

## IFI DATA: IFI you don't know, ask!

Jeff Gross



*Jeff.Gross@ca.com*

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Platform: DB2 for z/OS

### **Abstract**

The Instrumentation Facility Interface (IFI) can be a daunting resource in which to retrieve valuable DB2 information via the SMF or GTF processes. This presentation will show how to research which records type to use, in what manner generating these records affect system performance, design which fields of data from a record can be used in a report, and how analyze this data into useful information that can save your company money.

What it does not show is how to write the program to retrieve this data.

### Bullet Points

- What areas of DB2 should be investigated for which symptoms?
- What is the cost in obtaining this information?
- How often should monitoring take place?
- Why can performance factors change and how can this be predicted?
- What tools are available for free and what do vendors supply?

Starting the process of tuning a DB2 system is challenging due to the overwhelming amount of data that can be reviewed. This presentation will present a plan for why data is needed at which time and for what purpose.

Are there predefined goals for performance? What is management's stake?

What are the user's perceptions and experiences?

Which areas should be looked at first?

DB2 areas that should be considered for performance tuning include, but are not limited to..... System Constraints, DASD Contention, Virtual Storage, Dynamic SQL

How to retrieve data? (Free tools, Vendor Tools)

What data is needed and how much overhead does it put on the system?

How can this data be transformed into useful information?

When should this data be retrieved?

What external factors would change monitoring schedules?

## What is IFI?

- IFI is an acronym for **Instrumentation Facility Interface**
- Used to generate data for Tracking DB2 activity
- What systems produce this data?
  - Only DB2? Yes
- It writes out trace records to a few destinations.
  - SMF – Systems Management Facility
  - GTF – Generalized Trace Facility
  - SRV - ??
  - OPX or OP $n$  - ??
- Where does IFI fit into the larger scheme of z/OS?

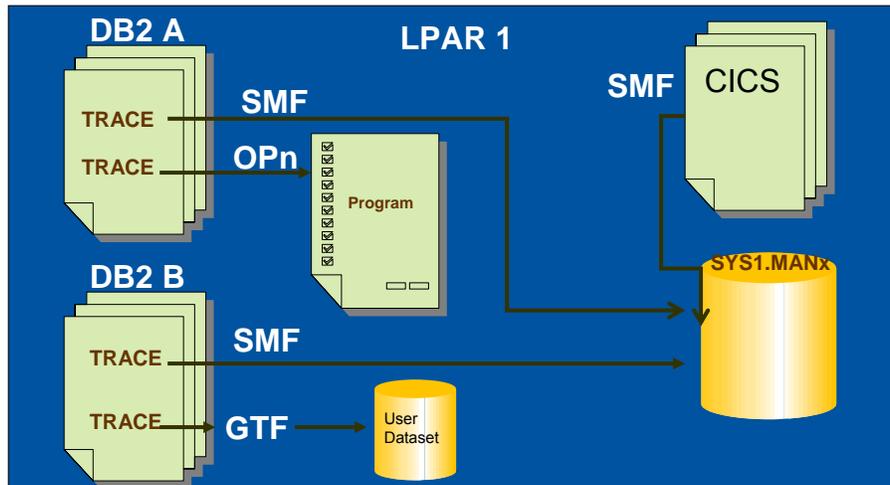
IFI is a DB2 facility that generates trace data. IFI is an acronym for Instrumentation Facility Interface. This facility is only in DB2 and not in other products like IMS or CICS.

These trace records can be written out via several output methods and they have the same general format.

The most common method is SMF. This method writes the data to the same facility where all the other OS and products (such as IMS and CICS) write their trace data.

GTF is a dedicated process in which you have to start a job/task to capture the data written.

## Big picture look at IFI



This picture shows how the different IFI outputs interact on a single LPAR.

The SMF output gets consolidated into one dataset, but the OPn and GTF data goes to it's own areas. OPn is in memory and must be read fast enough to not be lost. GTF uses a user defined dataset.

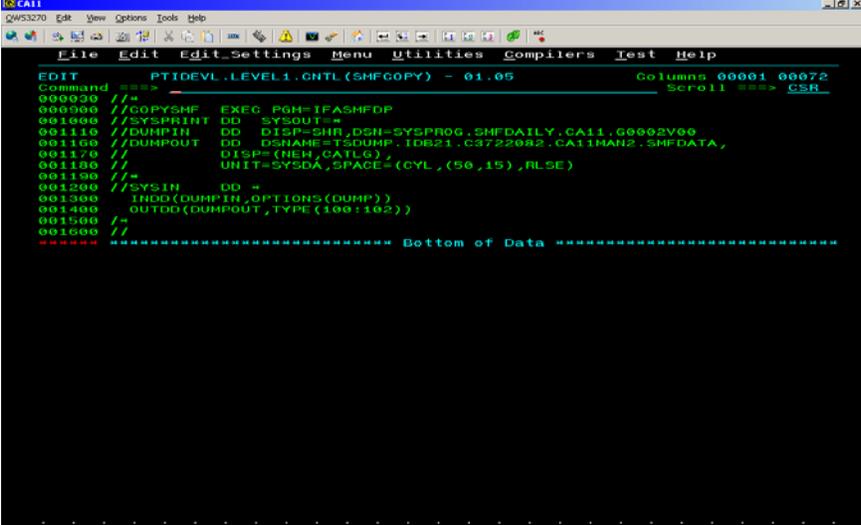
The next few slides detail how each output works.

