



Expert Stored Procedure Monitoring, Analysis and Tuning on System z

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Agenda

- **What are stored procedures?**
 - Benefits of stored procedures
 - Stored procedure analysis – Issues and solutions
- **Monitoring stored procedures using OMEGAMON DB2 Performance Expert**
- **Isolating and tuning poorly performing stored procedures**

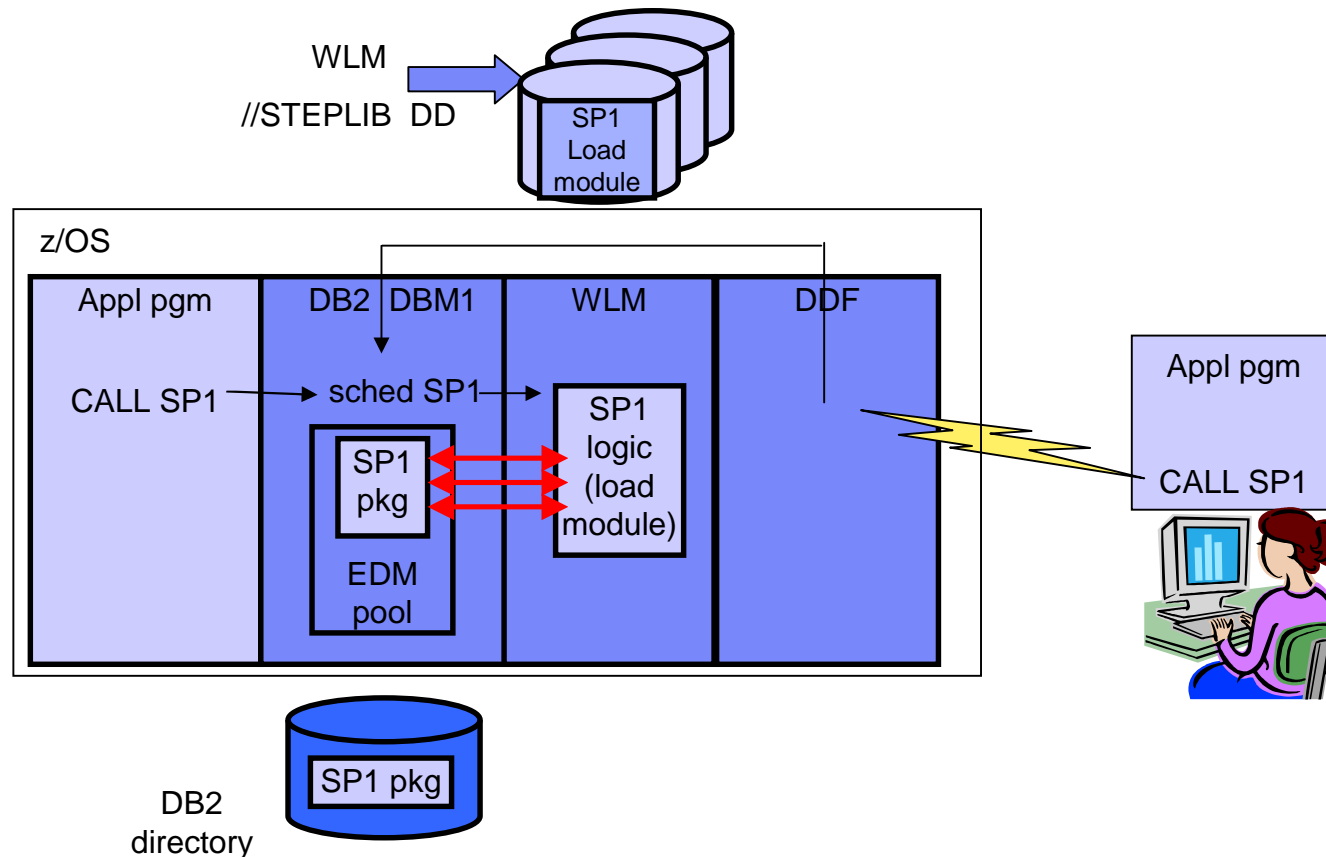


What are Stored Procedures?

- **A stored procedure is a user-written program that can be called by an application with an SQL CALL statement.**
- **It is a compiled program that is stored at a DB2 server**
- **It can execute business logic and SQL statements**
- **Stored procedure types**
 - External high level language procedures COBOL, PL/I, C, C++, Assembler, REXX, and Java
 - External SQL procedures
 - Native SQL procedures introduced by DB2 9 for z/OS

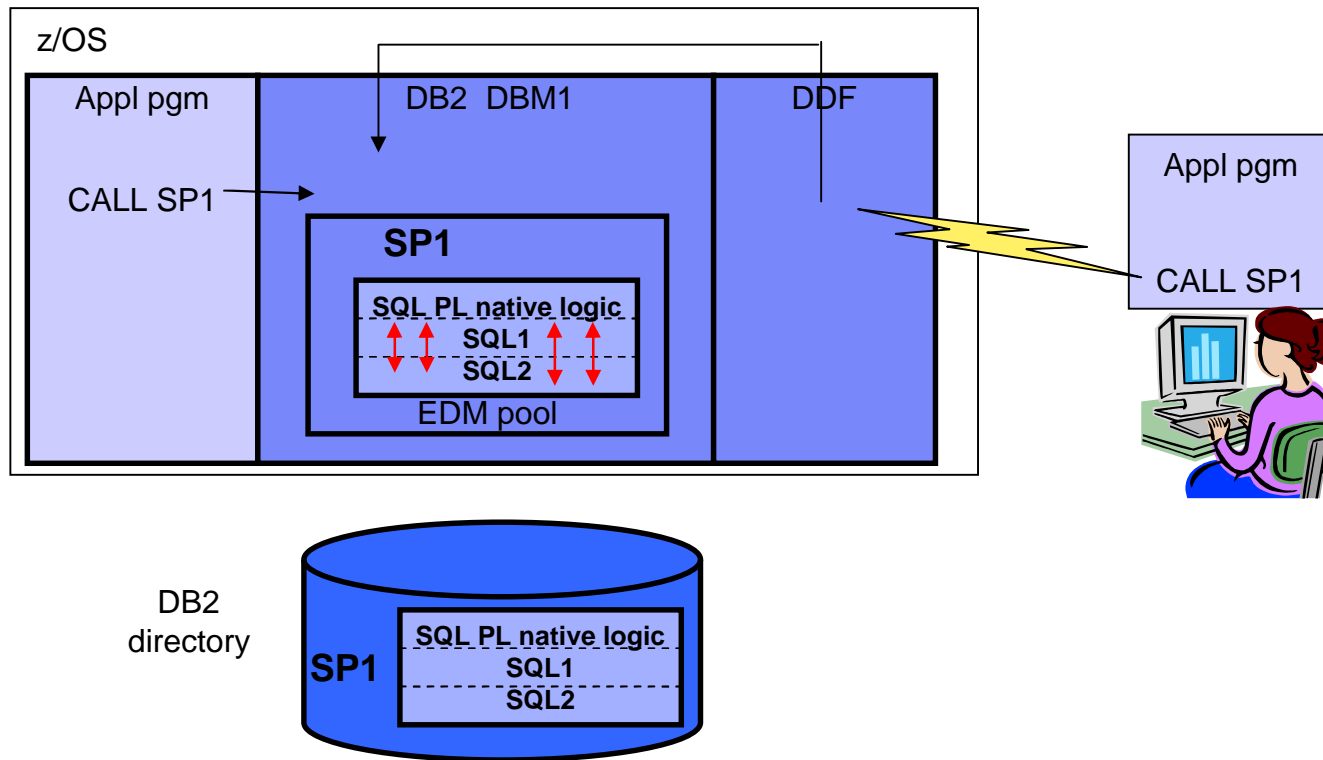


DB2 z/OS Stored Procedure Processing (External)





Native SQL Procedure Processing (Internal)





Programming Benefits of Stored Procedures

- **Modularity in application development**
- **Data will be processed always in a consistent way according to the rules defined in the stored procedure**
- **Enforcement of business rules**
 - You can use stored procedures to define business rules that are common to several applications.
 - can be an alternative to using constraints and triggers.
- **Improved application security**
 - Sensitive business logic runs on the DB2 server
 - End users are authorized to execute a stored procedure, they do not need table privilege -> similar to static authorization model
- **Application integration solutions**
 - can access non-DB2 resources
e.g. VSAM files, MQ queues, IMS or CICS transactions
 - Stored procedures can have access to commands that run only on the server.



