSP.TIME  CL8 SUSP|
   |FIMDPH0             PACKAGE        27       0.062866       0.003673       0.058697         2|
   |FIMDPH1             PACKAGE       403       3.598929       0.599123       2.994598       354|
   |FIMDIRQ             PACKAGE         2       0.002423       0.000706       0.001796         1|
   |FIMDCHR             PACKAGE         6       0.073416       0.001200       0.072333         2|
   |FIMDREP             PACKAGE        27       0.002771       0.002436            N/P       N/P|
   |FIMDEXR             PACKAGE        49       0.003984       0.003895            N/P       N/P|
   |FIMDMRPB            PACKAGE     10975       6.664664       1.235758       5.358279       751|
   |FIMDMTO1            PACKAGE       263       0.320842       0.039257       0.283440        62|
   |FIMDMTO2            PACKAGE        92       0.010085       0.008776            N/P       N/P|
   |FIMDMTO3            PACKAGE       250       0.326448       0.049734       0.274011        27|
   |FIMDMTO4            PACKAGE      4761       1.480512       0.557355       0.871868       132|
   |FIJDCAIB            PACKAGE       456       0.447282       0.096527       0.333334        66|
   ------------------------------------------------------------------------------

JEN      JENJBMRM BATCH    08:21:28.538964       1       1       0       0       1.179661       1.046372      529       33        0
FIJ1BAT  'BLANK'  ALLIED   NORM DEALLOC       1159     229       0       0       0.166724       0.140499        0        7        0

   ------------------------------------------------------------------------------
   |PROGRAM NAME        TYPE      SQLSTMT  CL7 ELAP.TIME   CL7 CPU TIME  CL8 SUSP.TIME  CL8 SUSP|
   |FIMDLIST            PACKAGE      1390       1.046320       0.140450       0.896530        36|
   ------------------------------------------------------------------------------
```

Accounting INTERVAL processing

- Can 'roll up' accounting records in intervals, for example 5 minute interval in case you need need to see how the system performs over time
  - For example to find a peak or drop in workoad
  - Use REDUCE INTERVAL(x) and REPORT ORDER(INTERVAL)
  - Is processing intensive to generate such a report. Therefore filter as much as possible
  - May also need to adjust
    //SORTWK0x DD UNIT=SYSDA,SPACE=(CYL,(500,500))
  - Or add more SORTWKxx DD statements for sorting

- Also works for STATISTICS
  - Don't 'roll up' statistics into INTERVALs smaller than the DB2 STATIME interval
    - Eg if STATIME=5 , using INTERVAL(1) does not make any sense
      Report will show 5 identical values for 5 minutes

Accounting INTERVAL processing example

- Generate an accounting report report
  - For 1 minute interval
  - Per connection type
  - Write report to a DDNAME ACTRDRDA
  - Takes a lot of work to produce.
    Therefore limit the scope as much as you can
    - Only for D2PL
    - Using FROM , TO
    - Only for specific plans ..

```
//SYSIN   DD  *
  GLOBAL
  TIMEZONE (+5:00)
  FROM(,08:55:00.00)
  TO(,09:05:00.00)
INCLUDE( DB2ID(D2PL))
ACCOUNTING
  REDUCE
    INTERVAL(1)
  REPORT
    LAYOUT(LONG)
    ORDER(CONNTYPE-
INTERVAL)
    EXCLUDE(PACKAGE(*))
```

```
 LOCATION: MEMD2PB                    OMEGAMON XE FOR DB2 PERFORMANCE EXPERT (V4)                PAGE: 1-1
      GROUP: D2PBDSNG                          ACCOUNTING REPORT - LONG                REQUESTED FROM: ALL      08:
     MEMBER: D2PL                                                                              TO: DATES    09:
  SUBSYSTEM: D2PL                              ORDER: CONNTYPE-INTERVAL                 INTERVAL FROM: 06/30/08 08:
DB2 VERSION: V8                                    SCOPE: MEMBER                              TO: 06/30/08 09:
…
CONNTYPE: DRDA  INTERVAL: 06/30 08:55 - 06/30 08:56
…
CONNTYPE: DRDA  INTERVAL: 06/30 08:56 - 06/30 08:57
…
CONNTYPE: DRDA  INTERVAL: 06/30 08:57 - 06/30 08:58
…
CONNTYPE: DRDA  INTERVAL: 06/30 08:58 - 06/30 08:59
…

CONNTYPE: IMS-MPP  INTERVAL: 06/30 08:55 - 06/30 08:56
…
CONNTYPE: IMS-MPP  INTERVAL: 06/30 08:56 - 06/30 08:57
…
CONNTYPE: IMS-MPP  INTERVAL: 06/30 08:57 - 06/30 08:58
…
CONNTYPE: IMS-MPP  INTERVAL: 06/30 08:58 - 06/30 08:59
…
```

Accounting only package info

- Both package and DBRM
- Be careful when rollup is active