## SMF output

- SMF is the Systems Management Facility (iea2g280)
- Traces records get written out with all other trace records from other areas:
  - z/OS, JES, VSAM, RMF, DB2, HTTP, CICS, MQSeries and TCP/IP
- There are about a 125 SMF record types (DB2 makes up 3 of these record types.)  
100 is Stats, 101 is Accounting and 102 is Performance.
- All the records get mixed together in the SYS1.MANx file
- Must dump records out all records and filter on only the ones you want.
  - **Tip: Filter every time the SYS1.MANx files switches.**
- Record length is 32760
- Memory move to SMF from DB2

Memory move knowledge taken from  
<http://www.mxg.com/news/news21.asp>

## JCL to copy SMF data



```
CA11
QW53270  Edit  View  Options  Tools  Help
File  Edit  Edit Settings  Menu  Utilities  Compilers  Test  Help
EDIT      PTIDEVL.LEVEL1.CNTL(SMFCOPY) - 01.05      Column 00001 00072
Command ==>
000000 //*
000000 //COPYSMF EXEC PGM=IFASMFDP
001000 //SYSPRINT DD SYSOUT=*
001100 //DUMPFH DD DISP=SHR,DSN=SYSPROG.SMFDAILY.CA11.00002V00
001100 //DUMPOUT DD DSNNAME=TSDUMP.IDB21.C37220R2.CA11MAN2.SMFDATA,
001170 //          DISP=(NEW,CATLG),
001180 //          UNIT=SYSDA,SPACE=(CYL,(50,15),RLSE)
001190 //*
001200 //SYSIN DD *
001300 INDD(DUMPFH,OPTIONS(DUMP))
001400 OUTDD(DUMPOUT,TYPE(100:100))
001500 /*
001600 //
***** Bottom of Data *****
-----
Connected to lpx.ca.com port 23      | 4/15 | NUM | 00:56:26 IBM-3270-4-E - A95T9629
```

This JCL shows how to retrieve the DB2 SMF data from system save area.  
This is not the raw system area, but a secondary area.

## GTF

- Start GTF trace first with an Operator command specifying where trace output is to be written.
- Coordinate with other GTF trace users. (Do not want to use the same output dataset?)
- Output goes where you specify with the command.
- Stop the GTF trace.
- Read data from data set.
- For basic information to start trace, see Chapter 23 in Performance Monitoring and Tuning Guide (dsnpfk13.pdf).
- For detail information on starting a GTF trace, see Chapter 10 in z/OS Diagnosis Tools and Service Aids (iea2v180.pdf).
- Does not mix data with other SMF records. No overload either.
- Record length is 256.
- Physical I/O write in DB2.

Physical I/O knowledge taken from <http://www.mxg.com/news/news21.asp>

## SRV

- An exit to a user-written routine.
- For instructions and an example of how to write such a routine, see the macro DSNWVSER in library *db2.highlvl.SDSNMACS*.
- I have never seen this routine in use and the instructions in the DSNWVSER member look intimidating.

## **OPX or OPn**

- Buffer that can be read in real-time.
- If buffer fills up, trace records are lost.
- There is not much doc on how to use, but this is read from a real time programming interface and not a batch job.
- Chapter 24 in the DB2 9 Performance Monitoring and Tuning Guide details.

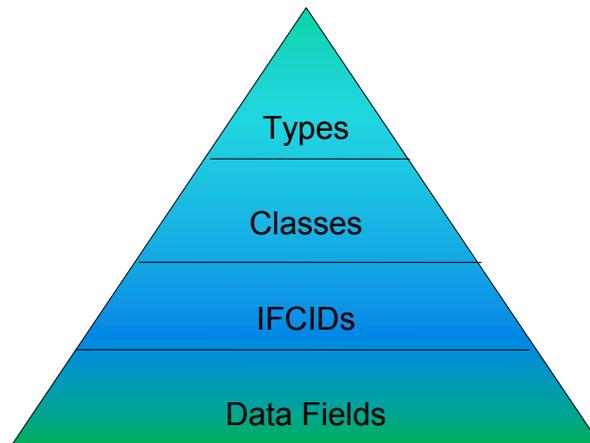
Real-time and on-line monitoring products will use this interface.

## IFI record organization

- IFI Trace Types (in addition to SMF record types)
  - Broad areas of the data.
  - Would never run a trace at this level
  - Might run multiple traces with different types
- Classes
  - Further defines Trace Type
  - Classes can be repeated between Types
- Records
  - Header
    - SMF or GTF header info.
  - Fields
    - The actual data you can read

The IFI topic is split into classifications that allow you to concentrate in different areas of DB2.

## IFI record org picture



This is the classification hierarchy within IFI. The next 15 slides will show the details of Trace Types and Classes. It would take many more pages to describe all the records.