Total Cost of Ownership Benefits of Stored Procedures

- **Reduced network traffic for distributed applications**
 - Grouping SQL statements into a stored procedure results in two trips across the network for each group of statement, resulting in better performance for applications
- **Cost of ownership reduction**
 - If stored procedure is called from distributed client via DRDA, a portion is eligible for zIIP redirect.
 - Including: Call statement processing; Result set processing; Commit processing
 - Stored procedures written in Java can take advantage of zAAP engines
 - Native SQL procedures run as enclave SRB in DBM1 address space and the Stored Procedure execution itself is zIIP off-loadable with DB2 9 for z/OS.
 - For WLM managed stored procedures:
 - SQL processing runs under a TCB hence not eligible for zIIP redirect
- **As of now, there is NO performance benefit for calling a Stored Procedure from a local application**



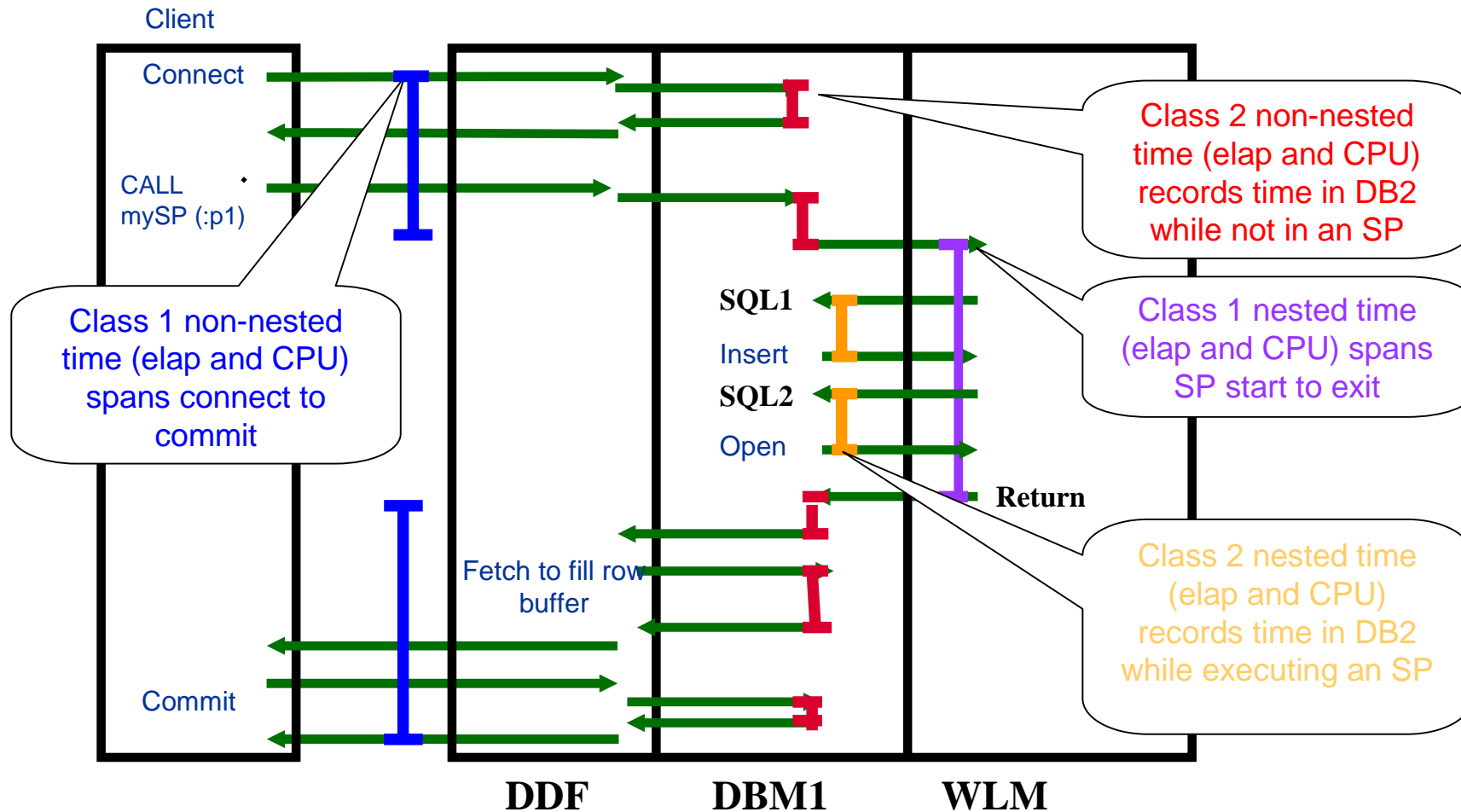
Stored Procedure Language / API CPU Cost comparison - Update

- IRWW workload (OLTP workload consisting of 7 transactions)
- Called from distributed JCC type 4 client

Language/API	Base CPU/Tran Cost	Billable CPU/Tran Cost after zIIP and/or zAAP redirect
COBOL Stored Procedure	1X (BASE)	0.80x (Some zIIP)
C Stored Procedure	1.02x	0.82x (Some zIIP)
SQLJ Stored Procedure	2.01x	1.11x (zAAP+ some zIIP)
JDBC Stored Procedure	2.97x	1.84x (zAAP+ some zIIP)
Native SQL Stored Procedure	1.09x	0.59x (Significant zIIP)



Performance Reporting – External Stored Procedure





External Stored Procedure Performance Summary - Plan-Level

- DB2 Accounting class 1 and 2 needed (3 is recommended)

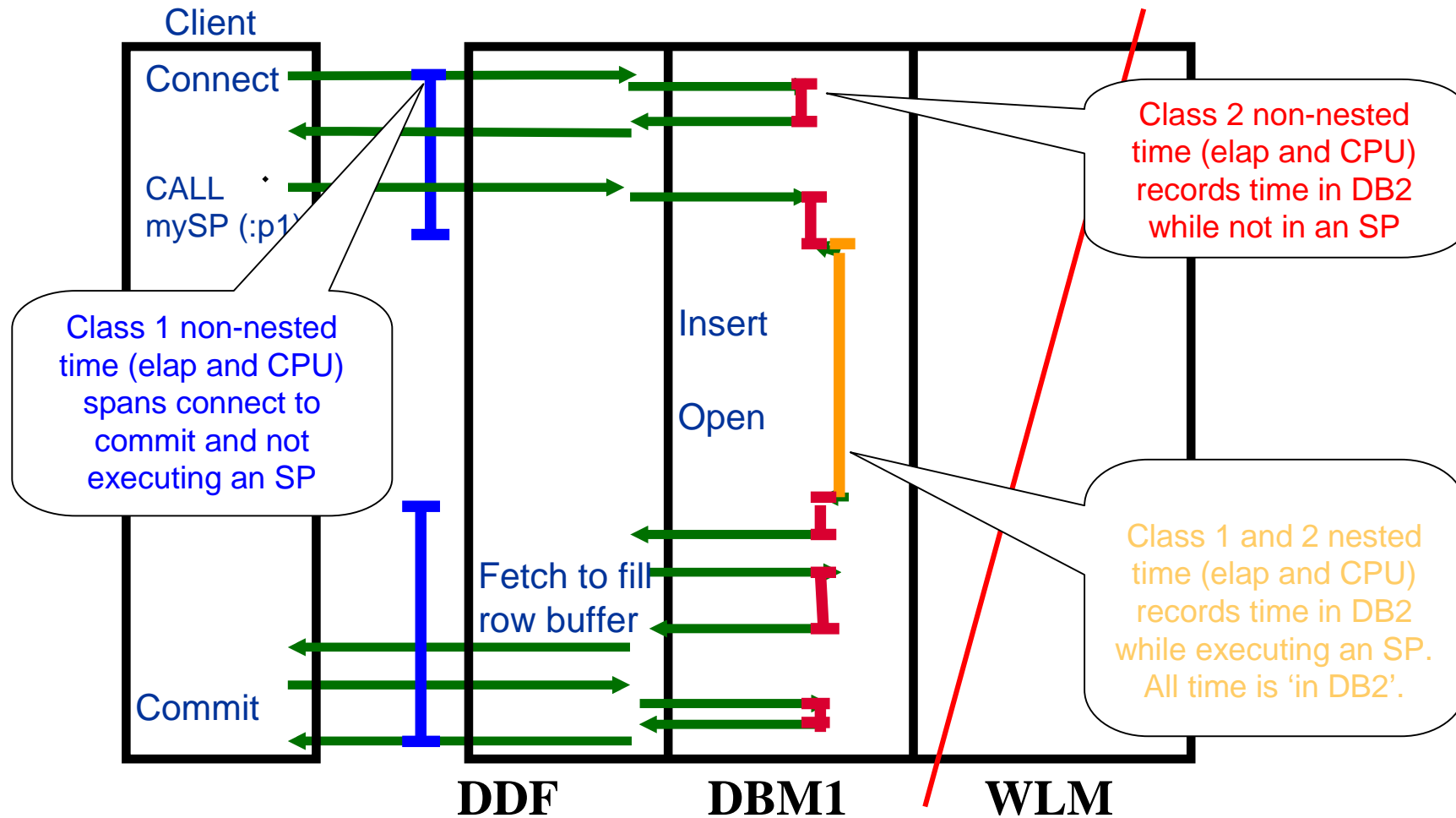
AVERAGE	APPL(CL.1)	DB2 (CL.2)
-----	-----	-----
ELAPSED TIME	0.003212	0.002575
NONNESTED	0.000714	0.000694
STORED PROC	0.002498	0.001881
UDF	0.000000	0.000000
TRIGGER	0.000000	0.000000
CP CPU TIME	0.000715	0.000654
AGENT	0.000715	0.000654
NONNESTED	0.000149	0.000129
STORED PRC	0.000567	0.000525
UDF	0.000000	0.000000
TRIGGER	0.000000	0.000000
PAR.TASKS	0.000000	0.000000

Class 1 non-nested time (ET & CPU)
Class 2 non-nested time (ET & CPU)

Class 1 nested time (ET & CPU)
Class 2 nested time (ET & CPU)



Performance Reporting – Native SQL Stored Procedure





Native SQL Stored Procedure Performance Summary - Plan-Level

- DB2 Accounting class 1 and 2 needed (3 is recommended)

AVERAGE	APPL(CL.1)	DB2 (CL.2)
-----	-----	-----
ELAPSED TIME	0.004834	0.002789
NONNESTED	0.002819	0.000774
STORED PROC	0.002015	0.002015
UDF	0.000000	0.000000
TRIGGER	0.000000	0.000000
CP CPU TIME	0.000963	0.000909
AGENT	0.000963	0.000909
NONNESTED	0.000198	0.000143
STORED PROC	0.000765	0.000765
UDF	0.000000	0.000000
TRIGGER	0.000000	0.000000
PAR.TASKS	0.000000	0.000000

CL1 and CL2 will always be equal!

