



F14

# Introducing the new DB2 Performance Expert for Multiplatform

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A decorative graphic consisting of several green circles of varying sizes, some overlapping, arranged in a horizontal line. A central green rounded rectangle with a purple border is superimposed over the middle of this graphic.

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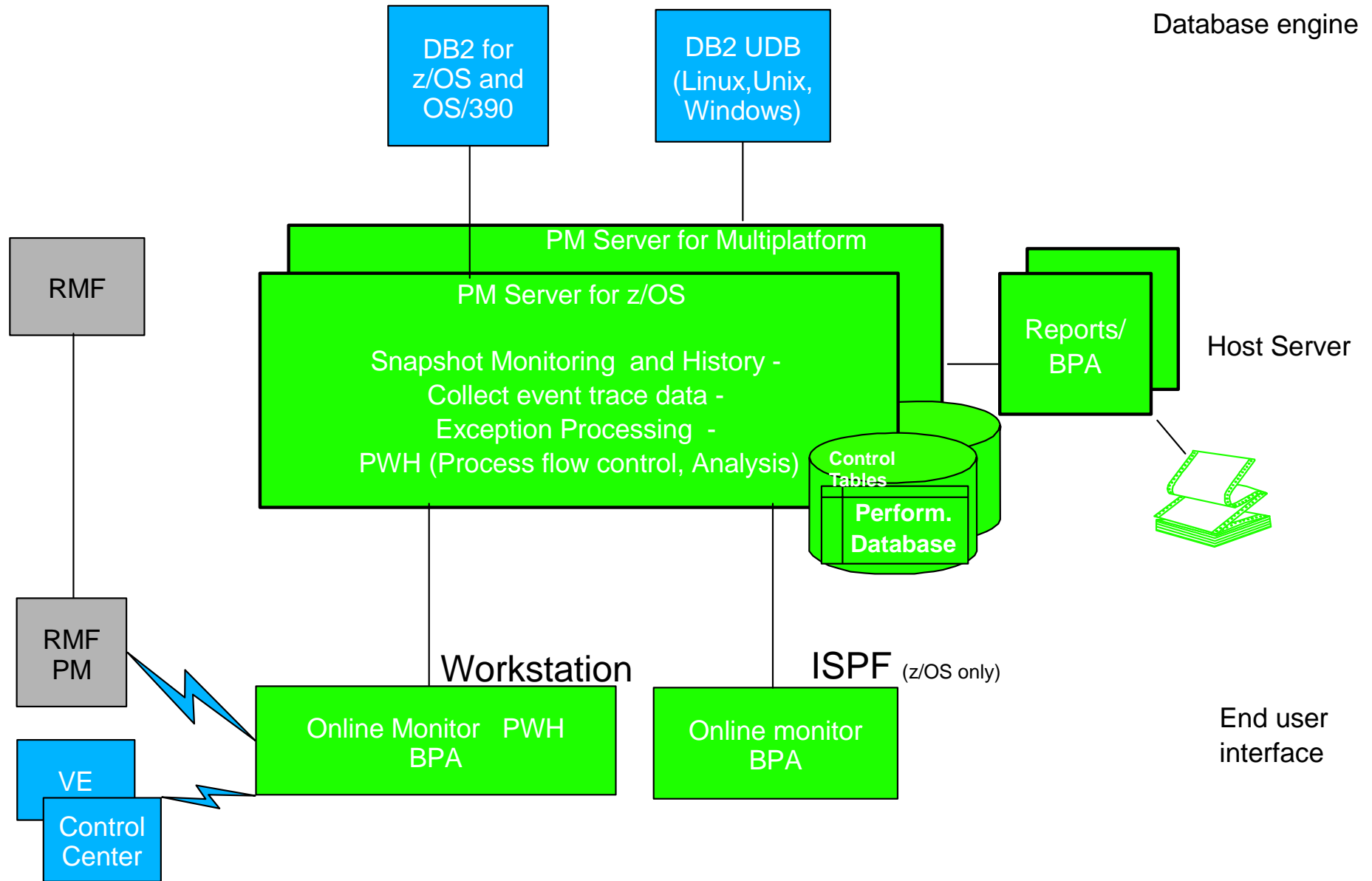
# Agenda

- Performance Expert in general
  - ▶ Highlights and General Structure
- DB2 Performance Expert for Multiplatform
  - ▶ Structure and general considerations
  - ▶ Manage your Systems
  - ▶ Monitor your Instances
  - ▶ Monitor your Applications
- Outlook
  - ▶ Tracing SQL statements
  - ▶ Monitor exceptional conditions
  - ▶ Performance Warehouse
  - ▶ Buffer pool analysis
  - ▶ DB2 Connect Monitoring (End-to-End)
- Installation considerations
- References and Bibliography

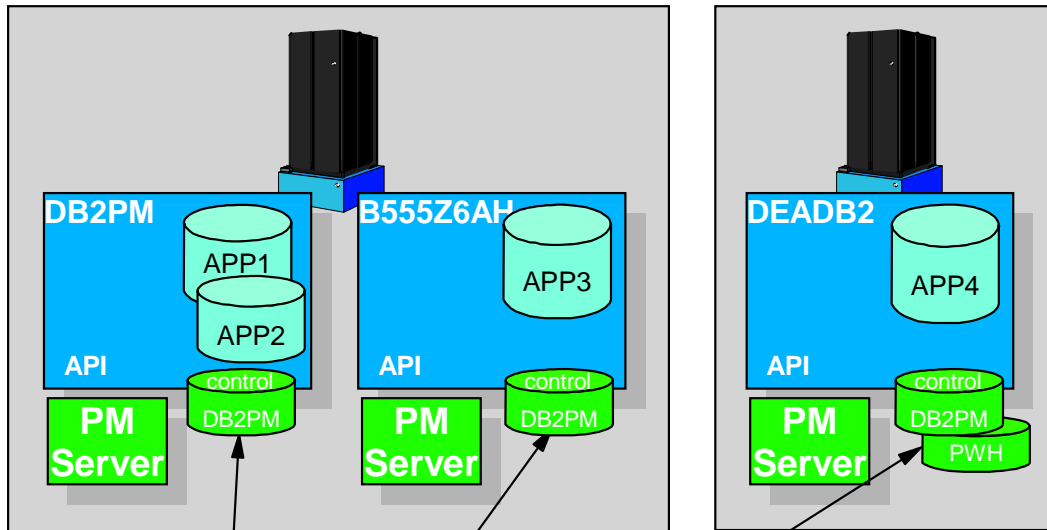
# Highlights

- One central point of control for all DB2 instances
- Real-time online monitoring of several DB2's in parallel of
  - ▶ Applications
  - ▶ System Statistics, Configuration Parameters
  - ▶ Current activities and history data can be shown
  - ▶ Bottlenecks (Locking conflicts, exceeded exception thresholds)
  - ▶ Graphical view of important performance data (System Health)
- Variety of reports and collection of trace data
  - ▶ Accounting, Statistics, SQL Activity, Locking, I/O, Utility, ...
  - ▶ Buffer pool report and analysis
  - ▶ Event and expert reports are provided
- Performance data can be stored and managed in a Performance Warehouse, Analysis support

# General structure



# Environment structure



The PM Server is attached to an DB2 Instance. The PM Server has at least some control tables and temporary tables on each DB2 instance in database DB2PM. Data of different DB2 instances and databases can be stored in one single DB2 Performance Expert Performance Database.

**DB2 Performance Expert - System Overview**

Monitor Selected View Tools Window Help

**Monitored Objects**

- Unix, Windows
  - B555Z6AH
  - B567Z1DF
  - DB2PM
  - DEADB2
- z/OS

**Databases**

DB Name	DB path	Input Alias	Status of DB
APP1	C:\DB2\...	APP1	Database is active
DB2PM	C:\DB2\...	DB2PM	Database is active

**Bufferpool**

Hit ratio (%)	54
Index BP hit ratio (%)	45
Data BP hit ratio (%)	68
Average data pages read async.	N/C
Max. DB heap allocated	443207

**Online Monitor**

# Staged Delivery

Will go GA in September 2002 (with a staged delivery)

There was an electronic GA at July 26, 2002. This first stage included:

- AIX, Windows platform support
- Snapshot Monitoring
- Snapshot History

In September 2002, we will deliver the "CD-ROM" GA of DB2 Performance Expert for Multiplatforms, V1.1 (stage 2) available with full media packaging. This will include:

- Linux (I32), Sun, HP-UX for PE Server and GUI in addition to AIX and Windows
- Snapshot monitoring integrated in System Overview
  - Trace Reports
  - End2End Monitoring
- Already available with eGA

# Staged Delivery

A fix pack 1 for the DB2 Performance Expert for Multiplatforms V1.1 (stage 3) will follow by end of year 2002.

- Linux (z/OS) support
- WS Client:
  - Automated installation
  - Persistent data on PE Server
  - Multiple logon support
    - Customization
    - Exception Processing
- End2End
  - Additional thread detail
  - Network Monitoring (ping)
- Performance Warehouse(PWH)
  - Queries and Rules of thumb
- Buffer Pool Analyzer
  - Reporting and Analysis
- Expert Reports



# Types of Monitoring

## ■ Online Monitoring

- ▶ Takes a **snapshot** of current DB2 and application activities.
- ▶ Continued monitoring of individual applications and immediate reporting of out-of-line situations (conflicts, exceptions).
- ▶ For problem analysis meaningful if it persists or has recently occurred.