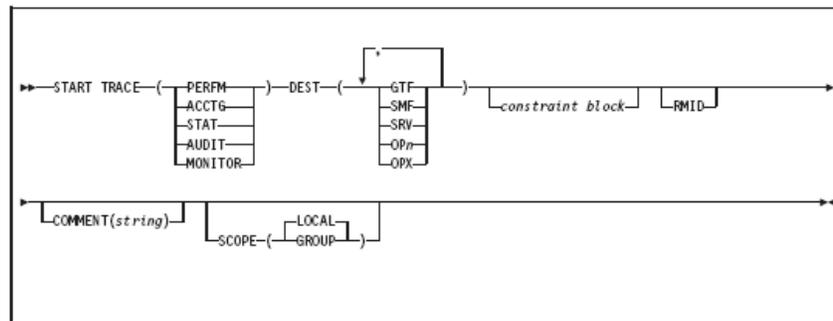
## Trace Types

- **( ACCTG )** Specifies a trace that is intended to be used in accounting for a particular program or authorization ID. This trace includes records that are written for each thread. **Abbreviation:** A
- **( AUDIT )** Specifies a trace that collects audit data from various components of DB2. **Abbreviation:** AU
- **( STAT )** Specifies a trace that collects statistical data that is broadcast by various components of DB2, at time intervals that can be chosen during installation. **Abbreviation:** S
- **( PERFM )** Specifies a trace that is intended for performance analysis and tuning. This trace includes records of specific events in the system. **Abbreviation:** P
- **( MONITOR )** Specifies a trace that collects monitor data. This option makes trace data available to DB2 monitor application programs. **Abbreviation:** MON

Taken from Chapter 81 of DB2 9 Command Reference (dsnrk12)

## Command to Start trace

- Use this command carefully as it can start to record and write more information than you need.
- Use constraint block for Class and IFCID (plus many other data limits)



Starting a trace only takes a few parameters, but more are needed, via the *constraint block* to limit the data you want to review. The *Scope* parameter controls whether the Data Sharing group is affected or not.

## Defaults for Dest parm

- There are defaults, but I recommend specifying this parameter.

*Table 28. Allowable destinations for each trace type*

Type	GTF	SMF	SRV	OP #	OPX
PERFM	Default	Allowed	Allowed	Allowed	Allowed
ACCTG	Allowed	Default	Allowed	Allowed	Allowed
STAT	Allowed	Default	Allowed	Allowed	Allowed
AUDIT	Allowed	Default	Allowed	Allowed	Allowed
MONITOR	Allowed	Allowed	Allowed	Allowed	Default

Some of the traces have default output areas. It is always good to specify the destination so there are no assumptions and it is shown in the trace start command.

## Constraints

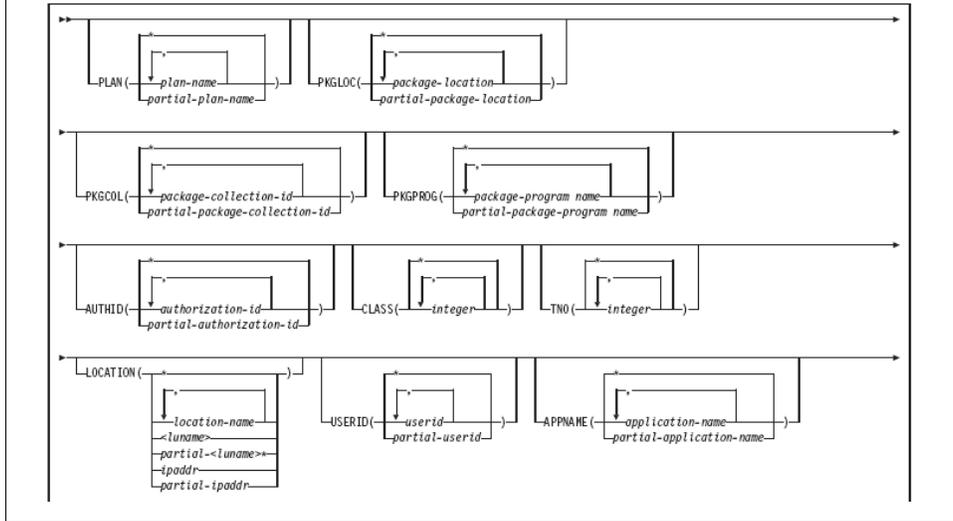
- Constraints can be tricky, but must be use for performance reasons.

*Table 29. Allowable constraints for each trace type*

Type	PLAN	AUTHID	CLASS	LOCATION
PERFM	Allowed	Allowed	Allowed	Allowed
ACCTG	Allowed	Allowed	Allowed	Allowed
STAT	NO	NO	Allowed	NO
AUDIT	Allowed	Allowed	Allowed	Allowed
MONITOR	Allowed	Allowed	Allowed	Allowed

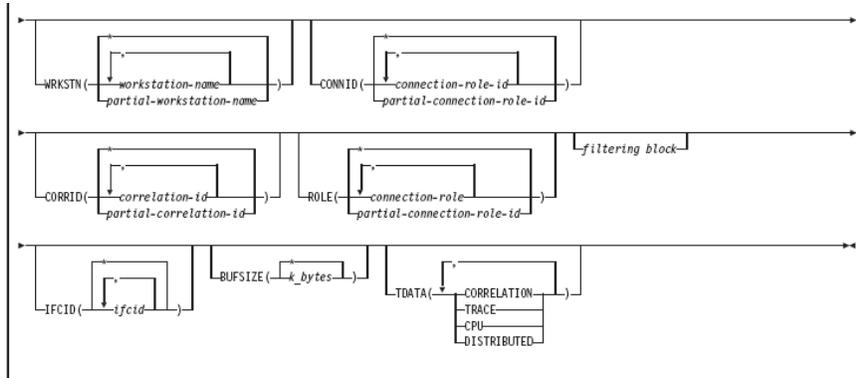
The constraint block places optional constraints on the kinds of data that are collected by the trace. The allowable constraints depend on the type of trace started, as shown in the following table.