CL1 and CL2 will always be equal!



Stored Procedure Detail Reporting - Package level Reporting

- Accounting class 7 and/or 8 needed
- SYSSTAT package contains time for CALL statement, result set processing, SET special registers, and VALUES statements for LOB handling

SYSSTAT	VALUE	SYSSTAT	TIMES
-----	-----	-----	-----
TYPE	PACKAGE	ELAP-CL7 TIME-AVG	0.000387
		CP CPU TIME	0.000072
LOCATION	DSND91B	AGENT	0.000072
COLLECTION ID	NULLID	PAR.TASKS	0.000000
PROGRAM NAME	SYSSTAT	SE CPU TIME	0.000000
NSQLNEW	VALUE	NSQLNEW	TIMES
-----	-----	-----	-----
TYPE	PACKAGE	ELAP-CL7 TIME-AVG	0.004751
		CP CPU TIME	0.001667
LOCATION	DSND91B	AGENT	0.001667
COLLECTION ID	USRT001	PAR.TASKS	0.000000
PROGRAM NAME	NSQLNEW	SE CPU TIME	0.000000



Issues with Plan and Package Level Stored Procedure Analysis

- Multiple Stored Procedures called in a transaction are summed at the plan level. By definition this affects the analysis of nested SPs.
- Package level analysis can be difficult if an Stored Procedure execute different paths and SQL based on parameters. How do you differentiate between the invocations?
- Package level analysis does not apply to Stored Procedures that do not execute SQL

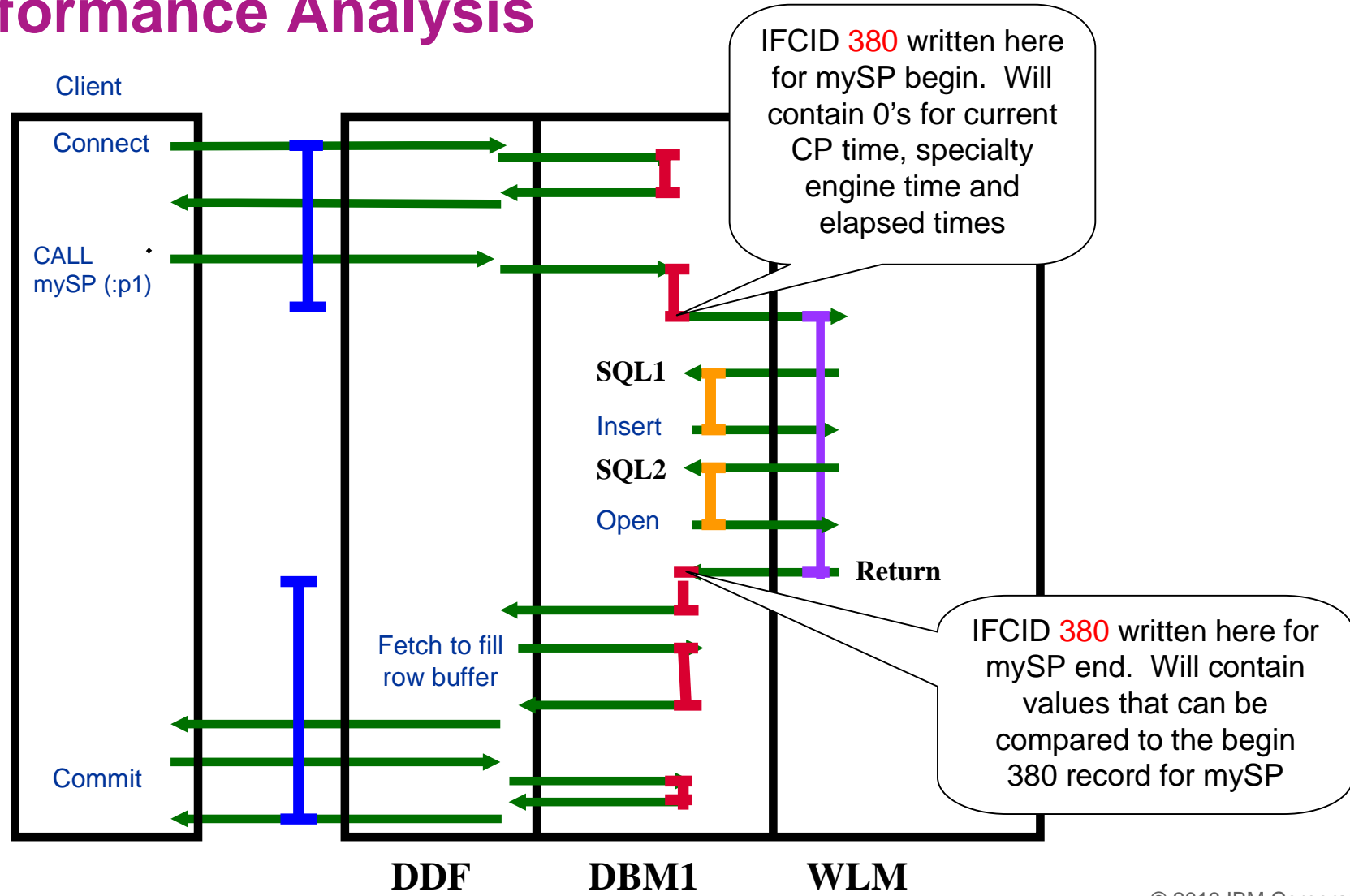


Enhanced Instrumentation for Stored Procedure Performance Analysis

- **PM53243 (DB2 10) New **IFCIDs 380 and 381** are created for Stored Procedure and User-Defined Function detail respectively. These records:**
 - Identify the stored procedure or UDF beginning or ending
 - Include the current CP, specialty engine, and elapsed time details for nested activity
- **These record can be used to determine the CP, specialty engine, and elapsed time for a given Stored Procedure or UDF invocation**



Enhanced Instrumentation for Stored Procedure Performance Analysis



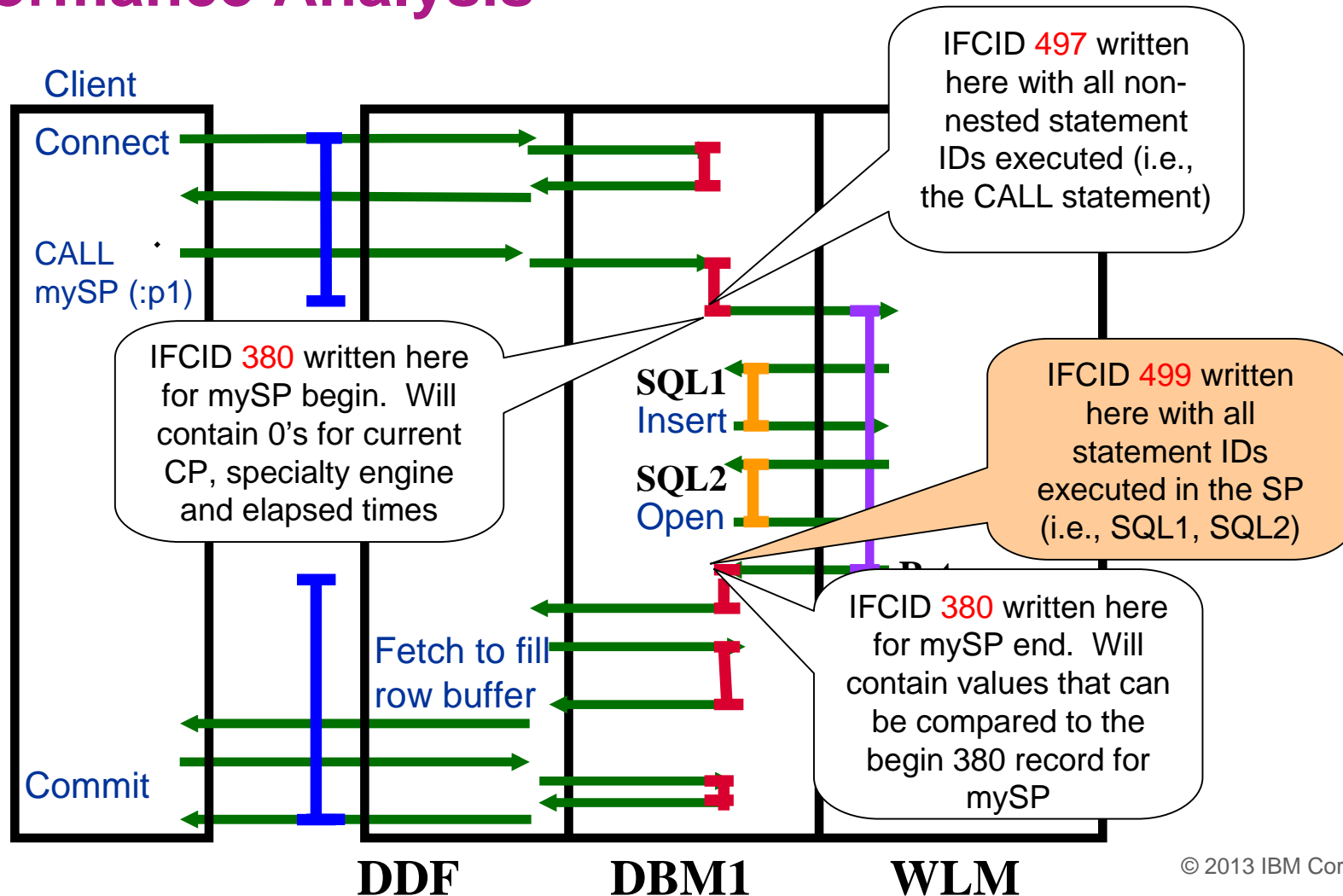


Enhanced Instrumentation for Stored Procedure Performance Analysis

- Additionally PM53243 (DB2 10) added **IFCID 497, 498, 499** for SQL drill down analysis. These records contain the dynamic or static statement IDs for non-nested, UDF, and SP work respectively.
- The statement IDs can be **correlated to IFCID 316** dynamic statement **or IFCID 401** static statement cache data.