## ■ Reporting

- ▶ Based on previously **collected trace** records.
- ▶ Allows problem analysis at a very detailed level (down to single trace record)
- ▶ Aggregates data and calculates averages for
  - continued monitoring
  - trend analysis
  - loadable into DB2 PM Performance DB

## ■ *Differences*

- ▶ *Amount of data to be worked on.*
- ▶ *Snapshot application data only shows active applications, event data only shows data of completed applications.*

# Types of History

- **Snapshot History (recent past history)**
  - ▶ Short range history (minutes, hours, days)
  - ▶ Collects snapshot information on history interval
  - ▶ Interval, data, and amount/type of data are customizable
  - ▶ History dataset with wrap-around mechanism
  - 👉 **Allows to look back into recent past snapshots**
- **Performance Database (long term history)**
  - ▶ Long range history (days, weeks, months, ...)
  - ▶ Automatic creation and updates done by PE Server
  - ▶ Loading process can be defined and scheduled from GUI, process steps managed by PE Server
  - ▶ DDL and DML for Performance DB tables still provided for manual process.
  - 👉 **Allows to run analysis using predefined Rule-of-Thumbs and SQL queries, allows any report and trend analysis**

# Manage your Systems

- Integrated System Overview
  - ▶ Integrates the DB2 Performance Expert for Multiplatforms
  - ▶ Integrates the DB2 Performance Expert for z/OS
  - ▶ Shows availability and status of your DB2 systems
  - ▶ System tree view can be customized
  - ▶ Multiple logon
  - ▶ Consistent look and feel cross platform

# System Overview

DB2 Performance Expert - System Overview

Monitor Selected View Tools Window Help

Traces  
Exceptions  
Buffer Pool Analysis Ctrl+Alt+B  
Performance Warehouse Ctrl+Alt+P

Monitored Objects

- Multiplatforms
  - Instances
    - AIXSERVER
    - B555Z6AH
    - DEADB2
  - z/OS
    - Subsystems
    - Data Sharing Groups
      - DSN3
      - DSN5
      - DSN8
      - DSND
      - DSNI
        - SGI1
        - SGI2
        - SGI3
      - DSNV

DB2 System SGI2  
System Name SYS2  
DB2 V7  
Server V7  
User ID JEN  
Logon [Logoff](#)  
Exception stopped  
Trace Status N/A  
Description

DB2 Commands  
Thread Summary  
Statistics Details  
System Health  
Threads in Lock Conflicts  
Locking Conflicts  
System Parameters  
Performance Warehouse  
Trace Activation

**mult. Platform**

Server Sta...	Logon	DB2 Syste...	Group	User ID	Exception	Trace Stat...	Session	Operating ...	System N...	DB2	Si
↑	✓	AIXSERVER		JEN	N/A	N/A	1	AIX		V7R2	V1
↓	✗	B555Z6AH		JEN	N/A	N/A	0	Windows 2000		V7R2	V1
↓	✗	DEADB2		JEN	N/A	N/A	0	Windows 2000		V7R2	V1
↓	✗	D511			N/A	N/A	0	ZOS	MVST2	V5	VE
↓	✗	D521			N/A	N/A	0	ZOS	PMO2	V5	VE

# System Overview - Multiple Logon

The screenshot shows the DB2 Performance Expert - System Overview window. The 'Multiple Logon' dialog box is open, allowing configuration of logon profiles. The dialog has two main sections: 'DB2 System' and 'Launch Profile'.

**DB2 System Information:**

- DB2 System: SGI2
- System Name: SYS2
- DB2: V7
- Server: V7
- User ID: JEN
- Logon: [Logon](#)
- Exception: N/A
- Trace Status: N/A
- Description:

**Launch Profile:**

- AIXSERVER
- B555Z6AH
- DEADB2
- z/OS
  - Subsystems
    - D511
    - D521
    - D611
    - D621
    - D661
    - D662
    - D711
    - D721
    - D722
    - D761
    - D762
  - Data Sharing Groups
    - DSN3
      - S511
      - S512
- Thread / Application Summary
- Threads in Lock Conflicts
- Locking Conflicts

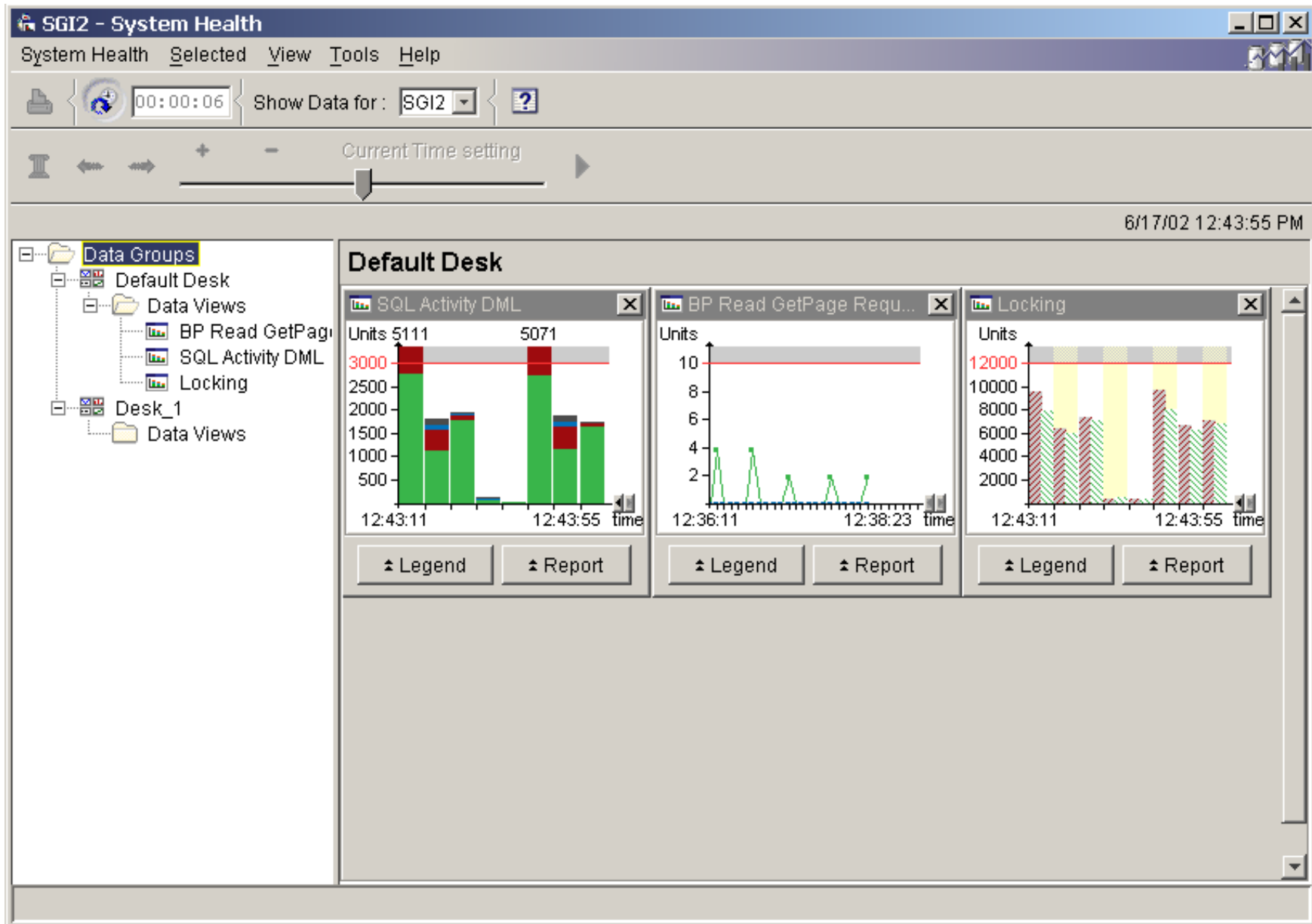
**System Overview Table:**

Server Sta...	Logon	DB2 System...	Group	User ID	Exception	Ti
↓	×	SG82	DSN8		N/A	N/A
↓	×	SG83	DSN8		N/A	N/A
↑	×	SGD1	DSND	JEN	N/A	N/A
↑	×	SGD1_e	DSND	JEN	N/A	N/A
↑	×	SGD2	DSND	JEN	N/A	N/A
↓	×	SGD3	DSND		N/A	N/A
↑	×	SGI1	DSNI		N/A	N/A
↑	×	SGI2	DSNI	JEN	N/A	N/A

# Monitor your Instances

- Shows important performance counters in graphical form (data views)
  - ▶ with customization options for data views with threshold lines
- Shows Statistics counters in detail
  - ▶ Database snapshot information (usage, caches, high water marks, locks, reads, writes, etc.)
  - ▶ Buffer pool (read, writes, I/O, etc.)
  - ▶ Tablespace snapshot
  - ▶ Table snapshot
- Shows System/Configuration Parameters
- Shows Dynamic SQL Statement cache details
  - ▶ usage, times, rows read, ...
  - ▶ SQL statement text
- Shows actual situation as well as historical data
- Delta, Interval, Autorefresh, and Print functions