## Constraints (1 of 2)



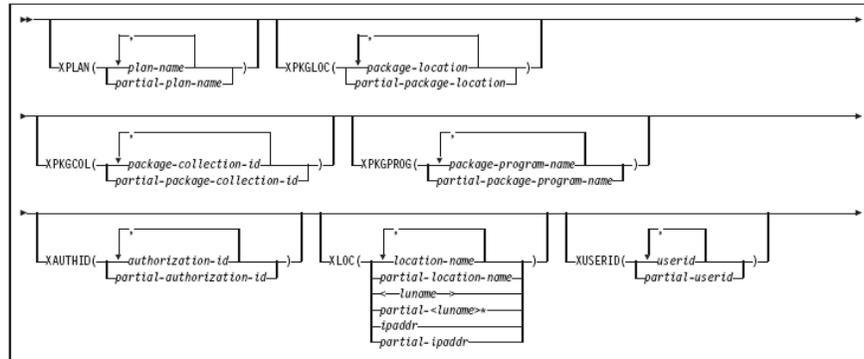
There are many constraints to use that will allow only the needed records to be written.

## Constraints (2 of 2)



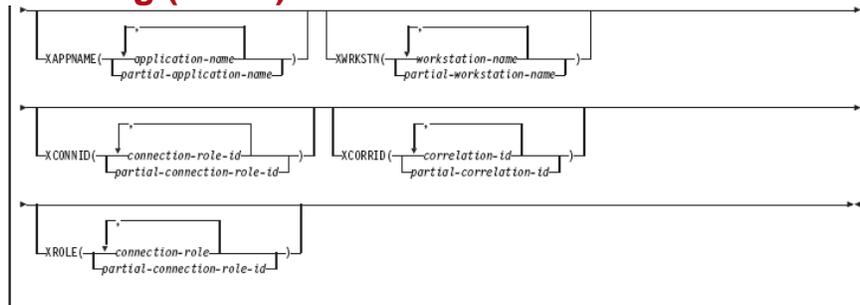
The constraints are described in Chapter 81 of the DB2 9 Command Reference Guide.

## Filtering (1 of 2)



Filter criteria will exclude this type of activity from the Trace. For example, the parameter XPLAN(A\*) will exclude all plans that start with A. Please see the DB2 Command Reference for complete syntax rules.

## Filtering (2 of 2)



More filters

## Classes within Trace Types

- Table 30 from the DB2 9 for z/OS Command Reference is located in the START TRACE chapter.
- Which information should I start looking at?
- Where to find hints in the manuals

Classes are the next level down from Trace Types that allow you to narrow the type of information retrieved.

## Accounting trace classes with IFCIDs

- 1\* Standard accounting data 3,106,200,239
- 2 Entry or exit from DB2 event signaling 232
- 3 Elapsed wait time in DB2 6-9,32,33,44,45,117,118,127,128,170,171, 174,175,213-216,226,227,242,243,321,322,329
- 4 Installation-defined accounting record 151
- 5 Time spent processing IFI requests 187
- 6 Reserved
- 7 Entry or exit from DB2 event signaling for package and DBRM accounting 232,240
- 8 Wait time for a package 6-9,32,33,44,45,117,118,127,128,170,171, 174,175,213-216,226,227,241-243,321,322
- 10 Package detail 239
- 11 - 29 Reserved
- 30 - 32 Available for local use

There are many traces classes with too many fields to be described in this presentation. The fields are described in these PDS members.  
*db2.highlvl.SDSNMACS(DSNDQ\*)*

## Audit Trace classes with IFCIDs

- 1\* Access attempts denied due to inadequate authorization 140
- 2 Explicit GRANT and REVOKE 141
- 3 CREATE, ALTER, and DROP operations against audited tables 142
- 4 First change of audited object 143
- 5 First read of audited object 144
- 6 Bind time information about SQL statements that involve audited objects 145
- 7 Assignment or change of authorization ID 55,83,87,169,319
- 8 Utilities 23,24,25,219,220
- 9 Installation-defined audit record 146
- 11 - 29 Reserved
- 30 - 32 Available for local use

## Statistics Trace classes with IFCIDs

- 1\* Statistics data 1,2,105,106,202, 225
- 2 Installation-defined statistics record 1 152
- 3 Deadlock, lock escalation, group buffer pool, data set extension information, and indications of long-running URs and active log space shortages  
172,196,250,258,261,262,313,330,337
- 4 DB2 exceptional conditions 173,191-195,203,210, 235,236,238,267,268
- 5 DB2 data sharing statistics record 230
- 6 Storage usage details 225
- 7 Reserved
- 8 Data set I/O statistics 199
- 11 - 29 Reserved
- 30 - 32 Available for local use