Enhanced Instrumentation for Stored Procedure Performance Analysis





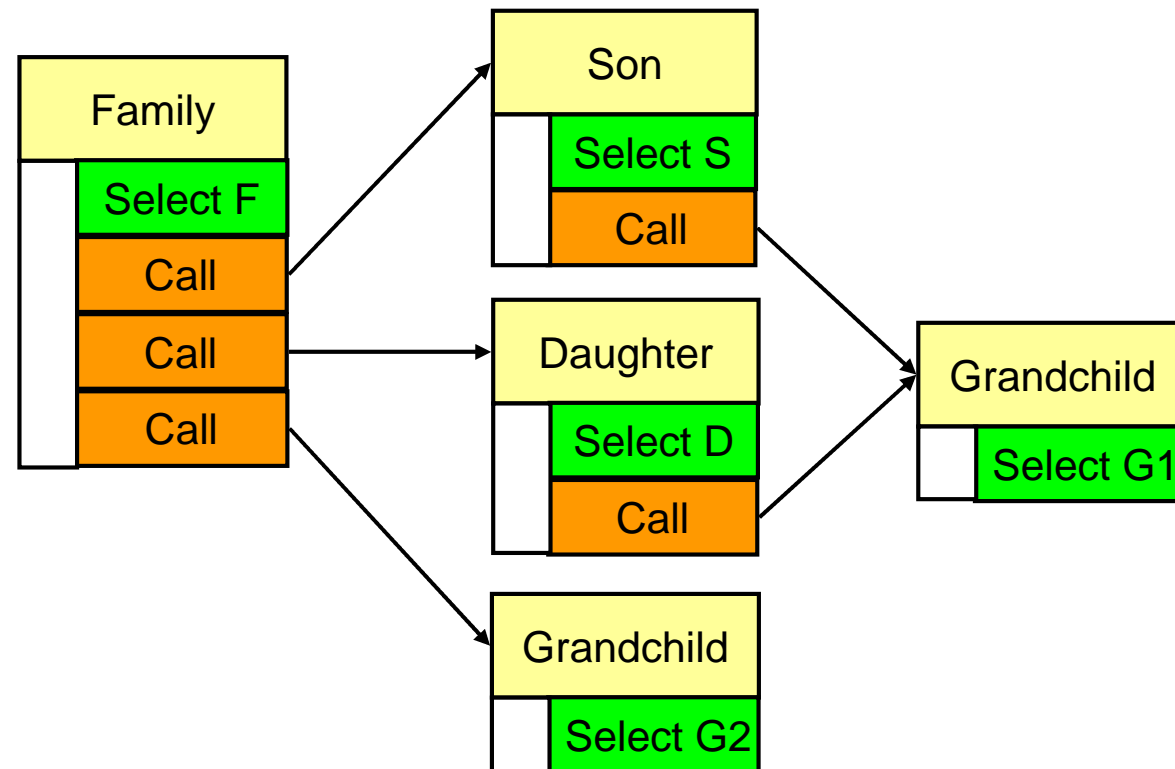
Monitoring Stored Procedures with Tivoli OMEGAMON XE for DB2 Performance Expert for z/OS

- The new DB2 instrumentation records for Stored Procedures are ingested by the OMEGAMON Collector, aggregated on a system level and returned to the (Optim Performance Monitor) Repository Server.
- The OMEGAMON Collector processing includes the sequencing logic and the calculation of elapsed times for the different accounting class times written in the IFI records as timestamps, considering nesting as well.
- In parallel the IFCID 316/401 data for the Statement Caches is collected and a correlation to the executed stored procedure statements via IFCID 499 is made.
- Full RECTRACE support for all new IFCIDs is provided



Using the OMEGAMON XE for DB2 Performance Expert Web Console to analyze Stored Procedures – sample scenario

▪ Workload:



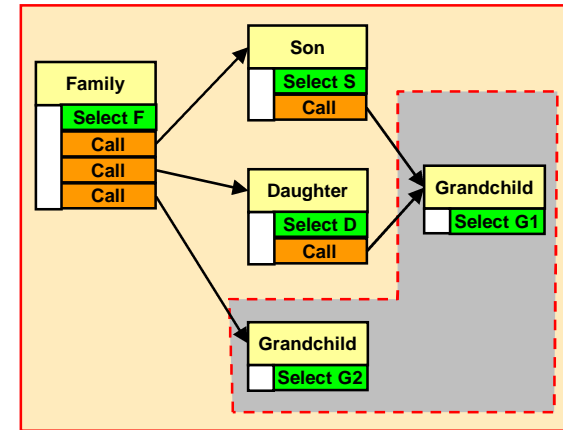


SQL Dashboard – aggregation by ROUTINEID

- Workload at SQL dashboard (“All statements” view) executed in the selected time period (time slider), valid for all subsequent views

Σ of Family

Σ of Grandchild



All Statements

All Statements View

Dashboard filter: Highest 20 by Total Execution Elapsed Time

Statement Text Contains call ; Clear Filter

Statement Text	Routine ID	Number of Calling Paths	Execution Elapsed Time	Number of Execu	CPU Time
CALL SYSIBM.SQLPROCEDURECOLS(IN VARCHAR, IN VARCHAR, IN ...	-2,147,483,102	1	1.160051	168	0.148540
CALL SPMON_CONF_IOD.FAMILY.V1()	-2,147,482,976	1	0.403588	40	0.018785
CALL SYSPROC.ADMIN_COMMAND_DB2(IN VARCHAR, IN INTEGER, I...	-2,147,483,148	2	0.372614	13	0.065811
CALL SYSPROC.ADMIN_INFO_SYSPARM(IN VARCHAR, OUT INTEGER,...	-2,147,483,134	1	0.360020	2	0.033512
CALL SYSIBM.SQLPROCEDURES(IN VARCHAR, IN VARCHAR, IN VAR...	-2,147,483,101	1	0.268017	84	0.051966
CALL SPMON_CONF_IOD.DAUGHTER.V1()	-2,147,482,977	2	0.142537	60	0.006785
CALL SPMON_CONF_IOD.GRANDCHILD.V1()	-2,147,482,979	6	0.108440	164	0.005870
CALL SPMON_CONF_IOD.SON.V1()	-2,147,482,978	2	0.083759	52	0.009528
CALL OPM.DB2MON_LOC.V1(OUT VARCHAR)	-2,147,482,972	1	0.023140	1	0.004644



Showing Stored Procedure Details

Execution Summary

All Statements

All Statements View

Dashboard filter: Highest 100 by Total Execution Elapsed Time

Statement Text Contains Call ;

Statement Text	Routine ID	Number of C	Execution Elap	Number of Executor	CPU Time	Rows	Rows R	I/	Lo	Ne
CALL SPMON_CONF.FAMILY.V1()	-2,147,48...	1	0.704594	46	0.151073	--	--	--	--	0

SQL Statement Details

View Configuration Changes

Overview Server Execution Times Row Activity I/O Locking and Communication

Statement

```
CALL SPMON_CONF.FAMILY.V1( )
```

Statement type:

First referenced table:

Stored Procedure Elapsed Times

Category	Percentage
Nested Elapsed Time	50.06 %
In-DB2 Nested Elapsed Time	49.94 %

Stored Procedure CPU Times

Category	Percentage
Nested CPU Time	27.85 %
Nested Specialty Engine Time	22.15 %
In-DB2	27.85 %

Stored Procedure Information

Routine ID of stored procedure call:	-2,147,482,547
Nesting level:	0
Version name:	V1
Number of calling paths:	1
Number of executions:	46
Nested elapsed time:	0.015317
Nested CPU time:	0.003283
Nested specialty engine time:	0.004130
In-DB2 nested elapsed time:	0.015282
In-DB2 nested CPU time:	0.003283
In-DB2 nested specialty engine time:	0.004130

Class 1 nested times

Class 2 nested time



Showing calling paths of Stored Procedures (1/2)

- Select Calling Path for Daughter

Dashboard filter: Highest 20 by
Statement Text Contains CALL ;
Statement Text
CALL SPMON_CONF.DAUGHTER.V1()
CALL SYSPROC.ADMIN_INFO_SYSPARM(IN VARC

Actions
Tune All
Select Calling Path
Show SQL for All Calling Paths

Σ of Daughter(1) called by Family(0)

Σ of Daughter(0)

Stored Procedure Calling Paths

Select a calling path from the list to show the SQL statements that are executed in the context of the calling path.