```
//SYSIN    DD  *
  GLOBAL
    TIMEZONE (+5:00)
    INCLUDE (DB2ID(DB2A))
  ACCOUNTING
    REPORT
      ORDER(PROGRAM) DDNAME(ACRPPG)
      LAYOUT (SHORT)
```

```
   LOCATION: DP3G                        OMEGAMON XE FOR DB2 PERFORMANCE EXPERT (V4)                    PAGE: 1-1
      GROUP: DSNDP3G                              ACCOUNTING REPORT - SHORT                  REQUESTED FROM: NOT SPECIFIE
     MEMBER: DP33                                                                                    TO: NOT SPECIFIE
  SUBSYSTEM: DP33                                    ORDER: PACKAGE                          INTERVAL FROM: 07/09/08 18:
DB2 VERSION: V8                                     SCOPE: MEMBER                                    TO: 07/09/08 19:

                                                         TYPE            SQLSTMT    CL7 CPU TIME  CL8 SUSP
PACKAGE                                                   #OCCURS  CL7 ELAP.TIME  CL8 SUSP.TIME
---------------------------------------------------------  --------  -------------  -------------  --------

'BLANK'.'BLANK'.DSNTIAUL                                 DBRM             373.00       0.013646     25.00
                                                                1       0.344343       0.329956

'BLANK'.'BLANK'.NAA0210                                  DBRM              26.0K       0.641476    402.25
                                                                4       0.918041       0.185402

'BLANK'.'BLANK'.NAC0310                                  DBRM             360.3K      13.319734   1673.00
                                                                1      16.550562       1.034322
```

System Parameters Report Set

- **SYSPARMS TRACE** command
- Show configuration information of subsystem.
  - so called "ZPARM's“
- Based on IFCID 106 (ZPARMS) , 202 (BP config)
- ALWAYS good to verify these in each trace/report
- New entry is produced when system parameters change.
- Buffer pool and group buffer pool changes are reported as well.

Locking Report Sets

- Provides detail information about
  - DB2 transaction locks
    - Suspensions
    - Timeouts
    - Deadlocks
  - DB2 drain locks and DB2 claims
  - DB2 lock avoidance and related data, like page latches
  - Global locks in a data sharing environment
- Reports summarize locking information per DB2 PM identifier.
  - Lock suspension report
  - Lockout report
- Traces list individual locking events.
  - Lock suspension trace
  - Deadlock trace
  - Timeout trace
  - Lockout trace
  - Lock detail trace

Locking Report - Suspension

- LOCKING REPORT
  LEVEL(SUSPENSION)
  ORDER(DATABASE-PAGESET)
- Requires perf class(6) data
- Locking is an IRLM "thing" so does not show (all) DB2 latches

➲ Look for objects with many suspensions

➲ Look for objects with long AET per suspension

```
.....
   LOCATION: DP10                        DB2 PERFORMANCE MONITOR (V8.1)                          PAGE: 1-69
      GROUP: DSNDP10                       LOCKING REPORT - SUSPENSION                  REQUESTED FROM: NOT SPECIFIED
                                                                                                    TO: NOT SPECIFIED
                                         ORDER: DATABASE-PAGESET                      INTERVAL FROM: 07/10/06 15:03:51.82
DB2 VERSION: V8                             SCOPE: GROUP                                        TO: 07/10/06 15:07:35.68

DATABASE                                                                -SUSPEND REASONS-- ---------- R E S U M E   R E A S O N S ----------
 PAGESET           --- L O C K   R E S O U R C E ---  TOTAL    LOCAL  GLOB.  S.NFY  --- NORMAL ----  TIMEOUT/CANCEL  --- DEADLOCK ---
  MEMBER           TYPE     NAME                     SUSPENDS  LATCH  IRLMQ  OTHER NMBR       AET NMBR       AET NMBR       AET
---------------- -------- ---------------------- ---------- -----  -----  ----- ---- ---------- ---- ---------- ---- ----------
DABISKR
 TKRACTIV
  DP14            PAGE     PAGE=X'0473B6'              1      0      0      0    1    0.003462    0       N/C    0       N/C
                           BPID=BP4                             0      0      1
                  PAGEPLCK PART=    6                  1      0      0      0    1    0.001018    0       N/C    0       N/C
                           PAGE=X'045A11'                       1      0      0
                           BPID=BP4
                  PAGEPLCK PART=    1                 11      0     10      0   11    0.007481    0       N/C    0       N/C
                           PAGE=X'0473B6'                       1      0      0
                           BPID=BP4
                  PAGESET  N/P                       283      4    275      0  283    0.002007    0       N/C    0       N/C
                                                               7      0      0
                  ** SUM OF DP14                  *  296      4    285      0  296    0.002212    0       N/C    0       N/C
                                                               9      0      1
....
```

Locking Trace