## Performance Trace classes with IFCIDs

1 of 2

- 1\* Background events 1,2,31,42,43,76-79,102,103,105-107,153
- 2\* Subsystem events 3,68-75,80-89,106,174,175
- 3\* SQL events 22,53,55,58-66,92,95-97,106,112,173,177,233,237,250,272,273,325
- 4 Reads to and writes from the buffer and EDM pools  
6-10,29-30,105-107,127,128,226,227,321,322
- 5 Write to log; archive log 32-41,104,106,114-120,228,229
- 6 Summary lock information 20,44,45,105-107,172,196,213,214,218,337
- 7 Detailed lock information 21,105-107,223
- 8 Data scanning detail 13-18,105-107,125,221,222,231,305,311
- 9 Sort detail 26-28,95-96,106
- 10 BIND, commands, and utilities detail 23-25,90,91,105-107,108-111, 201,256

## Performance Trace classes with IFCIDs

2 of 2

- 11 Execution unit switch and latch contentions  
46-52,56,57,93,94,106,113
- 12 Storage manager 98-101,106
- 13 Edit and validation exits 11,12,19,105-107
- 14 Entry from and exit to an application 67,106,121,122
- 15 Installation-defined performance record 1 154
- 16 Distributed processing 157-163,167,183
- 17 Claim and drain information 211-216
- 18 Event-based console messages 197
- 19 Reserved
- 20 Data sharing coherency summary 249-251,256-257, 261,  
262, 267,268
- 21 Data sharing coherency detail 255,259,263
- 22 Authorization exit parameters 314
- 23 - 29 Reserved
- 30 - 32 Available for local use

## Monitor Trace classes with IFCIDs

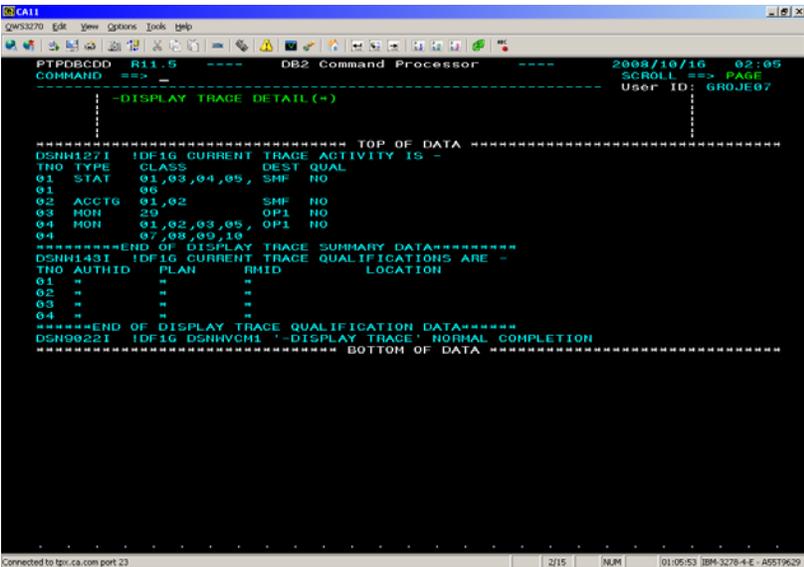
- 1\* Standard accounting data 200
- 2 Entry or exit from DB2 event signaling 232
- 3 DB2 wait time for I/O, locks; resource usage information 6-9, 32, 3,44,45,117,118,127, 128,170,171,174,175, 213,214,215,216,226,227,242,243,321,322
- 4 Installation-defined monitor record 155
- 5 Time spent processing IFI requests 187
- 6 Changes to tables created with DATA CAPTURE CHANGES 185
- 7 Entry or exit from DB2 event signaling for package and DBRM accounting 232,240
- 8 Wait time for a package 6-9,32,33,44,45,51,52,56,57, 117,118, 127,128,170,171,174,175,213-216,226,227,241-243,321,322
- 10 Package detail 239
- 9, 11-29 Reserved
- 30 - 32 Available for local use

## Trace Notes

- An asterisk (\*) indicates a default class for a trace type.
  - 1. For instructions on using the IFCIDs, see the topic "Interpreting DB2 trace output" in the *DB2 for z/OS Administration Guide*.
  - 2. DB2 does not collect statistical data for this record unless IFCID 318 is activated. IFCID 318 is not associated with any trace class; you must start it on its own.
- 
- Notice that the same IFCID is repeated within the same Trace Type for different classes and for different Trace Types.
  - The question then becomes, not if IFI has the information, but which information is needed.
  - Where to find more info on IFI records.

These are taken directly from the DB2 9 Command Reference manual.