Calling paths for: CALL SPMON_CONF_IOD.DAUGHTER.V1()

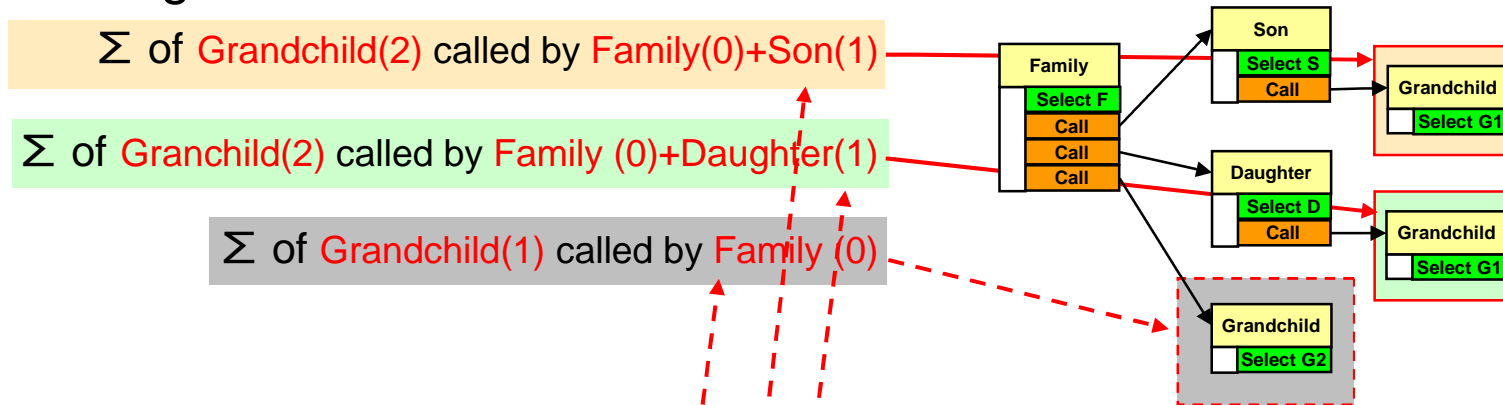
Calling Path	Nesting Level	Number of Exec	Nested Elapsed T	Nested CPU Time
CALL SPMON_CONF_IOD.FAMILY.V1() \ CALL SPMON_CONF_IOD.DAUGHTER.V1()	1	40	0.095590	0.003594
CALL SPMON_CONF_IOD.DAUGHTER.V1()	0	20	0.046947	0.003192

OK Cancel



Showing calling paths of Stored Procedures (2/2)

- Select Calling Path for Grandchild



Stored Procedure Calling Paths

Select a calling path from the list to show the SQL statements that are executed in the context of the calling path.

Calling paths for: `CALL SPMON_CONF_IOD.GRANDCHILD.V1()`

Calling Path	Nesting Level	Number of Execut	Nested Elapsed T	Nested CPU Ti
<code>CALL SPMON_CONF_IOD.FAMILY.V1() \ CALL SPMON_CONF_IOD.GRANDCHILD.V1()</code>	1	40	0.059185	0.001066
<code>CALL SPMON_CONF_IOD.FAMILY.V1() \ CALL SPMON_CONF_IOD.SON.V1() \ CALL SPMON_CONF_IOD.GRAND...</code>	2	40	0.024043	0.002116
<code>CALL SPMON_CONF_IOD.GRANDCHILD.V1()</code>	0	12	0.020522	0.000740
<code>CALL SPMON_CONF_IOD.DAUGHTER.V1() \ CALL SPMON_CONF_IOD.GRANDCHILD.V1()</code>	1	20	0.001797	0.000783
<code>CALL SPMON_CONF_IOD.FAMILY.V1() \ CALL SPMON_CONF_IOD.DAUGHTER.V1() \ CALL SPMON_CONF_IOD....</code>	2	40	0.001689	0.000641
<code>CALL SPMON_CONF_IOD.SON.V1() \ CALL SPMON_CONF_IOD.GRANDCHILD.V1()</code>	1	12	0.001203	0.000524

OK Cancel



Show SQL executed by a Stored Procedure (1/2)

- Action: Show SQL for This Calling Path

Select of Family (0)
shows

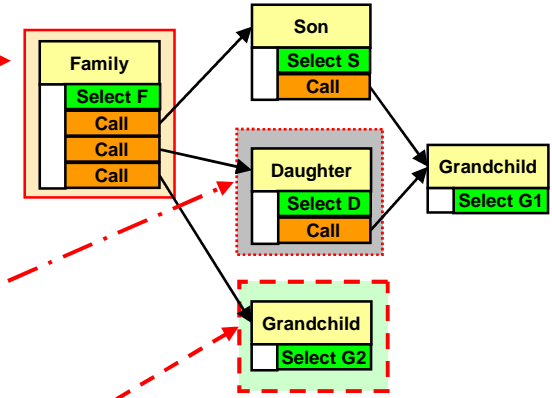
SELECT F *
 Σ of **Call Son(1)** called by **Family(0)**
 Σ of **Call Daughter(1)** called by **Family(0)**
 Σ of **Call Grandchild(1)** called by **Family(0)**

Select of Daughter(1)
shows

SELECT D
 Σ of **Call Grandchild(2)** called by **Daughter(1)**

Select of Grandchild(1)
shows

SELECT G

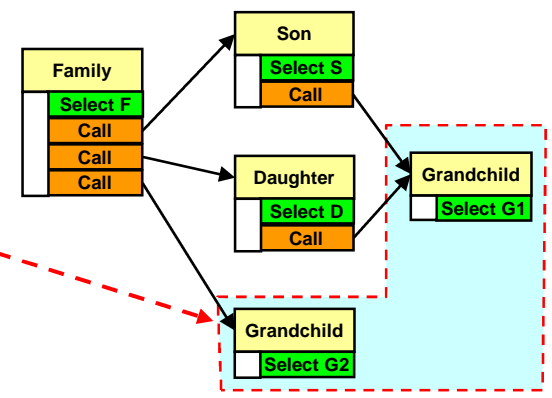


* see next slide

- Action: Show SQL for All Calling Paths

Select Grandchild()
shows Σ

SELECT G1
SELECT G2





Show SQL executed by a Stored Procedure (2/2)

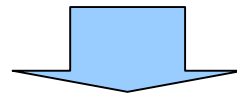
- Show SQL for **This** Calling Path for Family(0)

Dashboard filter: Highest 20 by Total Execution Elapsed Time

Statement Text Contains CALL ;

Statement Text	Routine ID	Number of C	Execution Elap	Number of Execution	CP						
CALL SYSPROC.ADMIN_INFO_SYSLOG(IN VARCHAR, IN VARCHAR, IN DATE, I...	-2,147,48...	1	11.750643	48	1.8						
CALL SYSPROC.ADMIN_COMMAND_DB2(IN VARCHAR, IN INTEGER, IN VARCH...	-2,147,48...	1	1.446675	66	0.243775	--	--	--	--	0	
CALL SPMON_CONF.FAMILY.V1()	-2,147,48...	1	0.704594	46	0.151073	--	--	--	--	0	
CALL SPMON_CONF.SON.V1(IN INTEGER)	-2,147,48...	1	0.457175	184	0.099174	--	--	--	--	1	

Actions: Tune All, Select Calling Path, Show SQL for This Calling Path



[Nesting Level 0] CALL SPMON_CONF_IOD.FAMILY.V1()

Stored Procedure View

Dashboard filter: Highest 20 by Total Execution Elapsed Time

Statement Text	Routine ID	Number of Calling P	Execution Elapsed T	Number of E	CPU Time	Rows Res	Physical I	I/O Time	Lock Wait	Last Execu
SELECT count(*) AS F INTO :H:H FROM sysibm.sysd...	--	--	0.150690	40	0.003045	40	3	--	0.002450	09/10 10...
CALL SPMON_CONF_IOD.DAUGHTER.V1()	-2,147,482,...	1	0.095590	40	0.003594	--	--	--	--	--
CALL SPMON_CONF_IOD.GRANDCHILD.V1()	-2,147,482,...	1	0.059185	40	0.001066	--	--	--	--	--
CALL SPMON_CONF_IOD.SON.V1()	-2,147,482,...	1	0.058601	40	0.007384	--	--	--	--	--



SQL Cache Correlation

- For a nested statement correlation to the cache is shown in “SQL Statements Details” area:

The screenshot displays the 'Execution Summary' and 'SQL Statement Details' sections. The 'SQL Statement Details' section is expanded to show the 'Overview' tab, which includes a table of statement identifiers and their associated metadata.

Statement Text	Routine ID	Number of Ex
[Nesting Level 1] CALL SPMON_CONF.SON.V1(IN INTEGER)		
SELECT COUNT(*) AS SON_EQ INTO :H:H FROM sysibm.syscolumns	--	40
CALL SPMON_CONF.GRANDCHILD.V1(IN INTEGER)	-2,147,482,550	40

Statement	Most Recent Identification
SELECT COUNT(*) AS SON_EQ INTO :H:H FROM sysibm.syscolumns	

Statement type:	Static
First referenced table:	--

Statement identifier:	--
Package name:	SON
Consistency token:	19417ECD1CF43E7C
Section number:	2
Cache insert time:	08/20 11:27:34
Last Execution time:	08/20 11:27:43
Number of parallel groups:	0



History Navigator

- The History Navigator shows the drill down history for Stored Procedures and can be used similar to a Browser History

SQL Statements Dashboard: PMO1DA11

Learn about tuning SQL statements, stopping SQL statements, and forcing applications.