```
   LOCATION: SYSDSN7                          DB2 PERFORMANCE MONITOR (V7)                          PAGE: 1-1
      GROUP: DSN7                               LOCKING TRACE - DETAIL                  REQUESTED FROM: NOT SPECIFIED
     MEMBER: SG71                                                                                   TO: NOT SPECIFIED
  SUBSYSTEM: SG71                                                                      ACTUAL FROM: 04/21/01 22:01:36.62
DB2 VERSION: V7                                    SCOPE: MEMBER                        PAGE DATE: 04/21/01
PRIMAUTH CORRNAME CONNTYPE
ORIGAUTH CORRNMBR INSTANCE     EVENT TIMESTAMP            --- L O C K   R E S O U R C E ---
PLANNAME CONNECT               RELATED TIMESTAMP EVENT    TYPE      NAME                    EVENT SPECIFIC DATA
------------------------------ ----------------- -------- --------- ----------------------- ----------------------------------------
SYSOPR   020.CLST 'BLANK'      22:01:36.62217251 UNLOCK   N/P       N/P                     DURATION=PLAN     STATE=X'00' XES PROP=N
SYSOPR   AT01     B2BB079820D3 MASS              REQUEST                                    RSN CODE=X'40'    RTNCD=12    XES FORC=N
'BLANK'  SG53                                                                             NMODIFY LOCAL  L-LOCK
                                                                                          HASH    =X'00000000'

SYSOPR   022.CKPA 'BLANK'      22:01:36.62572268 LOCK     PAGESET   DB  =DSNDB06           DURATION=ALLOCATN STATE=IS    XES PROP=Y
SYSOPR   0201     B2BB079821AE                    REQUEST           OB  =SYSUSER            RSN CODE= 0       RTNCD= 0    XES FORC=N
'BLANK'  SG53                                                                             NMODIFY GLOBAL L-LOCK         XES ASYN=N
                                                                                          HASH    =X'00000F06'

                               22:01:36.62580782 LOCK     PAGESET   DB  =DSNDB06           DURATION=ALLOCATN STATE=IS    XES PROP=Y
                                                 REQUEST           OB  =SYSPLAN            RSN CODE= 0       RTNCD= 0    XES FORC=N
                                                                                          NMODIFY GLOBAL L-LOCK         XES ASYN=N
                                                                                          HASH    =X'00000A06'

                               22:01:36.62595584 CLAIM    PAGESET   DB  =DSNDB06           DURATION=COMMIT    CLASS=RR
                                                 ACQUIRE           OB  =DSNAUH01           RSN CODE= 0        RTNCD= 0

                               22:01:36.62605962 LOCK     DATAPAGE  DB  =DSNDB06           DURATION=MANUAL   STATE=S     XES PROP=N
                                                 REQUEST           OB  =SYSUSER            RSN CODE= 0       RTNCD= 4    XES FORC=N
                                                                   PAGE=X'000002'          NMODIFY GLOBAL L-LOCK
                                                                                           PARENT  =X'1151E804'
                                                                                           HASH    =X'00035802'
```

Locking Trace - Deadlock