## Showing what traces are active



```
QW33270  Edit  View  Options  Tools  Help
-----
PTPOBCDD  R11.5  ----  DB2 Command Processor  ----  2008/10/16  02:05
COMMAND  ==>  --  SCROLL ==>  PAGE
-----
--DISPLAY TRACE DETAIL(+)--
-----
***** TOP OF DATA *****
DSNH1271  IDF16  CURRENT TRACE ACTIVITY IS -
TR0 TYPE CLASS DEST QUAL
01 STAT 01,03,04,05, SHP NO
01
02 ACCTG 01,02 SHP NO
03 MON 20 OP1 NO
04 MON 01,02,03,05, OP1 NO
04 07,08,09,10
*****END OF DISPLAY TRACE SUMMARY DATA*****
DSNH1431  IDF16  CURRENT TRACE QUALIFICATIONS ARE -
TR0 AUTHID PLAN RMID LOCATION
01 " " " "
02 " " " "
03 " " " "
04 " " " "
*****END OF DISPLAY TRACE QUALIFICATION DATA*****
DSN90221  IDF16  DSNHVCH1 '-DISPLAY TRACE' NORMAL COMPLETION
***** BOTTOM OF DATA *****
-----
Connected to tpcr.ca.com port 23 2/15 NUM 01:05:53 IBM-3270-4-E - A5179629
```

Using the Display command will show what is active on a DB2 Subsystem.

## Where to find more info IFI

- Where do I find information about IFI capabilities?
  - DB2 and Vendor Manuals
  - *db2.highlvl.SDSNIVPD(DSNWMSG)*
    - Data that can be loaded in DB2 tables
    - Then used in reporting
    - About 23,000 lines of information.
  - *db2.highlvl.SDSNMACS(DSNDQ\*)*
    - Field descriptions
    - Used in programs
    - Searchable for ideas

## DB2 Manuals

- **DB2 9 for z/OS Command Reference**
  - START TRACE command in Chapter 81
  - MODIFY TRACE command in Chapter 55
  - DISPLAY TRACE command in Chapter 35
  - STOP TRACE command in Chapter 92
- **DB2 9 for z/OS Administration Guide**
  - Reading Log data Chapter 20 and Other various areas.
- **DB2 9 for z/OS Technical Overview**
  - Improved Tracing in DB2 in Chapter 10.4
- **DB2 9 for z/OS Performance Monitoring**
  - Using Traces in Chapter 21-24
  - Interpreting DB2 trace output Chapter 36-38

## Vendor Tools Manuals

- ASG
  - TMON DB2 Reference Guide
- BMC
  - MAINVIEW User Guide
- CA
  - Insight Batch Report Reference (SMF IFCID)
  - Insight Writing Requests Guide (IFCID Query)
  - MICS Analyzer Option for DB2 Guide
- MXG
  - Source Library

I have tried to find all the manuals from vendors, but many have made them registered to only licensed users. I will take all recommendations.

**SDSNIVPD(DSNWMSG)**

```
. BROWSE DB2.DB2910.GA.PUT0802B.SDSNIVPD(DSNWMSG) Line 0000026
. Command ==> Scro
. IFCID FIELD DESCRIPTIONS | 000250
. ----- | 000260
. | 000270
. THIS FILE CONTAINS COPYRIGHTED, LICENSED MATERIAL IN | 000280
. MACHINE READABLE FORM TO ASSIST IN THE ANALYSIS OF AN | 000290
. IBM SYSTEM. BOTH THE MACHINE READABLE INFORMATION AND | 000300
. THE EXAMPLES IN THE ACCOMPANYING DOCUMENTATION ARE | 000310
. COPYRIGHTED AND LICENSED. | 000320
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. | 000510
```

*db2.highlvl.SDSNIVPD* in DB2 9

*db2.highlvl.SDSNSAMP* in DB2 V8 and earlier



## Searching for info

```

C:\AI1
-----
Menu  Reflist  Utilities  Help

Command ==> Search-For Utility  Strings found

Search String . . . STATISTIC

TSDF Library:
Project . . .
Group . . .
Type . . .
Member . . . (Blank or pattern for member selection list,
              "*" for all members)

Other Partitioned, Sequential or VSAM Data Set:
Data Set Name . . . DB2.DB2910.GA.PUT08028.SDSNMACS(DSHDQ*)
Volume Serial . . . (if not cataloged)

Listing Data Set . . . SRCHFOR.LIST
Data Set Password . . . (If Search-For data set password protected)

Enter "*" to select option      Execution Mode      Output Mode
-- Specify additional search strings  1. Foreground      1. View
-- Mixed Mode                    2. Batch           2. Browse
-- Bypass selection list

Connected to tpu.ca.com port 23          30/29  NUM  17:00:43  IBM-3270-4-E - A0510407
    
```

Say you want to find an IFCID field with information about “STATISTIC”  
 This is how you can search.