Execution Summary

Dashboard filter

Statement T

Statement T

CALL SYSPROC

CALL SYSPROC

CALL SYSPROC

CALL SPMON_

CALL SYSIBM

CALL SPMON_

CALL SYSIBM

CALL SPMON_

SQL Stater

All Statements

[Nesting Level 1] CALL SPMON_CONF.SON.V1(IN INTEGER) \ CALL SPMON_CONF.GRANDCHILD.V1(IN INTEGER)

[Nesting Level 1] CALL SPMON_CONF.DAUGHTER.V1() \ CALL SPMON_CONF.GRANDCHILD.V1(IN INTEGER)

[Nesting Level 2] CALL SPMON_CONF.FAMILY.V1() \ CALL SPMON_CONF.DAUGHTER.V1() \ CALL SPMON_CONF.GRANDCHI...

[Nesting Level 0] CALL SPMON_CONF.GRANDCHILD.V1(IN INTEGER)

[merged] CALL SPMON_CONF.GRANDCHILD.V1(IN INTEGER)

[Nesting Level 0]CALL SYSPROC.ADMIN_COMMAND_DB2(IN VARCHAR, IN INTEGER, IN VARCHAR, IN VARCHAR, OUT INT...

[Nesting Level 0]CALL SYSPROC.ADMIN_INFO_SYSPARM(IN VARCHAR, OUT INTEGER, OUT VARCHAR)

[Nesting Level 2] CALL SPMON_CONF.FAMILY.V1() \ CALL SPMON_CONF.DAUGHTER.V1() \ CALL SPMON_CONF.GRANDCHI...

[Nesting Level 0]CALL SPMON_CONF.DAUGHTER.V1()

[Nesting Level 0]CALL SPMON_CONF.FAMILY.V1()

[Nesting Level 0] CALL SPMON_CONF.SON.V1(IN INTEGER)

[Nesting Level 2] CALL SPMON_CONF.FAMILY.V1() \ CALL SPMON_CONF.SON.V1(IN INTEGER) \ CALL SPMON_CONF.GRAN...

All Statements



Isolating and Tuning Stored Procedures

- The poorly performing stored procedure has been **identified** and its performance **analyzed** using OMEGAMON XE for DB2 Performance Expert
- The next step is to **isolate** the stored procedure so that other workloads will not be adversely affected
- With the stored procedure isolated, then it can be **tuned**



Launch Optim Configuration Manager for z/OS

InfoSphere Optim Performance Manager

user01 | Log Out | Help

Open ↓ Task Launcher Services Extended Insight Dashboard SQL Statements

View: Historical Data End Time: 10/13/12 23:03 Duration: 1 Hour Automatic Refresh 40 sec

Learn about the time controls.

Europe/Paris
10/13/12 22:03 - 10/13/12 23:03

Aggregation level: 1

SQL Statements Dashboard: DB11 MOP DB11 MOP Disconnect

Learn about tuning SQL statements, stopping SQL statements, and forcing applications.

Execution Summary

All Statements All Statements View

Dashboard filter: Highest 20 by Total Execution Elapsed Time

Statement Text	Routine ID	Number of C	Execution El	Number of E	CPU Time	Rows Read	I/O Time	Lock Wait Ti
CALL SYSPROC.ADMIN_INFO_SYSLOG(IN DATE, IN TIME, IN VARCHAR, IN DATE...	-2,147,482...	1	11.327164	7	0.184351	--	--	--
CALL OPM.DB2MON_LOC.V1(OUT VARCHAR)	-2,147,482...	1	3.115494	1	0.004006	--	--	--
CALL SYSPROC.ADMIN_COMMAND_DB2(IN VARCHAR, IN INTEGER, OUT INTEGE...	-2,147,482...	1	2.969018	7	0.019101	--	--	--
CALL SYSPROC.ADMIN_INFO_SYS Parm(IN VARCHAR, OUT INTEGER, OUT VARC...	-2,147,482...	1	1.115085	1	0.009035	--	--	--
SELECT COLLID AS COLLID, VERSION AS VERSION, STATEMENT, NAME, HEX(CO...	--	--	1.086924	48	0.301781	1,883,904	--	0.000000
SELECT 'OMPE Extended Insight' FROM SYSIBM.SYSTABLES	--	--	0.539504	793	0.518125	0	--	0.000001
SELECT 'IOD 2011 HOL 1777' FROM SYSIBM.SYSTABLES	--	--	0.531736	791	0.514187	0	--	0.000002

SQL Statement Details View Configuration Changes



Navigate to the “Rule Set Manager” tab

IBM InfoSphere Optim Configuration Manager Log Out

Open **Task Launcher**

Show	Act	Setup
Clients and Servers	Define zParms	Alerts
Configuration Changes	Document Store	Blackout Event
DB2 Admin Tool Explorer	Manage Aliases	Configuration Repository
Managed Clients	Manage Application Profiles	Connection Profile Subscriptions
Storage Savings	Rule Set Manager	Console Security
Storage Statistics		Databases
Task Launcher		Job Manager
		Logs
		Manage Privileges
		Preferences
		Services
		Managed Connections

Use the Rule Set Manager to act on managed clients by using rules to isolate application transactions, map workload management service classes, redirect managed connections, throttle managed connections, and tune workload balancing.

Control applications at the server
Create or edit DB2 for z/OS application profiles to control and monitor threads and connections and how they interact with clients, applications, and users.

Managed clients
Explore information about all the clients on which the Data Tools Runtime Client is installed and configured and all the database or subsystems for which a connection exists.

Administer Servers

- Define zParms
- Show storage savings

Product Setup

- Connect to a database or a subsystem
- Manage privileges
- Job manager
- Preferences

Learn More

- Product overview
- Information Center
- Information roadmap
- IBM InfoSphere Optim Configuration Manager forum
- Support



Add Rule Set To Isolate Application

IBM InfoSphere Optim Configuration Manager

db2admin Log Out

Open Databases x Rule Set Manager x Clients and Servers x Manage Aliases x

Icon	Name	Status	Created	Client	Host	Application
Default	Default	No	System @ 2013-04-04 10:47:51.633	SAMPLE	9.55.157.113:50000/SAMPLE	
RS - labec416 NONALIA	RS - labec416 NONALIA	No	System @ 2013-04-05 16:56:30.211	labec416 NONALIAS	labec416.vmec.svl.ibm.com:446/STLEC1	
Isolate Application	Isolate Application	No	db2admin @ 2013-04-05 17:05:32.118	labec416	LABEC416.VMEC.SVL.IBM.COM:8000/STLEC1ALIAS	Isolate Applic

1 - 7 of 7 items

Rule Set: Isolate Application

Save Rule Set

Properties

Rules **+** Clone... ↑ ↓

History

Name Status

Add Rule

Specify the properties for the new rule.

Rule set: * Isolate Application

Name: * Isolate Application - Rule

Action: * Isolate Application Transactions
Isolate problematic applications that degrade performance and isolate new or modified applications until they are ready for production.

Client type: * JCC

OK Cancel

Managed connection: labec416

Action Manager



Define A Condition

IBM InfoSphere Optim Configuration Manager db2admin Log Out

Open Databases Rule Set Manager Clients and Servers Manage Aliases

Default	No		System @ 2013-04-04 10:47:51.633	SAMPLE	9.55.157.113:50000/SAMPLE	
RS - labec416 NONALIA	No		System @ 2013-04-05 16:56:30.211	labec416 NONALIAS	labec416.vmec.svl.ibm.com:446/STLEC1	
Isolate Application	No		db2admin @ 2013-04-05 17:05:32.118	labec416	LABEC416.VMEC.SVL.IBM.COM:8000/STLEC1ALIAS	Isolate Applic

1 - 7 of 7 items 10 | 25 | 50

Rule Set: Isolate Application * Rule: Isolate Application - Rule

Rules that isolate application transactions: Create client rules that isolate application transactions when problematic applications negatively affect performance, or new or modified applications require testing. Rule set: Isolate Application Managed connection: labec416

Save Rule

Properties

Conditions Specify the clients that this rule affects by selecting attributes to filter for the clients.

Field: is +

Action

Review the conditions that specify the clients that are affected by this rule. You can edit the conditions by adding and removing clients or by filtering for clients. The managed connection identifier is always the first condition and cannot be removed.

WHEN serverName IS LABEC416.VMEC.SVL.IBM.COM AND portNumber IS 8000 AND dbName IS STLEC1ALIAS



Define An Action

IBM InfoSphere Optim Configuration Manager

db2admin Log Out

Open Databases x Rule Set Manager x Clients and Servers x Manage Aliases x

Icon	Name	Default	Created By	Alias	Host	Action
	Default	No	System @ 2013-04-04 10:47:51.633	SAMPLE	9.55.157.113:50000/SAMPLE	
	RS - labec416 NONALIA	No	System @ 2013-04-05 16:56:30.211	labec416 NONALIAS	labec416.vmec.svl.ibm.com:446/STLEC1	
	Isolate Application	No	db2admin @ 2013-04-05 17:05:32.118	labec416	LABEC416.VMEC.SVL.IBM.COM:8000/STLEC1ALIAS	Isolate Applic

1 - 7 of 7 items | 10 | 25 | 50

Rule Set: Isolate Application x * Rule: Isolate Application - Rule x

Rules that isolate application transactions: Create client rules that isolate application transactions when problematic applications negatively affect performance, or new or modified applications require testing. **Rule set:** Isolate Application **Managed connection:** labec416

Save Rule

Properties Specify the alias name, host, and port to which the applications or transactions will be routed. You may optionally choose an existing alias already identified on the server.