```
   LOCATION: SG71                          DB2 PERFORMANCE MONITOR (V7)                          PAGE: 1-8
      GROUP: N/P                            LOCKING TRACE - DEADLOCK                  REQUESTED FROM: NOT SPECIFIED
     MEMBER: N/P                                                                                TO: NOT SPECIFIED
  SUBSYSTEM: SG71                                                                   ACTUAL FROM: 04/20/01 18:17:54.70
DB2 VERSION: V7                                  SCOPE: MEMBER                        PAGE DATE: 04/20/01
PRIMAUTH CORRNAME CONNTYPE
ORIGAUTH CORRNMBR INSTANCE     EVENT TIMESTAMP            --- L O C K   R E S O U R C E ---
PLANNAME CONNECT               RELATED TIMESTAMP EVENT    TYPE      NAME                    EVENT SPECIFIC DATA
------------------------------ ----------------- -------- --------- ----------------------- ----------------------------------------
FRNI     FRNI     CICS         18:21:24.84026606 DEADLOCK                                   COUNTER = 117K     WAITERS =    2
FRNI     GT06     B527EABFBD93 N/P                                                          TSTAMP  =04/20/01 18:21:24.83
FRNMFRNI CNATB02C                                         DATAPAGE  DB  =FRNDB110          HASH    =X'00D60F02'
                                                                    OB  =AVT06TS           ---------- BLOCKER is HOLDER -----------
                                                                    PAGE=X'000302'         LUW=DB2K.DB2K.B527EAC7A2C1
                                                                                           MEMBER  =N/P       CONNECT =CNATB02C
                                                                                           PLANNAME=FRNMFRNI  CORRID  =GT13FRNI
                                                                                           DURATION=COMMIT    PRIMAUTH=FRNI
                                                                                           STATE   =X
                                                                                           --------------- WAITER -------*VICTIM*-
                                                                                           LUW=DB2K.DB2K.B527EABFBD93
                                                                                           MEMBER  =N/P       CONNECT =CNATB02C
                                                                                           PLANNAME=FRNMFRNI  CORRID  =GT06FRNI
                                                                                           DURATION=MANUAL    PRIMAUTH=FRNI
                                                                                           REQUEST =LOCK      WORTH   =   17
                                                                                           STATE   =S
....
....
```

- Deadlock (172) and timeout (196) info can almost always be obtained
- Are written with stats trace class(3) that is normally always active
- LOCKING
  TRACE
    LEVEL (LOCKOUT)
  Lists both deadlocks and timeouts

SQL Activity Report Set

- Unit of reporting is a SQL statement within a thread.
- Reports details of SQL statement activity:
  - Workload highlights
  - Scan, RID list, and query parallelism activity
  - Sort and I/O activities
  - Lock suspensions, and page locking
  - Exit activity
  - Data capture activity
  - Prepare (minibind) information
  - Accounting
  - Host variable value
- Provides various levels of summarization.
  - Occurrence
  - Statement number
  - Cursor
  - Program
  - Statement type

SQL Activity Report Set ...

- Can merge distributed activity belonging to the same logical unit of work
- Traces show SQL statement activity of one thread
  - Can only handle 999 threads at a time
- Reports show SQL statement activity of an aggregation of threads, e.g. primauth-planname (default) combinations

```
SQLACTIVITY REPORT
             SUMMARIZEBY (STMTNO)
             WORKLOAD(SCAN)
             SORTBY(TCBTIME)
               ORDER(PLANNAME)
```

- Support of Query Sysplex Parallelism
  - Records of parallel tasks reported for the originating task
  - Workload reported for each member
  - CPU times in Query Parallelism workload block normalized to processor speed of originating task

SQL Activity Report Set ...

- Very processing intensive
  - Try to limit the scope as much as possible
    - FROM / TO, INSTANCE / PLANNAME …
  - Make sure to allocate enough and big //SORTWKxx DD
  - Make sure to allocate a big //SQLWORK DD
  - Sometimes results in ‘funny’ abends
    - S0C4 in sort
      - Sometimes more //SORTWKxx helps
    - S878 , S80A because
      - Sometimes playing with the REGION parm helps

SQL Activity Report Set ...

- sqlactivity
  - trace
    - summarizeby(cursor)
    - workload(none)

```
   LOCATION: DB8A                          OMEGAMON XE FOR DB2 PERFORMANCE EXPERT (V4)
      GROUP: N/P                                SQL ACTIVITY - TRACE
     MEMBER: N/P
  SUBSYSTEM: DB8A
DB2 VERSION: V8
                                                 SUMMARIZED BY CURSOR

                            PRIMAUTH: BART              CONNECT : BATCH              CORRNAME: DB8AEJ2C  CONNTYPE: TSO
                            ORIGAUTH: BART              PLANNAME: DSN8BH81           CORRNMBR: 'BLANK'   THRDTYPE: ALLIED
                            ENDUSER : 'BLANK'           WSNAME  : 'BLANK'            TRANSACT: 'BLANK'

TRACE # 1.1                 DB2 LUWID: USIBMSC.SCPDB8A.X'BFA27B976FB5'                       ACE ADDRESS: X'2023FCA8'

START TIME: 10/31/06 08:47:46.06  START ELAPSED:               0.000332    START REASON: CREATE THREAD
STOP TIME : 10/31/06 08:47:46.09  STOP ELAPSED :               0.000829    STOP REASON : TERMINATE THREAD

      EVENT            COUNT     TOT.ELAPS  TOTAL TCB                                  DETAIL
                                 AET/EVENT  TCB/EVENT
------------------- ---------- ---------- --------- ------------------------------------------------------------------------------

DBRM                                          DSN8BC3

TELE1                        1    0.006945  0.003317 STMTTYPE             COUNT   AET/OCCUR TCB/OCCUR
                                  0.006945  0.003317 CLOSE                    1    0.000018  0.000013
                                                     FETCH                   43    0.000161  0.000076
                                                     OPEN                     1    0.000021  0.000015

TELE2                        2    0.002606  0.001558 STMTTYPE             COUNT   AET/OCCUR TCB/OCCUR
                                  0.001303  0.000779 CLOSE                    2    0.000013  0.000008
                                                     FETCH                   10    0.000250  0.000149
                                                     OPEN                     2    0.000040  0.000024