# Graphical view



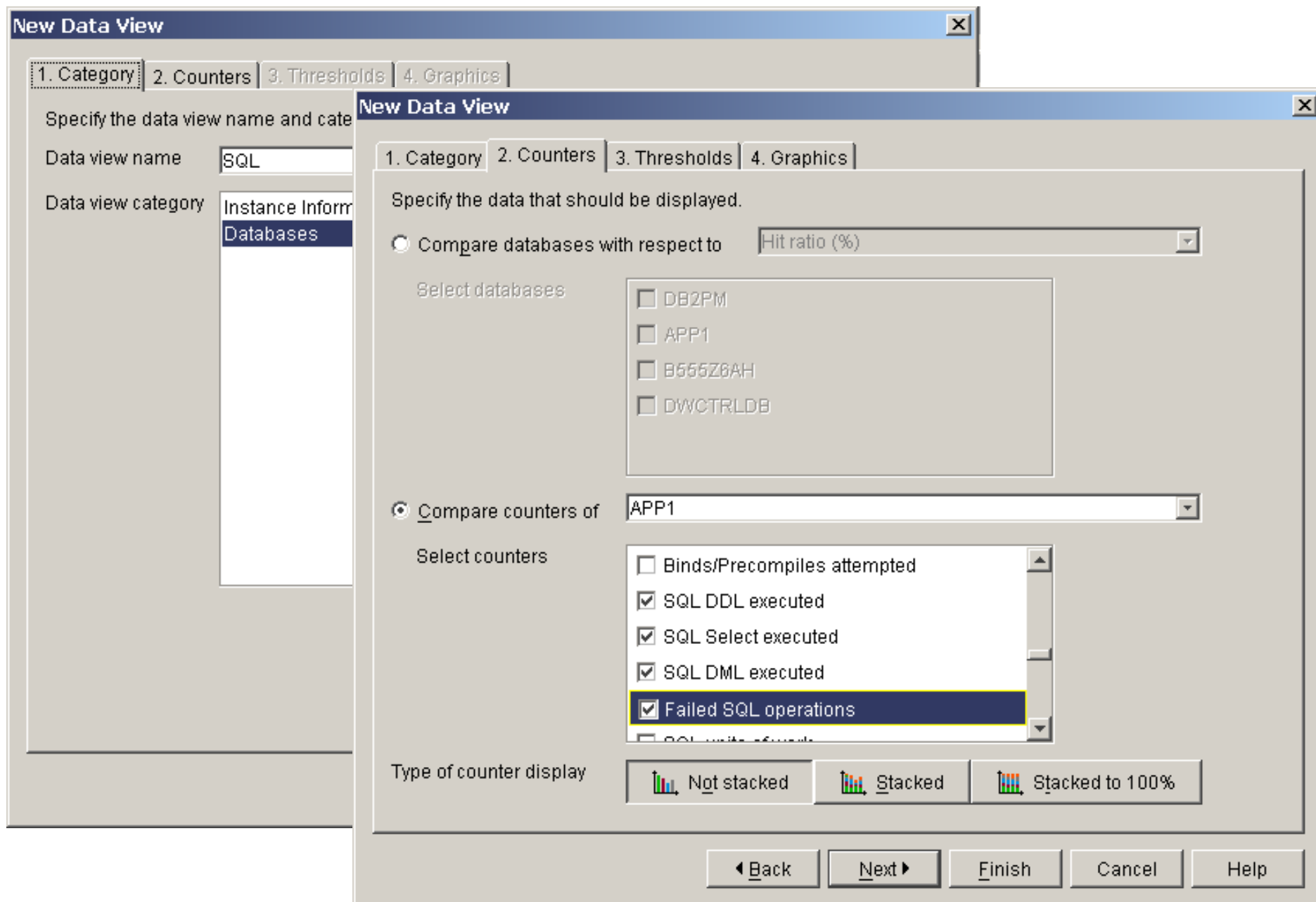
# Create new Data Views

The screenshot illustrates the steps to create a new data view in the IBM System Health application. The main window, titled "B5526AH - System Health", shows a tree view of data groups. A context menu is open over the "Data Views" folder under "Database APP1", with the "New..." option selected. This action has opened the "New Data Group" dialog box, where the "New name" field contains "Database|APP1".

Simultaneously, another "New Data View" dialog box is open, showing the "New Data View" configuration screen. The "Data view name" field is set to "SQL", and the "Data view category" is set to "Databases". The dialog also shows tabs for "1. Category", "2. Counters", "3. Thresholds", and "4. Graph".



# Counters for the new Data View



# Define thresholds and colors

**SQL Properties**

1. Category | 2. Counters | 3. Thresholds | 4. Graphics

Specify thresholds for the counters.

Scale  
 Y-axis scale for non % counters:  units per

Single thresholds



Counter name	Threshold	Higher / Lower	Value	per	Unit
SQL DDL executed	<input type="checkbox"/>	higher than	1000	per	Hour
SQL Select executed	<input type="checkbox"/>	higher than	1000	per	Hour
SQL DML executed	<input checked="" type="checkbox"/>	higher than	1500	per	Minute
Failed SQL operations	<input checked="" type="checkbox"/>	higher than	10	per	Minute

**New Data View**

1. Category | 2. Counters | 3. Thresholds | 4. Graphics

Specify the chart and counter properties.

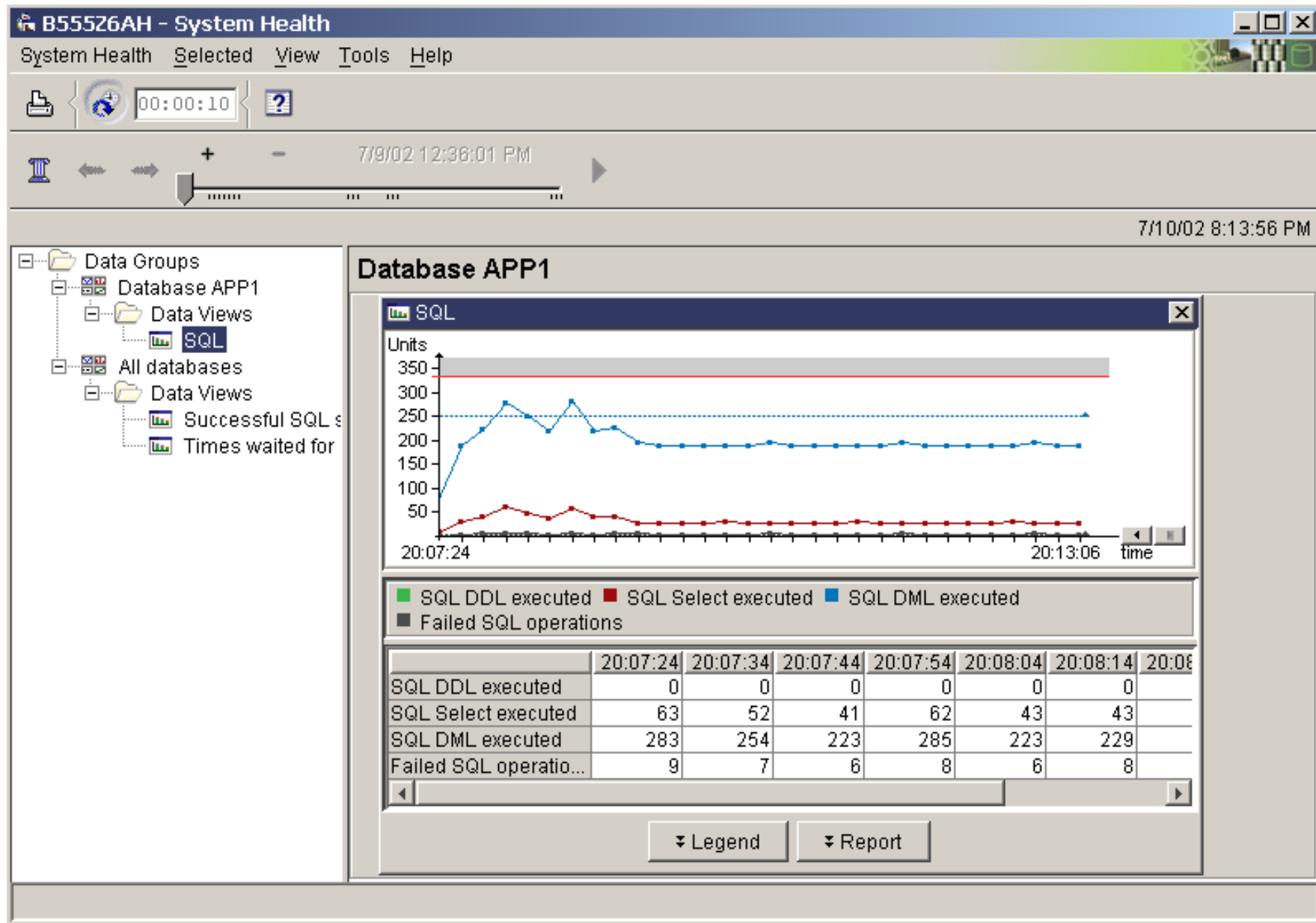
Maximum number of kept snapshots:

Chart type  Bar chart   Line chart 

Colors

Counter name	Color	Pattern
SQL DDL executed	<input type="text" value="Green"/>	<input type="text" value="Green"/>
SQL Select executed	<input type="text" value="Red"/>	<input type="text" value="Red"/>
SQL DML executed	<input type="text" value="Blue"/>	<input type="text" value="Blue"/>
Failed SQL operations	<input type="text" value="Black"/>	<input type="text" value="Black"/>

# New Data View



# Database Statistics Details

**Instance Information**

- Instance Information
- Databases**
- Dynamic SQL Statem
- Tablespaces
- Bufferpools

**Databases**

DB Name	Status of DB	Locks held	Locks waits	Appl. connect..	Appl. associated agents	Appl. exec..	BP hit ratio (%)
DB2PM	Database is active	11	1	3	3	0	85.42
APP1	Database is active	0	0	1	1	0	84.49

**Bufferpool**

- Bufferpool
- Details
- Application
- Locks
- Logs
- SQL Activity
- Cache
- Miscellaneous

**Bufferpool**

Hit ratio (%)	84.49	
Index BP hit ratio (%)	43.33	
Data BP hit ratio (%)	92.35	
Average data pages read async.	N/C	
Max. DB heap allocated	462879	
	<b>Synchronous</b>	<b>Asynchronous</b>
Data reads	24	0
Data writes	0	0
Index reads	34	0
Index writes	0	0
Elapsed time reading	316	N/C
Elapsed time writing	0	N/C

Select categories. Sort Database list and select database from the list and drill down into more details

# Dyn.SQL Statement cache

DEADB2 - Statistic Details

Statistics Details View Tools Help

7/30/02 11:53:24 AM 0:00:06

7/31/02 7:21:24 PM

**Dynamic SQL Statements**

DB Name	Statement	Executi...	Elapsed exec. time
DB2PM	select MT_DESCRIPTION,MT_CATEGORY,MT_TABLES...	84	0.00000
DB2PM	select MC_Column_Name, MC_DATA_TYPE, MC_GENE...	84	0.00000
DB2PM	SELECT KEY, VALUE FROM DB2PM.VERSION	50	0.00000
DB2PM	SELECT MC_COLUMN_NAME, MC_TABLE_NAME, MC...	22	0.00000

SQL Statement

```
select MC_Column_Name, MC_DATA_TYPE, MC_GENERATE, MC_NOT_NULL, MC_WITH_DEFAULT,
MC_ELEMENTID, MC_GROUPID, MC_DERIVED_ROUTINE, MC_PRIMARY_KEY, MC_DERIVED_FIELD,
MC_DELTA, MC_DERIVED_ORDER from DB2PM.MT_Column where MC_TABLE_NAME=?
```

DB Name	DB2PM
Executions	84
Compilations	1
Worst preparation time	1
Best preparation time	1
Sorts	0
Elapsed execution time	0.00000



# Configuration Parameters

B55526AH - System Parameters

System Parameters View Tools Help

7/10/02 8:24:48 PM 0:00:06

7/10/02 8:25:11 PM

Instance Management  
 Identification  
**Capacity Management**  
 Communications  
 Logging/Recovery/Pe  
 Databases

## Capacity Management

Agents	
Maximum coordinating agents	-1
Maximum logical agents	-1
Maximum agents	200
Maximum concurrent agents	-1
Max files open per application	16000
Initial agents in pool	0
Agent pool size	-1
Priority of agents	-1

Agent private memory	
Agent stack size	16
DRDA heap size	128
Min committed private memory	32
Private memory threshold	1296
Query heap size	1000
Sort heap threshold	10000
UDF shared memory size	858

Database application remote interface (DARI)	
Keep DARI process indicator	Yes
Maximum DARI processes	-1
Initialize DARI process with JVM	No
Initial fenced DARI processes in pool	0

Database manager instance memory	
Database system monitor heap size	32
Audit buffer size	0
Directory cache support	Yes
Maximum Java interpreter heap size	2048

Database shared memory	
Default backup buffer size	1024
Default restore buffer size	1024

# Monitor your Applications

- Gives an overview what's currently active
  - ▶ Sort and customization capability
  - ▶ Display Thread summaries & detail categories
    - Times
    - Locking
    - Locked Resources
    - SQL Activity
    - SQL Statement
    - Buffer Pools
  - ▶ Autorefresh, History, and Print for application snapshot functions

# Applications Summary

The screenshot shows a window titled "B55526AH - Application Summary" with a menu bar (Application Summary, Selected, View, Tools, Help) and a toolbar. The main area displays a table of application performance data. The table has columns for Application Name, Application Status, Auth Id, User CPU time, System CPU time, Locks held by appl., and Successful SQL statements. The second row, representing a 'javaw.exe' process, is highlighted in blue. Below the table, there is a blue text instruction: "Sort list as desired, select application and drill down into more details".

Application Name	Application Status	Auth Id	User CPU ti...	System CPU time ...	Locks held by appl.	Successful SQL statements
javaw.exe	UOW waiting	JEN	0.91619	0.22031	10	2458
javaw.exe	UOW waiting	JEN	0.18026	0.01001	1	75
db2bp.exe	UOW waiting	JEN	0.16023	0.06008	0	300
java.exe	UOW waiting	JEN	0.16023	0.04005	0	407
javaw.exe	UOW waiting	JEN	0.02002	0.01001	0	9

Sort list as desired, select application and drill down into more details



# Application Details

B55526AH - Application Details (Auth Id: JEN)

Application Details View Tools Help

Refresh display and trace the SQL statement currently executed or page back into the recent snapshot history.

- Identification
- Times
- SQL Statement and Package
- SQL Activity
- Locks
- Cache
- Buffer Pool
- Sort
- Miscellaneous
- Subsections

## SQL Statement and Package

### Statement

Most recent operation	SQL Execute Immediate
Statement type	Dynamic statement
Section number	65
Application creator	NULLID
Package name	SQLLF000
Cursor name	NULL
Blocking cursor	0
Node number	0

### SQL statement text

```
update session.BUFFERPOOLA set DATAPAGEHITRATIO=CASE
WHEN POOLDATALREADS=0 THEN NULL ELSE
(1-(POOLDATAPREADS/POOLDATALREADS))*100 END
```

SQL statement text

### Times

Start timestamp	7/10/02 8:08
Stop timestamp	7/10/02 8:08
Elapsed time	0.0006
User CPU time	0.0000
System CPU time	0.0000

### Sort

Statement sorts	
Total sort time	
Sort overflows	

### Rows

Read	1
Fetch	
Deleted	
Updated	
Inserted	
Fetch	

# Application Details

B55526AH - Application Details (Auth Id: JEN)

Application Details View Tools Help

7/9/02 12:33:01 PM 0:00:06

- [-] Identification
- [-] Times
- [-] SQL Statement and F
- [-] SQL Activity
- [-] Locks
- [-] Cache
- [-] Buffer Pool
- [-] Sort
- [-] Miscellaneous
- [-] Subsections

## SQL Activity

Statements		Internal activities	
Commit	95	Automatic rebinds	0
Rollback	0	Rows deleted	0
Dynamic SQL attempted	4638	Rows updated	0
Static SQL attempted	95	Rows inserted	0
DDL executed	0	Commits	1
Select SQL executed	521	Rollbacks	0
Update/Insert/Delete executed	2766	Rollbacks due to deadlock	0
Failed operations	57		
SQL requests since last commit	109	UOW	
Successful SQL statements	4676	UOWs	96
		UOW log space used (Bytes)	0
Statement ratios		UOW completion status	Not def.
SELECT	0.00	UOW start timestamp	7/10/02 8:08...
UPDATE/INSERT/DELETE	0.00	UOW stop timestamp	N/A
Rows		Previous UOW completion timestamp	7/10/02 8:08...
Read	12	Elapsed time (s)	0.03703
Written	4	Cursors	

# Outlook

- Tracing SQL statements
  - Monitor exceptional conditions
  - Performance Warehouse
  - Buffer Pool Analysis
  - DB2 Connect Monitoring (End-to-End)
- Functions are similar to functions already available in DB2 Performance Expert for z/OS  
(explained with help of the z/OS panels)

# Tracing SQL statements

Select application and invoke SQL Activity tracing from Application summary or Application Details panel

The screenshot shows the 'D722 - Application Summary' window. The menu is open, and 'SQL Activity Report' is selected. The table below shows the following data:

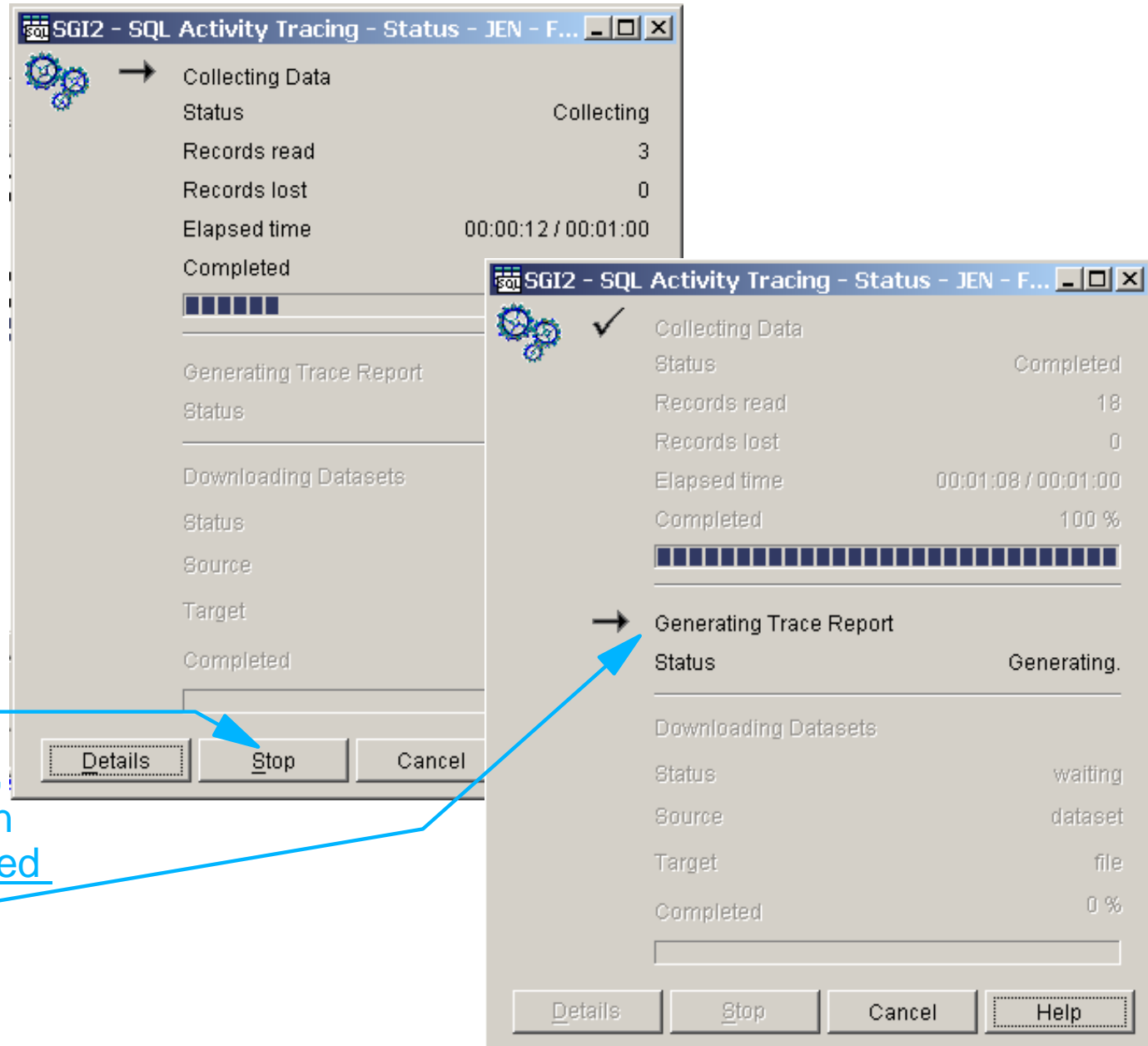
AuthID	Plan	Program N..	Elapsed C...	Elapsed C...	Total Clas...	CPU Clas...	CPU Clas...
WTN	DISTSERV	SQLC2D0...	0.052	0.045	2.231	2.954	2.276
DB2PM	N/P	N/P	0.271	0.058	0.013	13:54:09	0.081
DB2PM	N/P	N/P	0.045	0.024	0.005	13:54:10	0.078
DB2PM	PMOMDEV	DGO@SD...	0.035	0.033	1.731		
DB2PM	PMOMDEV	DGO@DB...	0.108	0.092	0.104		
JEN	PMOMDEV	N/P	0.002	0.001	0.011		
DEA	PMOMDEV	N/P	0.002	0.002	0.002		
POD	PMOMDEV	N/P	0.001	N/P	N/P		
BOY	PMOMDEV	N/P	0.023	0.012	0.002		

User is prompted for stop conditions

The dialog box 'D722 - SQL Activity Report - DB2PM - - PM02D722' is shown. It contains the following fields and options:

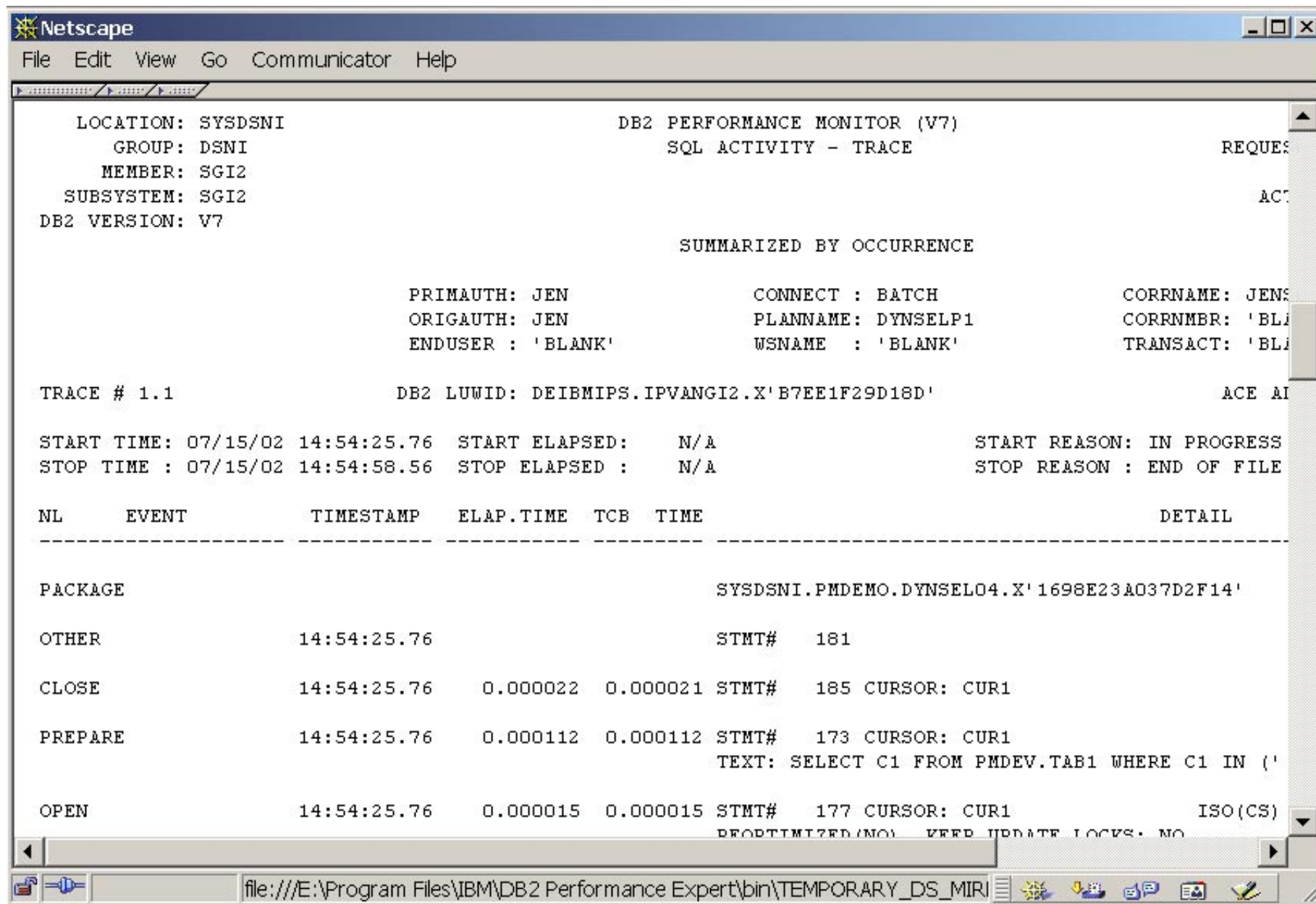
- Start Report
- Additional Stop Conditions
- You can specify the following additional stop conditions:
- Elapsed time: 00:10:00 hh:mm:ss
- Number of records collected: 0
- Buttons: OK, Cancel, Help

# Tracing SQL statement



User may request more details or can stop trace data collection manually, after trace collection reports are generated automatically

# Tracing SQL statements



LOCATION: SYSDSNI DB2 PERFORMANCE MONITOR (V7)  
 GROUP: DSN1 SQL ACTIVITY - TRACE  
 MEMBER: SGI2  
 SUBSYSTEM: SGI2  
 DB2 VERSION: V7

SUMMARIZED BY OCCURRENCE

PRMAUTH: JEN CONNECT : BATCH CORRNAME: JENS  
 ORIGAUTH: JEN PLANNAME: DYNSELP1 CORRNUMBR: 'BLI  
 ENDUSER : 'BLANK' WSNAME : 'BLANK' TRANSACT: 'BLI

TRACE # 1.1 DB2 LUWID: DEIBMIPS.IPVANGI2.X'B7EE1F29D18D' ACE AI

START TIME: 07/15/02 14:54:25.76 START ELAPSED: N/A START REASON: IN PROGRESS  
 STOP TIME : 07/15/02 14:54:58.56 STOP ELAPSED : N/A STOP REASON : END OF FILE

NL	EVENT	TIMESTAMP	ELAP.TIME	TCB	TIME	DETAIL
	PACKAGE					SYSDSNI.PMDEMO.DYNSELO4.X'1698E23A037D2F14'
	OTHER	14:54:25.76			STMT# 181	
	CLOSE	14:54:25.76	0.000022	0.000021	STMT# 185	CURSOR: CUR1
	PREPARE	14:54:25.76	0.000112	0.000112	STMT# 173	CURSOR: CUR1 TEXT: SELECT C1 FROM PMDEV.TAB1 WHERE C1 IN ('
	OPEN	14:54:25.76	0.000015	0.000015	STMT# 177	CURSOR: CUR1 ISO(CS) REOPTIMIZED(NO) KEEP UPDATE LOCKS: NO

file:///E:\Program Files\IBM\DB2 Performance Expert\bin\TEMPORARY\_DS\_MIRI

With your preferred browser you can browse, search, print, or save your report.