## Results of the search

```

VIEM      GROJE07.SRCHFOR.LIST      Columns 00001 00072
Command  *-----*  SDF011  *-----*  CSR
000201  DSHDQMS1  *-----*  STRING(S) FOUND  *-----*
000202
000203  13  * DESCRIPTIVE-NAME = SMF COMMON HEADER AND STATISTICS MAPPING
000204  22  * FUNCTION = MAPPING MACRO FOR SMF HEADER FOR STATISTICS DATA.
000205  105 * SMF COMMON HEADER MAPPING MACRO FOR STATISTICS TYPE 100
000206  138 * DB2 DSHDQMS1 SUBTYPE=0 STATISTICS RECORD SECTION MAPPING FOR
000207  139 * SYSTEM SERVICES STATISTICS. THE RECORD IS WRITTEN TO SMF AS
000208  168 * QMSA DSHDQMSA  * CONTROL ADDRESS SPACES STATISTICS
000209  169 * QMSB DSHDQMSB  * IFC DESTINATION STATISTICS
000210  170 * QMSC DSHDQMSC  * IFCID STATISTICAL INFORMATION
000211  171 * QMST DSHDQMS1  * SUBSYSTEM SUPPORT STATISTICS
000212  172 * QMST DSHDQMS1  * COMMAND STATISTICS
000213  174 * QVLS DSHDQVLS  * LATCH STATISTICS
000214  175 * QVAS DSHDQVAS  * AGENT SERVICES STATISTICS
000215  176 * QSST DSHDQSS1  * STORAGE MANAGER STATISTICS
000216  177 * QLST DSHDQLST  * DDF STATISTICS - VSR2
000217  178 * QJST DSHDQJST  * LOG MANAGER STATISTICS
000218  1  IGRSUPC  * HV5/PDF FILE/LINE/WORD/BYTE/SFOR COMPARE UTILITY: ISPF
000219  LINE * SOURCE SECTION  * SOURCE DSN: DB2.002910.GA.PU00
000220
000221  179 * QBST DSHDQBST  * DDF SYSTEM STATISTICS
000222  243 * DB2 DSHDQMS1 SUBTYPE=1 STATISTICS RECORD SECTION MAPPING FOR
000223  244 * DATA BASE SERVICES STATISTICS. THE RECORD IS WRITTEN TO SMF
000224  267 * QASST DSHDQASST  * QOL STATISTICS
000225  268 * QIST DSHDQIST  * SERVICE CONTROLLER STATISTICS
000226  269 * QBST DSHDQBST  * BUFFER MANAGER STATISTICS
000227  270 * QIST DSHDQIST  * DATA MANAGER STATISTICS - VOR0
000228  271 * QISA DSHDQISA  * LOCKING STATISTICS
000229  272 * QISE DSHDQISE  * EDM POOL STATISTICS - RELEASE 2
000230  275 * QLES DSHDQLES  * LE STATISTICS
000231  276 * QISJ DSHDQISJ  * STARJOIN POOL STATISTICS (5)
000232  327  * DSHDQISE  * EDM POOL STATISTICS
000233  333  * DSHDQLES  * LE Statistics
000234  335  * DSHDQISJ  * STARJOIN pool statistics
000235  341 * DB2 DSHDQMS1 SUBTYPE=2 STATISTICS RECORD SECTION MAPPING FOR
000236  409 * DB2 DSHDQMS1 SUBTYPE=3 STATISTICS RECORD SECTION MAPPING FOR
000237  410 * GLOBAL STATISTICS
000238  493 * /* SMF COMMON HEADER MAPPING MACRO FOR STATISTICS TYPE 100
    
```

And then we have a big result set of which we can further search within.

## SDSNMACS(DSNDQWST) member

```

C:\I11
C:\WINDOWS\system32\cmd.exe
File Edit Edit Settings Menu Utilities Compilers Test Help
VIEW DB2_DB2910_GA.PUT0802B.SDSNMACS(DSNDQWST) - 01. Columns 00001 00072
Command ==> Scroll ==> C5R
-----
000000 =
001000 =
001100 = MACRO-NAME = DSNDQWST
001200 =
001300 = DESCRIPTIVE-NAME = SMF COMMON HEADER AND STATISTICS MAPPING
001400 = MACRO
001500 = Licensed Materials - Property of IBH
001600 = 5635-DB2
001700 = (C) COPYRIGHT 1982, 2006 IBH Corp. All Rights Reserved.
001800 =
001900 =
002000 = STATUS = Version 9
002100 =
002200 = FUNCTION = MAPPING MACRO FOR SMF HEADER FOR STATISTICS DATA.
002300 = SMF TYPE 100 RECORD HEADER
002400 =
002500 = NOTES = NONE
002600 =
002700 = IN ORDER TO GET A LISTING OF DSNDQWST, DSNDQWST_LIST MUST
002800 = BE DECLARED AND SET IN YOUR MODULE.
002900 =
003000 = MACRO DEPENDENCIES = NONE
003100 = MACRO RESTRICTIONS = NONE
003200 = MACRO REGISTER-CONVENTIONS = NONE
003300 =
003400 = MODULE-TYPE = MACRO
003500 = PROCESSOR = PLS
003600 = DSNDQWST_SUBTYPE =
003700 = 0 - PRODUCES IFCID 0001 MAPPING
003800 = 1 - PRODUCES IFCID 0002 MAPPING
003900 = 2 - PRODUCES IFCID 0202 MAPPING
004000 = 3 - PRODUCES IFCID 0230 MAPPING
004100 = ALL - PRODUCES IFCID 0001, 0002, AND
004200 = 0202 MAPPING
004300 =
004400 = PROCESSOR = ASSEMBLER
004500 = ASSEMBLER KEYWORDS
004600 = DSFCT = YES - DEFAULT
-----
Connected to tpu.ca.com port 23 5/15 NUM 17:11:16 JRP-3270-4-E - ASST0407
    
```

This members allows you to list out fields from each IFCID.