TELE3                        3    0.002489  0.001452 STMTTYPE             COUNT   AET/OCCUR TCB/OCCUR
                                  0.000830  0.000484 CLOSE                    3    0.000013  0.000008
                                                     FETCH                    6    0.000390  0.000227
                                                     OPEN                     3    0.000037  0.000022

#   541                      1    0.000288  0.000142 UPDATE                           ISO(CS) REOPT(NO)  KEEP UPD LOCKS: N/A
                                  0.000288  0.000142
```

SQL Activity Report Set ...

- sqlactivity
  - trace
    - summarizeby(occurrence)
    - workload(all)

```
   LOCATION: DB8A                          OMEGAMON XE FOR DB2 PERFORMANCE EXPERT (V4)
      GROUP: N/P                                SQL ACTIVITY - TRACE
     MEMBER: N/P
  SUBSYSTEM: DB8A
DB2 VERSION: V8
                                      SUMMARIZED BY OCCURRENCE, WITH ALL WORKLOAD
    .....

TRACE # 1.1                 DB2 LUWID: USIBMSC.SCPDB8A.X'BFA27B976FB5'                    ACE ADDRESS: X'2023FCA8'

START TIME: 10/31/06 08:47:46.06  START ELAPSED:               0.000332    START REASON: CREATE THREAD
STOP TIME : 10/31/06 08:47:46.09  STOP ELAPSED :               0.000829    STOP REASON : TERMINATE THREAD

NL     EVENT          TIMESTAMP   ELAP.TIME  TCB  TIME                                  DETAIL
------------------- ---------- ---------- -------- ------------------------------------------------------------------------------------

FETCH               08:47:46.08    0.000512  0.000282 STMT#        495 CURSOR: TELE3                    SQLST:00000 SQLCO:     0
                                                      SENSITIVE(UNS)   ORIENTATION(NEXT)
     --- WORKLOAD HILITE ------------------------------------------------------------------------------------------------------------
     SCANS    :      3  RECS/SORT:   N/P  I/O REQS:      N/P  SUSPENDS   :      N/P  EXITS     :       23  AMS             :      N/P
     ROWSPROC:     62  WORK/SORT:   N/P  AET/I/O :      N/P  AET/SUSP   :      N/P  AET/EXIT : 0.000003  AET/AMS         :      N/P
     PAGESCAN:     13  PASS/SORT:   N/P  DATACAPT:      N/P  RIDS UNUSED:      N/P  CHECKCON :      N/P  DEGREE REDUCTION :      N/P
     LOB_PAGSCAN:         0          LOB_UPD_PAGE :         0
     --- SCAN ACTIVITY --------------------------------------------------------------------------------------------------------------
                                 ------ROWS------  --QUALIFIED AT--  ----------ROWS----------          --PAGES- ---------RI--------
     DATABASE  PAGESET   SCANS   PROCESS  EXAMINE  STAGE 1  STAGE 2  INSERTS  UPDATES  DELETES          SCANNED     SCANS  DELETES
     MEMBER    TYPE
     DSN8D81A  12            1         1        0        0        1        0        0        0                2         0        0
     N/P       INDX
     DSN8D81A  21            1        42       41        1        2        0        0        0               10         0        0
     N/P       INDX
     DSN8D81A  21            1        19       19        0        0        0        0        0                1         0        0
     N/P       SEQD
     TOTAL                   3        62       60        1        3        0        0        0               13         0        0
     --- EXITS ---------------------------------------------------
     MEMBER     VALIDATION TOTAL   AET/EXIT   EDIT TOTAL   AET/EXIT
     N/P                   0        N/C           23   0.000003
```

SQL Activity Report Set ...

- sqlactivity
  trace
  summarizeby(occurrence)
  workload(all,vars)

- Requires IFCID 247 input host variable
- Only IFCID 247 supported

If you need 248 (output host var) use rectrace

```
  LOCATION: DB8A                              OMEGAMON XE FOR DB2 PERFORMANCE EXPERT (V4)
     GROUP: N/P                                    SQL ACTIVITY - TRACE
    MEMBER: N/P
 SUBSYSTEM: DB8A
DB2 VERSION: V8
                                                                :KLOAD

                                                                        CORRNAME: DB8AEJ2C  CONNTYPE: TSO
                                                                        CORRNMBR: 'BLANK'   THRDTYPE: ALLIED
                                                                        TRANSACT: 'BLANK'
TRAC                                                                            ACE ADDRESS: X'2023FCA8'

START TIME: 10/31/06 08:47:46.06  START ELAPSED:                0.000332    START REASON: CREATE THREAD
STOP TIME : 10/31/06 08:47:46.09  STOP ELAPSED :                0.000829    STOP REASON : TERMINATE THREAD