# Monitor exceptional conditions

- Monitor Online exceptional events, like timeout, deadlocks, ...
- Use user defined thresholds for periodic checking against DB2 snapshot values
- Use 'Enterprise wide exception' processing to be started with the PE Server
- Immediate alerts about exceptional conditions
- Allows to route alerts to an 'User Exit', respectively user-defined routine for subsequent processing or display (for example, by Cell phone or pager)
- Single (log) point of control for all systems
- Multiple system control (start / stop)

# Single Exception Log Window

The screenshot shows the 'Exception Processing' window with a tree view on the left and two log tables on the right. The tree view includes 'Event Exception Processing', 'Event Exceptions', 'Event Exception Log', 'Periodic Exception Processing', 'Threshold Sets', and 'Periodic Exception Log'. The 'Event Exception Log' table lists events with columns for Timestamp, DB2 Subsystem, Event, and Specific Information. The 'Periodic Exception Log' table lists periodic events with columns for Begin, Last Chan..., End, DB2 Subs..., Exception Field, Value, and Warning. Below these logs is a table showing the status of various subsystems.

Subsystem	Event Status	Periodic Status	Periodic Interval	Periodic User Exit
SGI2	▶	▶	60	<input type="checkbox"/>
SGD1	●	●	0	<input type="checkbox"/>
SGD2	▶	▶	60	<input type="checkbox"/>
D611	●	●	0	<input type="checkbox"/>
D661	●	●	0	<input type="checkbox"/>

One single log window showing all events and threshold based exceptions happened in all DB2 systems connected.



To drill down into more details for Statistics or thread threshold exceeded or for exceptional events just double-click on log entry.



# Exception Processing Activation

Several logged-on DB2 systems can be selected to activate or deactivate exception processing

The screenshot shows the 'Activation' dialog box with the following details:

- Subsystems:**
  - Subsystems
    - D611
    - D661
  - Data Sharing Groups
    - DSND
      - SGD1
      - SGD2
    - DSNI
      - SGI2

The 'Activation' pane contains two sections:

- Event Exception Processing:** Status: Running. Checked items: EDM Pool full, Authorization failure, Thread commit indoubt, Deadlock, Timeout.
- Periodic Exception Processing:** Status: Running. Demo (dropdown), Interval seconds: 60, User exit:

Buttons: Close, Help

# Exception Processing Definitions

Selecting other tree objects will show additional information about events monitored and thresholds used. Select an existing threshold set or a new one to open the threshold editor window.

Event	SGD1	SGI2	SGD2	D611	D661
Deadlock	✓	✓	✓	✓	✓
Timeout	✓	✓	✓	✓	✓
EDM Pool full	✓	✓	✓	✓	✓
Authorization failure	✓	✓	✓	✓	✓
Coupling Facility Rebuild/Alt...	✓	✓	✓	✓	✓
Coupling Facility Rebuild stop	✓	✓	✓	✓	✓
Coupling Facility Alter stop	✓	✓	✓	✓	✓
Thread commit indoubt	✓	✓	✓	✓	✓
Global trace start	✓	✓	✓	✓	✓
Data set extension	✓	✓	✓	✓	✓
Unit of Recovery problem	✓	✓	✓	✓	✓
Log space shortage	✓	✓	✓	✓	✓

Status	A/S	Exception Category	Exception Field	Warning Level	Problem Level	Mode
▶	A	SQL Statements p...	Total SQL DML...	>500	>700	by total
▶	A	Locking Activity per...	Actual number ...	>2	>4	by total
▶	A	Elapsed, CPU, an...	Elapsed time i...	>4	>8	by total

# Exception Threshold Editor

Demo - Demo - Configure

Threshold Configurations Selected Edit Tools Help

Status	A/S	Exception category	Exception field	Warning Level	Problem Level	Mode	Connection name	Correlation name	Primary
▶	A	SQL Statements p...	Total SQL DM...	>500	>700	by total			JEN*
▶	A	Locking Activity per...	Actual number...	>2	>4	by total			JEN*
▶	A	Elapsed, CPU, an...	Elapsed time i...	>4	>8	by total			JEN*

Field selection Threshold definition

Show:  All exception fields  
 Thread related exception fields  
 Subsystem related exception fields

Select the exception category

A/S	Exception category
A	Elapsed, CPU, and Waiting Times per Plan
A	Elapsed, CPU, and Wait Times per Program
S	CPU Times per Address Space
A	SQL Statements per Plan Execution
A	SQL Statements per Program Execution
S	SQL Statements per System
A	Subsystem Events per Plan Execution
S	Subsystem Events per System
A	Locking Activity per Plan Execution
S	Locking Activity per System
A	RID List Processing per Plan Execution
S	RID List Processing per System

Select the exception field

O/B	Exception field
O/B	Total SQL DML statements
O/B	Total SQL DCL statements
O/B	T...

Select the category and the field at the first tab for which you want to define a warning and problem threshold at the second tab together with filter criteria if applicable and desired.

Field selection Threshold definition

Selected category  Selected exception field

Warning and Problem Threshold

VALUE  WARNING Threshold

PROBLEM Threshold

Filter

Connection name	Qualifier	Value
Correlation name	Primary ...	JEN*
Correlation number		
Plan name		
Primary authorization		
Requesting location		
Buffer pool ID		
Local location		
Group name		

# Performance Warehouse

- Automatic creation and maintenance of the DB2 tables
- Supports to run reports started from GUI
- Supports to build and schedule processes to prepare and load performance data (DB2 event trace data) into the Performance Database
- Provides standard SQL queries and in future also standard Rule-of-Thumb (ROT)
- Provides the capability to adapt and define customers own ROT and queries
- Allows to have one single Performance Database for several DB2 instances

# Control Process execution

Looking for processes running or already executed, check for filter definition by selecting 'View' in the menu bar.

The screenshot shows the Performance Warehouse interface. On the left is a tree view of process groups under 'jdbc:db2:sgi2'. The 'Process Executions' folder is selected. A 'Filter Process Execution' dialog box is open, allowing users to define filters for process execution. The dialog has a table for defining filters and an 'Enable filter' checkbox.

Column	Comparison	Value
Name	=	
AND Group	=	
AND Start	<	2002-07-01_00:00:00
AND Stop	IS	NULL
AND Status	=	

Enable filter

Buttons: OK, Cancel, Help

Below the dialog, a list of process executions is visible, including columns for process name, start time, and end time.

# SQL Query Definition

Performance Warehouse

Performance Warehouse Selected Help

jdbc:db2:sgi2

- Process Groups
  - Accounting
    - Processes
      - Accounting Report and Trace
        - Steps
  - Statistics
  - Stats\_and\_load
  - Public
- Process Executions
- Rule-of-Thumb Groups
- Query groups
  - JEN\_Acctg
    - Query **Create**
  - Public
  - Queries

Name	Description	Modified
DB2PM.Accounting queries...	Accounting report block 'Ap...	2002-07-12 17:47:32.4232...
SQL1		2002-07-05 17:15:38.5500...

**Query Properties**

General Definition

Name: TOP accounting

Author: JEN

Creation date and time: 2002-07-12 18:47:50.653215

Modification date and time: 2002-07-12 18:47:50.653215

Scope: private

Description: This query delivers the TOP plan executions last week

OK Apply Cancel Help

Create your own SQL query by copying and changing an existing one or by defining a new one.