## What areas of DB2 should be investigated for which symptoms?

- *AREA (IFCID)*
- CPU (3)
  - Split up between TCB and SRB
  - Where used? SP, trigger, User Function
- I/O
  - Buffer Pool (2)
    - Get Page / Read I/O (higher is better)
    - Page Writes / Write I/O (higher is better)
  - Logging (1 & 32-41)
  - Dataset size, extents (199 & 258)
  - Dataset I/O (6-9)
  - Paging (127, 128, 198)

Here are some of the recommendations on which IFCID to use for what DB2 information.

## What areas of DB2 should be investigated for which symptoms?

- Waiting
  - Locks (2, 20, 149, 150, 172, 196)
  - Latches (1, 51, 52, 56, 57, 226, 227)
- Storage used
  - System (1, 217, **DBM1 is 225**)
  - Buffer Pool (2, 250)
  - EDM Pool (2 & 29-30)
  - RID (2, 3, 125, 190, 316)
  - Dynamic Statement Cache (316 – 318)
- Overall information by Thread (3)

## How to organize information?

- Threads
- Plans/Packages
- Users
- Devices
- System Stats

When gathering this information, what type of filters would you want to use?

## How often should reviews be completed?

- Daily Alerts
- Weekly for Daily data
- Monthly for Weekly trends
- Quarterly for Monthly trends
- Yearly for Monthly trends (Seasonal trends)

What timeline can be followed to determine more information.

### **Goals to improving performance**

- Activity peaks should be monitored and suggestions made to smooth out the activity.
- Are there predefined goals for performance?
  - Who has them?
  - Are they currently being met?
- What are the user's perceptions?
  - Do they curse the system?

## Why can performance factors change?

Change!

- Time
  - Data Growth
  - Organization of Data (Reorg)
  - Statistics no long reflect data
- New workload
- New Application
- New System or Vendor Code

## **What is the cost in obtaining this information?**

- Cost of setting up the trace environment (one time)
- Cost of running the traces (CPU while trace is on and offloading)
- Cost of running reports
- Cost of analyzing data
- Cost of making changes based on analysis results.

## Record generation

- Some affect more than others. Why?
- Trace Records come in two types;
  - Synchronous (READS command)
    - Pull this info from the system
  - Asynchronous
    - The data is pushed out after the end of an event (Such as Thread End)

What manner generating these records affects system performance?

Synchronous records are updated in memory and written out when asked for. The STAT1 and STAT2 are examples.

Asynchronous records are created for each event and queue up in a buffer. A command must be issued at certain times to retrieve these records before the queue fills up.

## Tracing Overhead Part 1

- **Accounting traces** Accounting traces typically incur the following overhead:
  - Class 1: Typically, less than 5% transaction overhead, except for fetch-intensive applications that do not use multi-row fetch.
  - Class 2: CPU overhead can be 20% for fetch-intensive applications.
  - Class 3: Less than 1% CPU overhead.
  - Class 7 and 8: Less than 5% CPU overhead.

## Tracing Overhead Part 2

- **Audit Traces** Audit traces typically incur less than 10% transaction overhead with all classes on.
- **Performance traces class 1, 2, and 3**
  - Performance might incur the following overhead: 5% to 100% CPU overhead
  - Performance class 3 CPU overhead can be as high as 100% for fetch-intensive applications
- **Global Trace** Global trace can incur 10 to 150% CPU overhead

## What tools are available for free?

- The DB2 manuals describe and have some basic examples of how to write programs to retrieve info.
  - Chapter 24 in DB2 9 Performance Monitoring
- What are the challenges?
  - Time
  - Expertise
  - Maintainability
  - Transfer of Knowledge

I have not shown any programming examples to retrieve this data.

## What tools do vendors supply?

- Vendor Tools
  - ASG TMON
  - BMC MAINVIEW
  - CA Insight
  - IBM OMEGAMON, DB2 Performance Monitor
  - MXG
- Design which fields of data from a record can be used in a report
- How analyze this data into useful information that can save your company money

### **Helpful Hints and Tips**

- Get stats to generate frequently (at least once a minute)
- Make sure stats for Data Sharing systems are synchronized.
- Make sure you have enough space for output records.

## Questions?

- Thanks
- Dziękuję
- Gracias
- Merci
- Danke
- Grazie
- Obrigado
- Hvala
- Teşekkürler
- Tak
- Tack
- Takk
- Dank

Session A16

**IFI DATA:**

**IFI you don't know, ask!**

**Jeff Gross**  
**Jeff.Gross@ca.com**



Jeff Gross is currently the WW Support Delivery Manager of the DB2 Tools, IMS Tools, Common Services and Mainframe Software Manager (CA MSM) for z/OS products at CA. Jeff has more than 25 years of experience in the computer industry starting with a Computer Science degree from Northern Illinois University. He has seen DB2 grow since release 2.3 and used it in on-line, data warehousing and ad-hoc systems. He has spoken at NA and European IDUGs and CA World in Las Vegas.