NL     EVENT          TIMESTAMP   ELAP.TIME  TCB  TIME                                DETAIL
-------------------- ----------- ---------- --------- ----------------------------------------------------------------------------

DBRM                                                 DSN8BC3

OPEN                08:47:46.08    0.000039  0.000024 STMT#        492 CURSOR: TELE3             ISO(CS) SQLST:00000 SQLCO:     0
                                                     REOPTIMIZED(NO)  KEEP UPDATE LOCKS(NO)  SCROLL(NO)  SENSITIVE(UNS) TABLE(UNS)
      --- HOST VARIABLES ---------------------------------------------------------------------------------------------
      LOCATION : DB8A              COLLID :                      PROGNAME : DSN8BC3            CONSIS_TOKEN : X'17F44F39047E486B'
      STMT_NO  : 492         FORMAT : 1 - COMPLETE      NO.SQLDA ENTRIES : 2
      ......................................................................................................................
        ENTRY_NO. : 1           NAME :                               NULL_INDICATOR : NO   SQLTYPE : 452
        DATA_TYPE : FIXED-LENGTH CHARACTER STRING         DATA_LENGTH : 15
        PRECISION : N/A  SCALE : N/A  ADDR_HOST_VAR : X'24602151'  ADDR_IND_VAR : X'24602A58'
        DATA      :   SMITH
        ....................................................................................................................
        ENTRY_NO. : 2           NAME :                               NULL_INDICATOR : NO   SQLTYPE : 448
        DATA_TYPE : VARYING-LENGTH CHARACTER STRING       DATA_LENGTH : 12
        PRECISION : N/A  SCALE : N/A  ADDR_HOST_VAR : X'246022F0'  ADDR_IND_VAR : X'24602A58'
        DATA      : %
        ....................................................................................................................
```

Rectrace with IFCID 248 ...

- IFCID 248 output host variable

```
PRIMAUTH CONNECT   INSTANCE      END_USER       WS_NAME                    TRANSACT
ORIGAUTH CORRNAME  CONNTYPE      RECORD TIME    DESTNO ACE IFC  DESCRIPTION   DATA
PLANNAME CORRNMBR                TCB CPU TIME              ID
-------- -------- ----------- ---------------- ------ --- --- ------------ ----------------------------------------------------
BART     BATCH    BFA27B976FB5 'BLANK'          'BLANK'                    'BLANK'
BART     DB8AEJ2C TSO         08:47:46.08417492   1375   7 248 SQLDA & HOST   NETWORKID:  USIBMSC   LUNAME:  SCPDB8A   LUWSEQ:     1
DSN8BH81 'BLANK'                    0.01861695                VAR TRACING
         |-------------------------------------------------------------------------------------------------------------------|
         |0000  C4C2F8C1  40404040  40404040  40404040   40404040  40404040  40404040  40404040  | DB8A
         |0020  4040C4E2  D5F8C2C3  F3404040  40404040   40404040  17F44F39  047E486B  00000007  |   DSN8BC3           .4|..=.,....
         |0040  002C4000  000001EF  004E0054  00560004   C4C2F8C1  00000007  C4E2D5F8  C2C3F3    | .. ......+......DB8A....DSN8BC3
         |...................................................................................................................|
         |0000  01C0000C  24602869  24602A58  00000002   00000000  00004040  40404040  40404040  | .{...-...-............
         |0020  40404040  40404040  40404040  40404040   40404040  00000000  00000000  00000000  |                      ............
         |0040  00000000  00000000  00000000  0000                                               | ..............
         |...................................................................................................................|
         |0000  000A0006  C4C1D5C9  C5D3                                                        | ....DANIEL
         |-------------------------------------------------------------------------------------------------------------------|
.........
                           08:47:46.08419397   1377   7 248 SQLDA & HOST   'BLANK'
                                 0.01862627                VAR TRACING   NETWORKID:  USIBMSC   LUNAME:  SCPDB8A   LUWSEQ:     1
       |-------------------------------------------------------------------------------------------------------------------|
       |0000  C4C2F8C1  40404040  40404040  40404040   40404040  40404040  40404040  40404040  | DB8A
       |0020  4040C4E2  D5F8C2C3  F3404040  40404040   40404040  17F44F39  047E486B  00000007  |   DSN8BC3           .4|..=.,....
       |0040  002C4000  000001EF  004E0054  00560004   C4C2F8C1  00000007  C4E2D5F8  C2C3F3    | .. ......+......DB8A....DSN8BC3
       |...................................................................................................................|
       |0000  01C40004  24602878  24602A58  00000004   00000000  00004040  40404040  40404040  | .D...-...-............
       |0020  40404040  40404040  40404040  40404040   40404040  00000000  00000000  00000000  |                      ............
       |0040  00000000  00000000  00000000  0000                                               | ..............
       |...................................................................................................................|
       |0000  00080004  F0F9F6F1                                                              | ....0961
       |-------------------------------------------------------------------------------------------------------------------|
.........
BART     BATCH    BFA27B976FB5 'BLANK'          'BLANK'                    'BLANK'
BART     DB8AEJ2C TSO         08:47:46.08432648   1381   7  58 END SQL    <-- NETWORKID:  USIBMSC   LUNAME:  SCPDB8A   LUWSEQ:     1
DSN8BH81 'BLANK'                    0.01865004
```

Record Trace Report Set

- Formats individual IFCID trace records.
- Records can be shown in a short, long, or dump format.
- Represents most detailed level of performance data.
- Unfortunately have to resort too often to this gory level of detail

Record Trace Report Set

- Instance number
- ACE just a number (real address at the end of the trace)
- Some fields just have field name
  - Usually serviceability fields
  - see DSNWMSGS or code for details