# SQL Query Definition

Query Properties

General Definition

Column assist

Report type: ACCOUNTING

Report block: Identification

Table: DB2PMSACCT\_GENERAL

Columns

Column	Table	Data type	Field	Description
REQ_LOCATION	DB2PMSACCT_GENERAL	CHAR(16)	QWHDRQNM	The requesting location.
CONNECT_TYPE	DB2PMSACCT_GENERAL	CHAR(8)	QWHCATYP	The connection type.
CONNECT_ID	DB2PMSACCT_GENERAL	CHAR(8)	QWHCCN	The connection name.
CORRNAME	DB2PMSACCT_GENERAL	CHAR(8)	ADCORNME	The correlation name.
CORRNUMBER	DB2PMSACCT_GENERAL	CHAR(8)	ADCORNMB	The correlation number.
PLAN_NAME	DB2PMSACCT_GENERAL	CHAR(8)	QWHCPLAN	The plan name.
PRIMAUTH	DB2PMSACCT_GENERAL	CHAR(8)	QWHCAID	The primary authorization I

Query

Add column

Add table

```
SELECT DB2PM.DB2PMSACCT_GENERAL.PRIMAUTH,  
FROM  
WHERE  
GROUP BY  
HAVING  
ORDER BY
```

Select Report type, Report block or table and field  
and add column to the (free) editable SQL statement area

OK Apply Cancel Help

# SQL Query execution

Query Execution

View SQL View Result

Query Definition

- Time
- Variables

```
DB2PM.DB2PMSACCT_GENERAL.CLASS1_ELAPSED,  
DB2PM.DB2PMSACCT_GENERAL.CLASS2_ELAPSED
```

FROM DB2PM.DB2PMSACCT\_GENERAL

ORDER BY DB2PM.DB2PMSACCT\_GENERAL.C

Time setting

Select a time interval from the load log stati

Loaded by	Trace Start	Trace End	Ste
JEN	1999-08-2...	1999-08-2...	149
JEN	1999-08-2...	1999-08-2...	184

Start time [ ]

End time [ ]

Load step [ ]

Query Execution

View SQL View Result

```
SELECT DB2PM.DB2PMSACCT_GENERAL.PRIMAUTH,  
DB2PM.DB2PMSACCT_GENERAL.PLAN_NAME,  
DB2PM.DB2PMSACCT_GENERAL.CLASS1_ELAPSED,  
DB2PM.DB2PMSACCT_GENERAL.CLASS2_ELAPSED
```

FROM DB2PM.DB2PMSACCT\_GENERAL

PRIMAUTH	PLAN_NAME	CLASS1_ELAPSED	CLASS2_ELAPSED
JEN	FIJ1BAT	78.859340	77.774153
JEN	FIJ1BAT	19.432151	13.369487
JEN	DB2BP.EX	1380.199976	1.639612
JEN	FIJ1BAT	0.802550	0.596565
JEN	DB2BP.EX	235.859781	0.451145
JEN1	DSNESPRR	0.596754	0.221893
JEN1	ADB	950.838473	0.057874
JEN	DB2CCA.E	0.399351	0.000000

Row(s) 1 - 8 of 8

Save... Browse

Close Help

Select time period and define variable values before executing the SQL query

The result can be saved or shown in a browser window



# Standard SQL Queries

The screenshot shows the Performance Warehouse application window. The left pane displays a tree view of the database structure, with 'Queries' selected under the 'Public' folder. The main pane shows a table of queries with columns for 'Name' and 'Description'. A blue arrow points from the 'Description' column of the first row to a detailed description window.

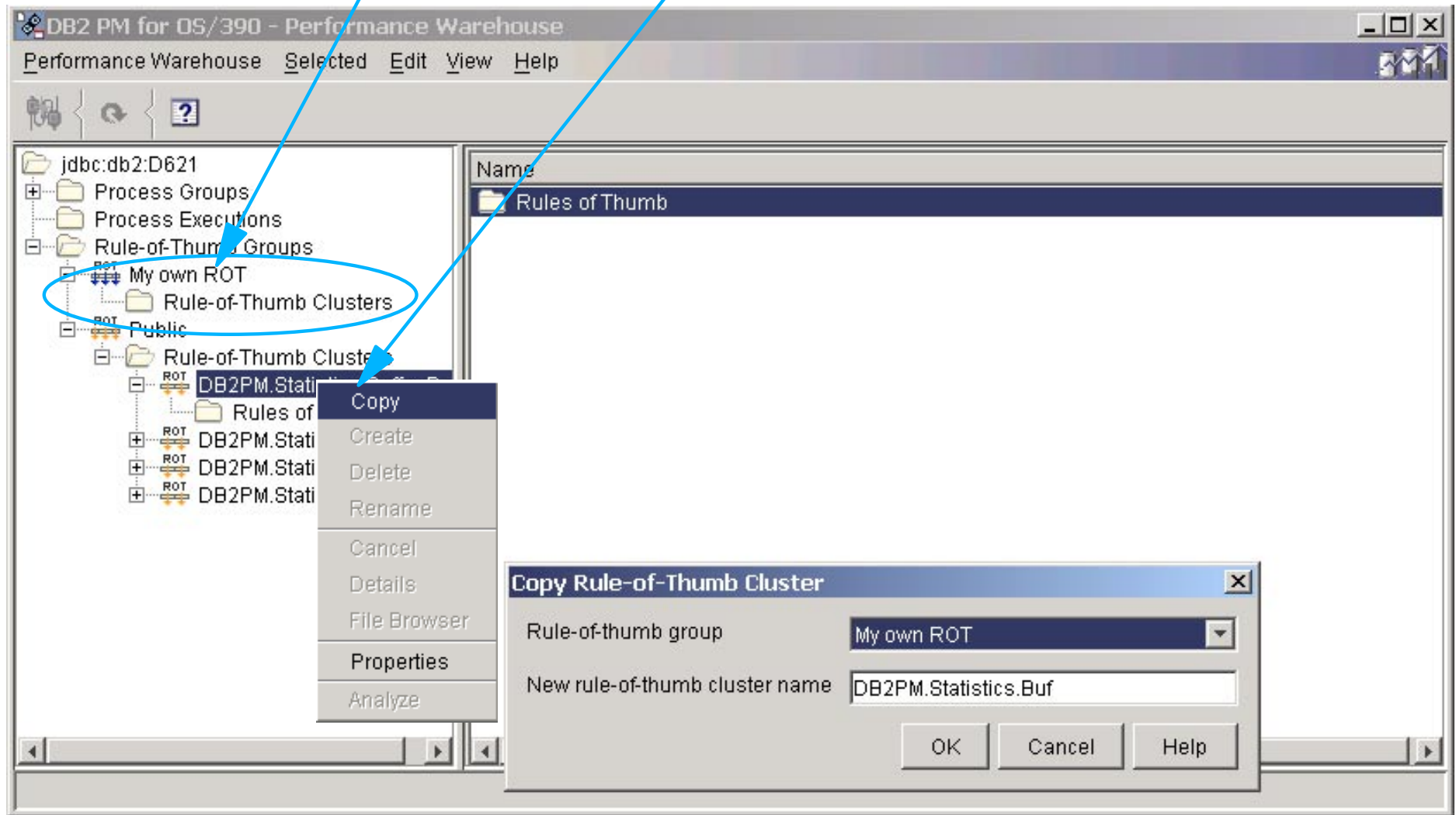
Name	Description
DB2PM.Accounting.Appl. Class 1 Time	Accounting report block 'Application Class 1 Time'
DB2PM.Accounting.Appl. Class 2 Time	Accounting report block 'Application Class 2 Time'
DB2PM.Expert Analysis - ACCOUNTING.Step 1	Step 1: Compare class 1 and class 2 times, simulate threshold query grouping by CORRNAME. Identify candidates for performance improvement. If the class 2 elapsed time is less than half of the class1 elapsed time, probably most performance improvements can be achieved 'outside DB2' (e.g. z/OS, CICS, IMS, etc.). Candidates for DB2 performance improvement are those online applications whose class 2 elapsed time are more than 50 % of class1 elapsed time. If desired, it may be useful to filter those applications with large
DB2PM.Expert Analysis - ACCOUNTING.Step 2	Step 2: Compare class 2 elapsed and class 2 cpu time. Evaluate the candidates for
DB2PM.Expert Analysis - ACCOUNTING.Step 3	Step 3: Evaluate class 2 cpu time per SQL statement execution. Evaluate candidate
DB2PM.Expert Analysis - ACCOUNTING.Step 4	Step 4: Evaluate class 3 suspension times. Evaluate the candidates for
DB2PM.Expert Analysis - ACCOUNTING.Step 5	Step 5: If step 3 indicates SQL statement problems, the following step may help to i
DB2PM.Statistic.Locking Activity.Quantity	Quantity data of statistics report block 'Locking Activity'
DB2PM.Statistic.OPEN/CLOSE Activity	Statistics report block 'OPEN/CLOSE Activity'
DB2PM.Statistic.SQL DML.Quantity	Quantity data of Statistics report block 'SQL DML'
DB2PM.Statistic.SQL DML.per second	Per second data of statistics report block 'SQL DML'
DB2PM.Statistic.SQL DML.per thread	Per thread data of statistics report block 'SQL DML'

**Description**

Step 1: Compare class 1 and class 2 times, simulate threshold query grouping by CORRNAME. Identify candidates for performance improvement. If the class 2 elapsed time is less than half of the class1 elapsed time, probably most performance improvements can be achieved 'outside DB2' (e.g. z/OS, CICS, IMS, etc.). Candidates for DB2 performance improvement are those online applications whose class 2 elapsed time are more than 50 % of class1 elapsed time. If desired, it may be useful to filter those applications with large

# Rule-of-Thumb definition

Define our own ROT group and rules - copy existing template or define your own



# Using the Wizard

Rule-of-Thumb Properties

General Definition **Select table and column to be added to the 'Value expression'**

VALUE and additional columns

Table: DB2PM\_STAT\_BUFFER

Report block: Buffer Pool General

Column Name	Field Name	Description
CURR_ACTIVE_BUFF	QBSTCBA	The number of currently active
VPOOL_FULL	QBSTXFL	The number of times a usable
EXPANSION_FAILED	QBSTXFV	The total number of virtual buf