Conditions

Action

Name	Value
Alias Name	* PENALTYBOX
Hostname/IP	* LABEC418.vmec.svl.ibm.com
Port	* 8999



Activate The Rule Set

IBM InfoSphere Optim Configuration Manager CASEYM Log Out

Open Task Launcher x Clients and Servers x Logs x Managed Clients x **Rule Set Manager x** Manage Aliases x Databases x Define zParms x Configuration Changes x J

Connection: All managed connections

Name	Active	Last Activated	Last Modified	Managed Connection	Managed Connection Details	Comments
RS - utec730	No		CASEYM @ 2013-04-02 15:56:46.404	utec730	utec730.vmec.svl.ibm.com:446/STLEC1	
Isolate Application	No		CASEYM @ 2013-04-04 02:28:21.502	v10 cm	DTEC297.VMEC.SVL.IBM.COM:446/STLEC1	Isolate Ap
RS - labec non alias	No		System @ 2013-04-02 12:23:43.131	labec non alias	LABEC416.VMEC.SVL.IBM.COM:446/STLEC1	
RS - labec416 STLEC1	No		System @ 2013-04-02 12:23:43.021	labec416 STLEC1	labec416.vmec.svl.ibm.com:446/STLEC1	
RS - m10ec5	No		System @ 2013-04-03 15:35:19.592	m10ec5	m10ec5.vmec.svl.ibm.com:446/STLEC1	
RS - labec416	No	CASEYM @ 2013-04-02 14:39:59.42	CASEYM @ 2013-04-02 14:54:36.896	labec416	LABEC416.VMEC.SVL.IBM.COM:8000/STLEC1ALIAS	
RS - fvtec783	No		System @ 2013-04-02 12:23:42.229	fvtec783	fvtec783.vmec.svl.ibm.com:446/STLEC1	
RS - TFSTDR	No	CASEYM @ 2013-04-03 13:32:15.48	CASEYM @ 2013-04-03 13:32:07.926	TFSTDR	hotel27.torolab.ibm.com:60000/TFSTDR	

1 - 28 of 28 items | 10 | 25 | 50

Rule Set: Isolate Application x **Rule: Isolate Application - Rule x**

Rules that isolate application transactions: Create client rules that isolate application transactions when problematic applications negatively affect performance, or new or modified applications require testing. **Rule set:** Isolate Application **Managed conn** cm

Save Rule

Properties Specify the alias name, host, and port to which the applications or transactions will be routed. You may optionally choose an existing alias already identified on the server.



Tuning Stored Procedures as the SQL Workload level

Execution Summary

[merged] CALL SPMON_CONF.GRANDCHILD2.V1(IN INTEGER) Stored Procedure View

Dashboard filter: Highest 20 by Total Execution Elapsed Time

Statement Text	Routine ID	Number of Calling Path	Number of Execution	Execution Elapsed Time	
SELECT COUNT(*) AS GRANDCHILD2_EQ INTO :H:H FROM sysibm.s...	--	--	32	0.061488	0.002382
SELECT COUNT(*) AS GRANDCHILD2_LT INTO :H:H FROM sysibm.sy...	--	--	32	0.001917	0.001653
SELECT COUNT(*) AS GRANDCHILD2_GT INTO :H:H FROM sysibm.s...	--	--	32	0.001868	0.001598

SQL Statement Details View Configuration Changes

Overview Server Execution Times Row Activity I/O Locking and Communication

Statement Most Recent Identification Most Recent Compilation

Actions
Tune All



SQL Workload is loaded into Optim Query Workload Tuner

The screenshot shows the IBM Query Tuning interface. The 'Show Statements' window displays the following table:

STAT EXEC	SOURCE	STAT_ELAP	AVG_STAT_ELAP	STAT_CPU	AVG_STAT_CPU	STAT_GPAG	AVG_STAT_GPAG	EXPLAINED	STMT_TEXT
1	WORKLOAD	629.000000	629.000000	379.000000	379.000000	0	0	Yes	SELECT * FROM SUDB101V.CUST_C
1	WORKLOAD	357.000000	357.000000	325.000000	325.000000	0	0	Yes	SELECT CU1.CUST_CODE, CUST_FJ
1	WORKLOAD	1,009.000000	1,009.000000	352.000000	352.000000	0	0	Yes	SELECT COUNT(*) FROM SUDB101V
1	WORKLOAD	970.000000	970.000000	352.000000	352.000000	0	0	Yes	SELECT * FROM SUDB101V.CUST_C
1	WORKLOAD	329.000000	329.000000	311.000000	311.000000	0	0	Yes	SELECT * FROM SUDB101V.CUST_C
1	WORKLOAD	1,112.000000	1,112.000000	364.000000	364.000000	0	0	Yes	SELECT COUNT(*) FROM SUDB101V
1	WORKLOAD	800.000000	800.000000	334.000000	334.000000	0	0	Yes	SELECT * FROM SUDB101V.CUST_C
1	WORKLOAD	340.000000	340.000000	320.000000	320.000000	0	0	Yes	SELECT * FROM SUDB101V.CUST_C
1	WORKLOAD	4,212.000000	4,212.000000	1,345.000000	1,345.000000	0	0	Yes	SELECT COH.CUST_ORDER_NUMBE
1	WORKLOAD	22.000000	22.000000	21.000000	21.000000	0	0	Yes	SELECT * FROM SUDB101V.CUST_C
1	WORKLOAD	1,620.000000	1,620.000000	962.000000	962.000000	0	0	Yes	SELECT MAX(CUST_UNIQUE_ITEMS
1	WORKLOAD	2,036.000000	2,036.000000	1,778.000000	1,778.000000	0	0	Yes	SELECT COUNT(*) FROM SUDB101V
1	WORKLOAD	42,591.000000	42,591.000000	13,659.000000	13,659.000000	0	0	Yes	SELECT A.CUST_ORDER_NUMBER,
1	WORKLOAD	5,709.000000	5,709.000000	4,913.000000	4,913.000000	0	0	Yes	SELECT CU.CUST_CODE, CU.CUST.



Invoke advisors to generate expert tuning recommendations

The screenshot displays the IBM Query Tuning interface. The main window is titled "Show Statements" and shows a list of workload statements. A "Select Activities" dialog box is open, allowing the user to choose which categories of recommendations to generate. The dialog box has the following options:

- Generate recommendations in these categories: (For more information, click the Help icon.)
 - Statistics
 - Query revisions
 - Indexes
 - Access paths
- Generate reports:
 - Recommendation summary
 - Table

Buttons for "Select All", "Clear All", "OK", and "Cancel" are visible at the bottom of the dialog box.

The "Show Statements" window displays a table of workload statements with the following columns: STAT_EXEC, SOURCE, STAT_ELAP, and AVG. The table contains 14 rows of data, all with "WORKLOAD" as the source.

STAT_EXEC	SOURCE	STAT_ELAP	AVG
1	WORKLOAD	629.000000	
1	WORKLOAD	357.000000	
1	WORKLOAD	1,009.000000	1
1	WORKLOAD	970.000000	
1	WORKLOAD	329.000000	
1	WORKLOAD	1,112.000000	1
1	WORKLOAD	800.000000	
1	WORKLOAD	340.000000	
1	WORKLOAD	4,212.000000	4,212.000000
1	WORKLOAD	22.000000	22.000000
1	WORKLOAD	1,620.000000	1,620.000000
1	WORKLOAD	2,036.000000	2,036.000000
1	WORKLOAD	42,591.000000	42,591.000000
1	WORKLOAD	5,709.000000	5,709.000000

The "Select Activities" dialog box also shows a "Generate reports:" section with options for "Recommendation summary" and "Table". The "Table" option is selected. The dialog box also has a "Select All" button and a "Clear All" button.



Review advisor recommendations summary

This page shows the recommendations from the advisors that you ran.

Database connection: ✔ MOPDB10 (DB2 for z/OS V10 (New-Function Mode))

Statements | **Summary** | **Statistics** | Indexes

Item Analyzed	Result	Recommendation Started	Recommendation Completed
Statistics	New recommendations were generated.	2012-09-05 21:22:08	2012-09-05 21:22:13
Indexes	No new recommendations were generated.	2012-09-05 21:22:38	2012-09-05 21:23:40



Review specific advisor recommendations (Stats)

IBM Query Tuning - QTProject1/Workload Group 1/Workload node 2 - IBM Data Studio

File Edit Navigate Search Project Data Run Window Help

Task Launcher *QTProject1/Workload Group 1/Workload node 2

Query Tuner Workflow Assistant

- 1. Status
 - Analysis Results
 - Workload node 2
 - Single Query
- 2. Capture
 - Workload
 - Open Workload Statements
 - Open Workload Recommendations
 - Open Workload Summary Report
 - Open Workload Table Report
 - Capture Workload Environment
- 3. Manage
- 4. Invoke
- 5. Review
- 6. Compare

Review Workload Advisor Recommendations

This page shows the recommendations from the advisors that you ran.

Database connection: MOPDB10 (DB2 for z/OS V10 (New-Function Mode))

► Status/Description

Capture Workload Environment...