```
   LOCATION: SYSDSN7                        DB2 PERFORMANCE MONITOR (V7)                          PAGE: 1-1
      GROUP: DSN7                                RECORD TRACE - LONG                  REQUESTED FROM: NOT SPECIFIED
     MEMBER: SG71                                                                              TO: NOT SPECIFIED
  SUBSYSTEM: SG71                                                                     ACTUAL FROM: 04/21/01 22:01:36.61
DB2 VERSION: V7                                                                         PAGE DATE: 04/21/01

PRIMAUTH CONNECT   INSTANCE      END_USER       WS_NAME                    TRANSACT
ORIGAUTH CORRNAME  CONNTYPE      RECORD TIME    DESTNO ACE IFC  DESCRIPTION  DATA
PLANNAME CORRNMBR                TCB CPU TIME               ID
-------- --------- ------------ ------------------ ------ --- --- -------------- ----------------------------------------------------
JEN      DB2CALL   B2BB07981C7B 'BLANK'            'BLANK'                       'BLANK'
JEN      JEN       DB2CALL      22:01:36.61635282      1   1   4 TRACE      --> NETWORKID:  DEIBMIPS  LUNAME:  IPVAMG53  LUWSEQ:     1
PMOMCT   'BLANK'                N/P                                  START        MESSAGE:  -START TRACE (A )C (01 02 03 05 07 08 30 )
                                                                                            RMID (* )D (OPX )PLAN (* )AUTHID (* )IFCID
                                                                                            (3 6 7 8 9 44 45 106 213 214 215 216 226 227
                                                                                            239 )BUFSIZE (512 )
                                                                                  QW0004CM  X'200000D704001302'
```

QW0004CM (S) TRACE CLASS MASK USED.

Record Trace Report Set

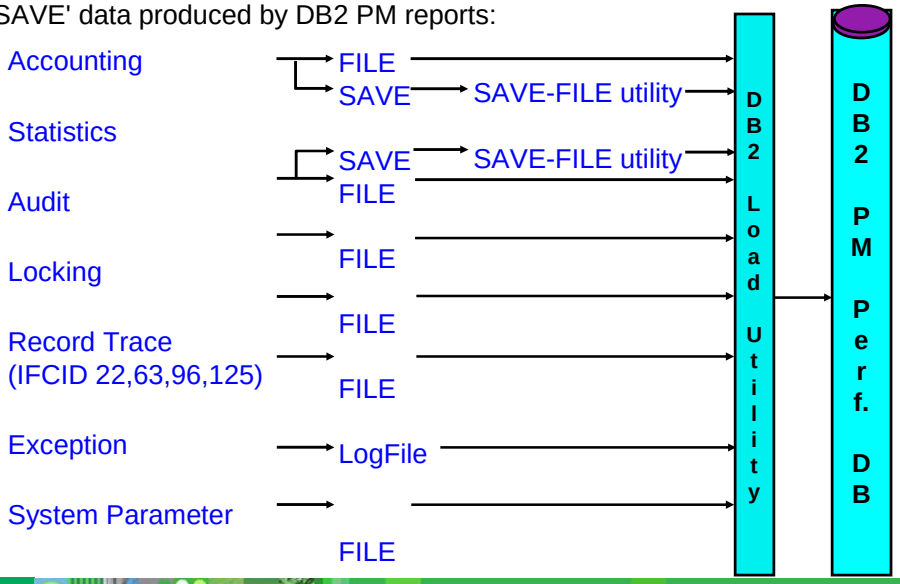
```
   LOCATION: SYSDSN7                          DB2 PERFORMANCE MONITOR (V7)                              PAGE: 1-22
      GROUP: DSN7                                  RECORD TRACE - LONG                    REQUESTED FROM: NOT SPECIFIED
     MEMBER: SG71                                                                                    TO: NOT SPECIFIED
  SUBSYSTEM: SG71                                                                          ACTUAL FROM: 04/21/01 22:01:36.61
DB2 VERSION: V7                                                                              PAGE DATE: 04/21/01
PRIMAUTH CONNECT   INSTANCE      END_USER       WS_NAME                       TRANSACT
ORIGAUTH CORRNAME  CONNTYPE      RECORD TIME    DESTNO ACE IFC  DESCRIPTION   DATA
PLANNAME CORRNMBR                TCB CPU TIME              ID
-------- -------- ----------- ----------------- ------ --- --- ------------- --------------------------------------------------------
SYSOPR   SG53     B2BB07982279 'BLANK'          'BLANK'                       'BLANK'
SYSOPR   020.CLST 'BLANK'     22:01:36.62880381     29   4  21 LOCK DETAIL    NETWORKID:  DEIBMIPS  LUNAME:  IPVAMG53  LUWSEQ:     1
'BLANK'  AT01                 N/P
         |-------------------------------------------------------------------------------------------------------------------------
         |LOCK RES TYPE: N/P                                    NAME: N/P
         |IRLM FUNC CODE : UNLOCK (ANY)           RETURN TOKEN: X'00000000'              REQUEST TOKEN      : X'00000000'
         |LOCK STATE     : X'00'                  DB2 TOKEN   : X'80A78000114CC048'      IRLM RETURN CODE   :         12
         |LOCK ATTRIBUTES: NMODIFY NOFORCE        PROP TO XES : NO                       ASYN TO XES        : NO
         |LOCK DURATION  : PLAN                   REQUEST TYPE:                          IRLM RETURN SUBCODE: B'0100000000000000'
         |PARENT TOKEN   : X'00000000'           GLOBAL/LOCAL: LOCAL                    OWNER              : 'BLANK'
         |CACHED STATE   : N/A                                                          LOCK HASH VALUE    : X'00000000'
         |QW0021CL  X'0000'       QW0021U  X'00B0000011533EC8'   QW0021FL  B'00000000'   QW0021CT  X'00000000'
         |QW0021F3  B'00000000'   QW0021O  X'00B0003E11533E38'   QW0021IR  X'0000'       QW0021F2  B'00000000'
         |-------------------------------------------------------------------------------------------------------------------------
```

DB2 Performance Reporting

- Instrumentation interface and trace classes
- Data Collection
- Working with Batch Reporting
  - Report sets ...
- **Performance Database**

Performance Database - Which Data and How

- 'FILE/SAVE' data produced by DB2 PM reports:



DB2 PE Performance database

- Load trace data into DB2 tables to allow SQL statements against data
  - Summarized (report) or raw (trace)
- Not all IFCIDs are supported
- Documented in "Chapter 19. The Performance Database and the Performance Warehouse" of OMPE Reporting User's Guide
- **Can be interesting if INTERVAL(1) is not granular enough**
- Sample JCL for **acctg** on STLMVS1 in **DB2DUMP.OMPE.JCL**
  - 1. DB2PMDB Run on MVS1 to save accounting trace to a file
  - 2. DGOACFGE Run on EC to create performance database
  - 3. DGOALFGE Run on EC to load accounting file into performance database
  - 4. DGOAQFIL Run on EC, the query to get the incoming transaction number

References

- Manuals:
  - DB2 Performance Expert V2 http://www-3.ibm.com/software/data/db2imstools/db2tools/db2pe/index.html
  - DB2 Performance Monitor for OS/390 V8 http://www-3.ibm.com/software/data/db2imstools/db2tools/db2pm/index.html
  - DB2 Buffer Pool Analyzer for z/OS V2 http://www-3.ibm.com/software/data/db2imstools/db2tools/bpa/index.html
  - DM Tools Library (complete library of all tools, including additional updates) http://www-306.ibm.com/software/data/db2imstools/db2tools-library.html
  - IBM Tivoli OMEGAMON XE for DB2 on z/OS http://publib.boulder.ibm.com/tividd/td/IBMTivoliOMEGAMONXEforDB2onzOS3.0.html

- Redbooks:
  - A Deep Blue View of DB2 Performance: IBM Tivoli OMEGAMON XE for DB2 Performance Expert on z/OS
    http://www.redbooks.ibm.com/abstracts/sg247224.html (May 2006)
  - DB2 Performance Expert for z/OS V2 (SG24-6867-01)
    http://www.redbooks.ibm.com/abstracts/sg246470.html (June 2004)
  - DB2 Performance Expert for Multiplatform V2 (SG24-6470)
    http://www.redbooks.ibm.com/abstracts/sg246470.html (Feb. 2005)

The end

- Any questions ?