Statements | Summary | **Statistics** | Indexes

Existing statistics status 7 tables need repair out of the 7 tables that were checked

Repair | Complete

This version of the RUNSTATS command collects a full set of statistics for the objects that are related to the workload. In the process of collecting it, this command repairs any problems that the Workload Statistics Advisor found. Run this version if you do not need to conserve time and CPU resources. If you want only to repair the problems that the Workload Statistics Advisor found, click the Repair tab.

Database Name	Table Space Name	Table Name	Cardinality	Reference count	Weighted Reference
<input checked="" type="checkbox"/> SUIDB101D	TSQVT001	PRODUCT_NAME_LOOKUP	6302	1	4,212.0
<input checked="" type="checkbox"/> SUIDB101D	TSQVT002	CUST_CRDT_CARD	31255	3	43,260.0
<input checked="" type="checkbox"/> SUIDB101D	TSQVT002	CUST_CUSTOMER	31255	3	6,088.0
<input checked="" type="checkbox"/> SUIDB101D	TSQVT201	CUST_ORDER_DETAIL	60252	2	9,921.0
<input checked="" type="checkbox"/> SUIDB101D	TSQVT202	CUST_ORDER_HEADER	39389	11	18,811.0
<input checked="" type="checkbox"/> SUIDB101D	TSQVT301	CUST_ORDER_HEADER_H...	325497	1	42,591.0
<input checked="" type="checkbox"/> SUIDB101D	TSQVT302	CUST_ORDER_DETAIL_HIST	361512	3	127,773.0

RUNSTATS Control Statements

```
RUNSTATS
INDEX("SUIDB101V", "PRODUCT_NAME_LOOKUP_VIRT_IDX_1346876895204")
SHRLEVEL CHANGE REPORT YES UPDATE ALL HISTORY NONE

RUNSTATS
INDEX("SUIDB101V", "CUST_CUSTOMER_VIRT_IDX_1346876875470",
      "SUIDB101V", "CUST_CRDT_CARD_VIRT_IDX_1346876895189",
      "SUIDB101V", "CUST_CRDT_CARD_VIRT_IDX_1346876875329")
SHRLEVEL CHANGE REPORT YES UPDATE ALL HISTORY NONE
```

RUNSTATS commands stored on database server



Further analysis such as plan comparison

IBM Query Tuning - QTProject1/Workload Group 1/Workload node 2 - IBM Data Studio

File Edit Navigate Search Project Data Run Window Help

Task Launcher *QTProject1/Workload Group 1/Workload node 2

Query Tuner Workflow Assistant

- 1. Status
 - Single Query
 - Compare Access Plan Graphs
- 2. Capture
 - Workload Plan Comparison
 - Compare Package Access Plan
 - Compare Workload Access Plan
 - Workload_0 Comparison Result
 - Comparison Result
 - 2012-09-05 21:32:27.575808
 - Workload Summary
- 3. Manage
- 4. Invoke
- 5. Review
- 6. Compare

View Comparison Results by Workload EXPLAIN Snapshots and SQL Statements

Database connection: MOPDB10 (DB2 for z/OS V10 (New-Function Mode))

Workload name: Workload_0

Start time: 2012-09-05 21:32:27.575808

Stop time: 2012-09-05 21:32:32.255522

Post-comparison filter applied: -

EXPLAIN Snapshots

Earlier/Later	Start Time	Stop Time	Cost	Statements	Regressed	Improved	Added	Removed
Earlier	2012-09-05 21:16:01.137823	2012-09-05 21:16:58.465919	17,612.846401	14	1	10	0	0
Later	2012-09-05 21:30:51.185535	2012-09-05 21:31:50.800592	970.261580	14	1	10	0	0

Statements

QUERYNO	Cost Increased?	Plan Changed?	Cost Increase %	Source Cost(ms)	Target Cost(ms)	Statement Changed?	Text
743	N	Y	-65.90	1.572239	0.536150	No	SELECT CU.CUST_CODE, CU.CUST_LAST_NAME, COH.CI
733	N	Y	-99.00	408.349426	4.102873	No	SELECT * FROM SUDB101V.CUST_ORDER_HEADER WHE
736	N	Y	-99.18	410.310852	3.372215	No	SELECT * FROM SUDB101V.CUST_ORDER_HEADER WHE
730	N	Y	-99.18	410.358215	3.372215	No	SELECT * FROM SUDB101V.CUST_ORDER_HEADER WHE
738	N	Y	-99.64	1,298.724487	4.681280	No	SELECT COH.CUST_ORDER_NUMBER, COH.CUST_ORDEI
735	N	Y	-99.73	408.068176	1.094804	No	SELECT COUNT(*) FROM SUDB101V.CUST_ORDER_HEA
742	N	Y	-99.87	12,714.192383	16.252399	No	SELECT A.CUST_ORDER_NUMBER, A.CUST_TOTAL, A.CI
737	N	Y	-99.98	308.977844	0.062066	No	SELECT * FROM SUDB101V.CUST_CRDT_CARD WHERE C
734	N	Y	-99.98	309.625549	0.062066	No	SELECT * FROM SUDB101V.CUST_CRDT_CARD WHERE C
732	N	Y	-100.00	406.059387	0.010387	No	SELECT COUNT(*) FROM SUDB101V.CUST_ORDER_HEA
731	Y	N	0.11	95.888573	95.995857	No	SELECT CU1.CUST_CODE, CUST_FIRST_NAME, CUST_LA
739	N	N	0.00	0.142730	0.142730	No	SELECT * FROM SUDB101V.CUST_CUSTOMER WHERE CU
740	N	N	0.00	404.050598	404.050598	No	SELECT MAX(CUST_UNIQUE_ITEMS), AVG(CUST_UNIQUE
741	N	N	0.00	436.525940	436.525940	No	SELECT COUNT(*) FROM SUDB101V.CUST_ORDER_HEA



More Information

- **Websites**

- [DB2 for z/OS home page](#)
- [DB2 Tools for z/OS home page](#)
- [Tivoli OMEGAMON XE for DB2 PE on z/OS home page](#)
- [Optim Query Workload Tuner for z/OS home page](#)
- [Optim Configuration Manager for z/OS home page](#)
- [DB2 for z/OS: Information Roadmap](#)

- **Other resources**

- Online demo: [Stored procedure monitoring and analysis](#)
- eBook: [Optimizing database performance through an integrated solution for DB2](#)



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Backup slides



Navigating to OMPE Extended Insight and the SQL Dashboard

InfoSphere Optim Performance Manager

Open ↓ Task Launcher × Console Security × Configuration Repository × Databases × Extended

Welcome to IBM InfoSphere Optim Performance Manager. Key tasks and getting-started tasks are shown.

Key Performance Management Tasks

- View the performance overview for a database. View the high-level status of a monitored database so that you can locate potential problems. You can investigate the source and severity of the problems by using the other dashboards.
- View the health summary**
View a summary of health alerts and indicators by severity and by time for all of your databases. **Navigates to Extended Insight**
- View alerts. View and respond to alerts for all of your databases. Collaborate on resolving alerts by adding comments to alerts or by sending alerts as emails.
- View connections to a database. View performance data for the application connections to a monitored database. To improve performance, you can disconnect idle applications.
- View SQL statements for a database**
View performance data for SQL statements that run on a monitored database. **Launches SQL Dashboard**
- Run performance reports for a database. Generate reports that you can use to review and analyze performance data and share the data with other team members.

Extended Insight Dashboard × SQL Statements ×

Automatic Refresh

Once launched, tabs are available to navigate between them.



Finally: Link to 'Extended Insight' functionality

Response Time Details: lily

Graph Grid
Selected layer: No layer selected
Fit Maximum

SQL Statements Clients
Show Highest 10 by Average Data Serv

Statement Text
SELECT STAGE FROM MTS.DSN_FILTER_TABLE
CALL SYSIBM.SQLCOLUMNS(IN VARCHAR, IN VA...
CALL SYSIBM.SQLSTATISTICS(IN VARCHAR, IN ...
CALL SYSIBM.SQLCOLPRIVILEGES(IN VARCHAR,...
SELECT CARDF FROM MTS.DSN_KEYTGTDIST_TA...

Display this list by the selected graph layer

Statement Most Recent Identification Most Recent Compilatio

CALL SYSIBM.SQLCOLUMNS(IN VARCHAR, IN VARCHAR, IN VARCHAR, IN VARCHAR, IN VARCHAR)

Statement identifier: --
Package name: --
Collection ID: --
Consistency token: --
Section number: --
Cache insert time: --

Isolation level:
Literal replacement:
CURSOR WITH HOLD:
Special Registers for Compilation
CURRENT PRECISION
CURRENT DEGREE:
CURRENT RULES:
CURRENT SQLID:
CURRENT SCHEMA:

Actions
Tune
Show the execution summary for the selected statement

Execution Summary

All Statements

Dashboard filter: Highest 20 by Total Execution Elapsed Time

Statement text Equals CALL SYSIBM.SQLCOLUMNS(IN VARCHAR, IN VARCHAR, IN VARCHAR, IN VARCHAR, IN VARCHAR) ;

Statement Text	Routine ID	Number of Calling P.	Execution Elap.	Numb
CALL SYSIBM.SQLCOLUMNS(IN VARCHAR, IN VARCHAR, IN VARCHAR, IN VARCHAR, IN V...	-2,147,483,...	1	39.600685	