VALUE expression: `>> DB2PM_STAT_BUFFER.READ_PAGE_INS_REQ/(DB2PM_STAT_BUFFER.SYNC_READ_IO+DB2PM_STAT_BUFFER.SEQ_PREFETCH_PAGE+DB2PM_STAT_BUFFER.LIST_PREFETCH_PAGE+DB2PM_STAT_BUFFER.DYM_PREFETCH_PAGE)`

Additional columns: `>>`

WARNING and PROBLEM thresholds

VALUE `>` WARNING threshold: 0.01  
Recommendation: Increase available Central Storage or reduce Virtual Pool size and use Hiper Poo

PROBLEM threshold: 0.05  
Recommendation: Increase available Central Storage or reduce Virtual Pool size and use Hiper Poo

**Define thresholds and recommendations**

OK Apply Cancel Help



# Run analysis using ROT

Starting analysis with the ROT selected you need to select the set performance data (by time period and several filters (optional)) stored in your performance database

The screenshot shows the DB2 PM for OS/390 - Performance Warehouse interface. On the left, a tree view shows the hierarchy: jdbc:db2:D621 > Rule-of-Thumb Groups > My own ROT > Rule-of-Thumb Clusters > DB2PM.Statistics.Buffer. A context menu is open over the selected item, with options: Copy, Create, Delete, Rename, Cancel, Details, File Browser, Properties, and Analyze. The 'Rules of Thumb Analysis' dialog box is open, showing the following configuration:

jdbc:db2:D621 - My own ROT - DB2PM.Statistics.Buffer

Filtering qualifiers for this analysis

Time ranges

Inserted by user	Trace start time stamp	Trace stop time stamp
NICK	2000-04-17 22:39:45.80...	2000-04-17 22:45:59.0
NICK	2000-04-17 22:39:45.80...	2000-04-17 22:45:59.0
NICK	2001-01-09 23:10:36.24...	2001-01-12 23:00:31.0
HECK	2000-04-17 22:39:45.80...	2000-04-17 22:45:59.0
NICK	1995-11-01 07:00:00.00...	1995-11-03 07:00:00.0
NICK	1995-11-01 07:00:00.00	1995-11-03 07:00:00.0

Interval start: 2002-02-25\_21:56:57

Interval end : 2002-02-25\_21:56:57

Filter columns

Column	Comparison	Value
LOCAL_LOCATION	=	
GROUP_NAME	=	
SUBSYSTEM_ID	=	
MEMBER_NAME	=	

Buttons: OK, Cancel, Help

# ROT analysis result

Depending on the selected ROT and the performance data you may get a result matrix, select row and column to get more specific information

**Rules of Thumb Analysis Result**

Result View Help

jdbc:db2:D621 - My own ROT - DB2PM.Statistics.Buf 'All' view for ro

Filter Result matrix Row details Column details

Attention values for rules of thumb sorted by time stamps

INTERVAL_TSTAMP	DM threshold	Merge pass degrad	No_prefetch_no_buf	Page_in for read	Page_in for write	Prefetch disabled	Synch res
2001-01-10 23:05:0...	OK	-	OK	problem	OK	OK	-
2001-01-10 23:05:0...	OK	OK	OK	OK	OK	OK	warning
2001-01-10 23:05:0...	OK	-	OK	problem	OK	OK	-
2001-01-10 23:05:0...	OK	OK	OK	OK	OK	OK	warning
2001-01-10 23:05:3...	OK	OK	OK	problem	problem	OK	problem
2001-01-10 23:05:3...	OK	-	-	problem	OK	-	-
2001-01-10 23:05:3...	OK	OK	OK	problem	problem	OK	problem
2001-01-10 23:05:3...	OK	-	-	problem	OK	-	-
2001-01-10 23:09:5...	OK	-	OK	warning	OK	OK	warning
2001-01-10 23:09:5...	OK	-	-	-	-	-	-

# ROT analysis result

The row details show the ROT analysis results according a specific time period

**Rules of Thumb Analysis Result**  
 Result View Help

jdbc:db2:D621 - My own ROT - DB2PM.Statistics.Buf 'All' view for ro

Filter Result matrix Row details Column details

Selected time stamp 2001-01-10 23:05:05.800069

ROT name	Attention
DM threshold	OK
Merge pass degrad	-
No_prefetch_no_buf	OK
Page_in for read	problem
Page_in for write	OK
Prefetch disabled	OK
Synch reads-sequ	-
Workf requ reject	-
Workfile prefetch	-
Write engine	OK

Rules of thumb details

ROT description Page-In for read i/o < 1 to 5% of pages read

VALUE expression DB2PM\_STAT\_BUFFER.READ\_PAGE\_INS\_REQ/(DB2PM\_STAT\_BUFFER.YNC\_READ\_IO+DB2PM\_STAT\_BUFFER.SEQ\_PREFETCH\_PAGE+DB2PM\_STAT\_BUFFER.LIST\_PREFETCH\_PAGE+DB2PM\_STAT\_BUFFER.TCH\_PAGE)

VALUE 5.62248995983936e-001 > 0.05 (Problem threshold)

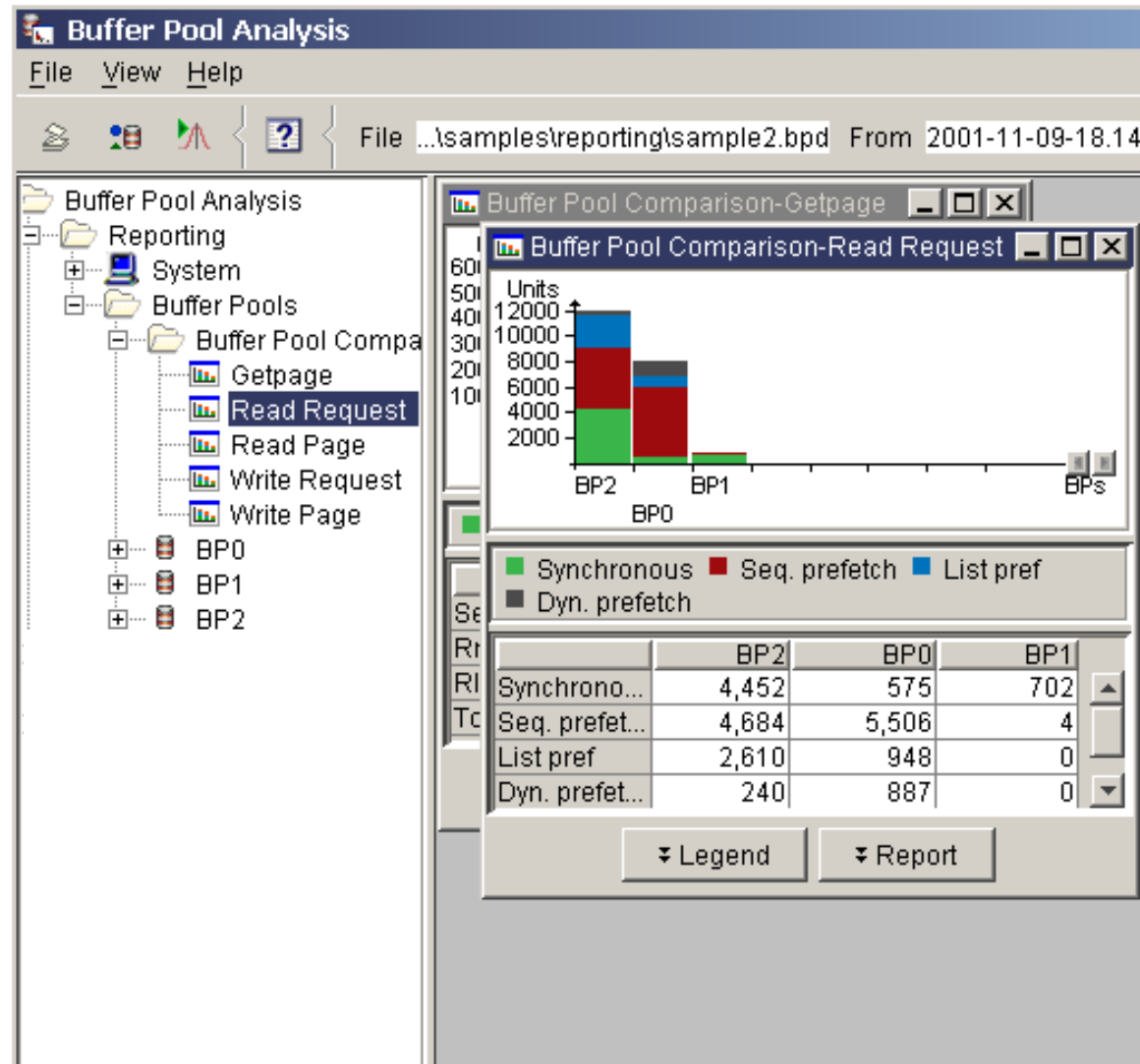
Recommendation Increase available Central Storage or reduce Virtual Pool size

Name	Value
DB2PM_STAT_BUFFER.READ_PAGE_INS_REQ	1.40000000000000e+001
DB2PM_STAT_BUFFER.SYNC_READ_IO	2.37000000000000e+001

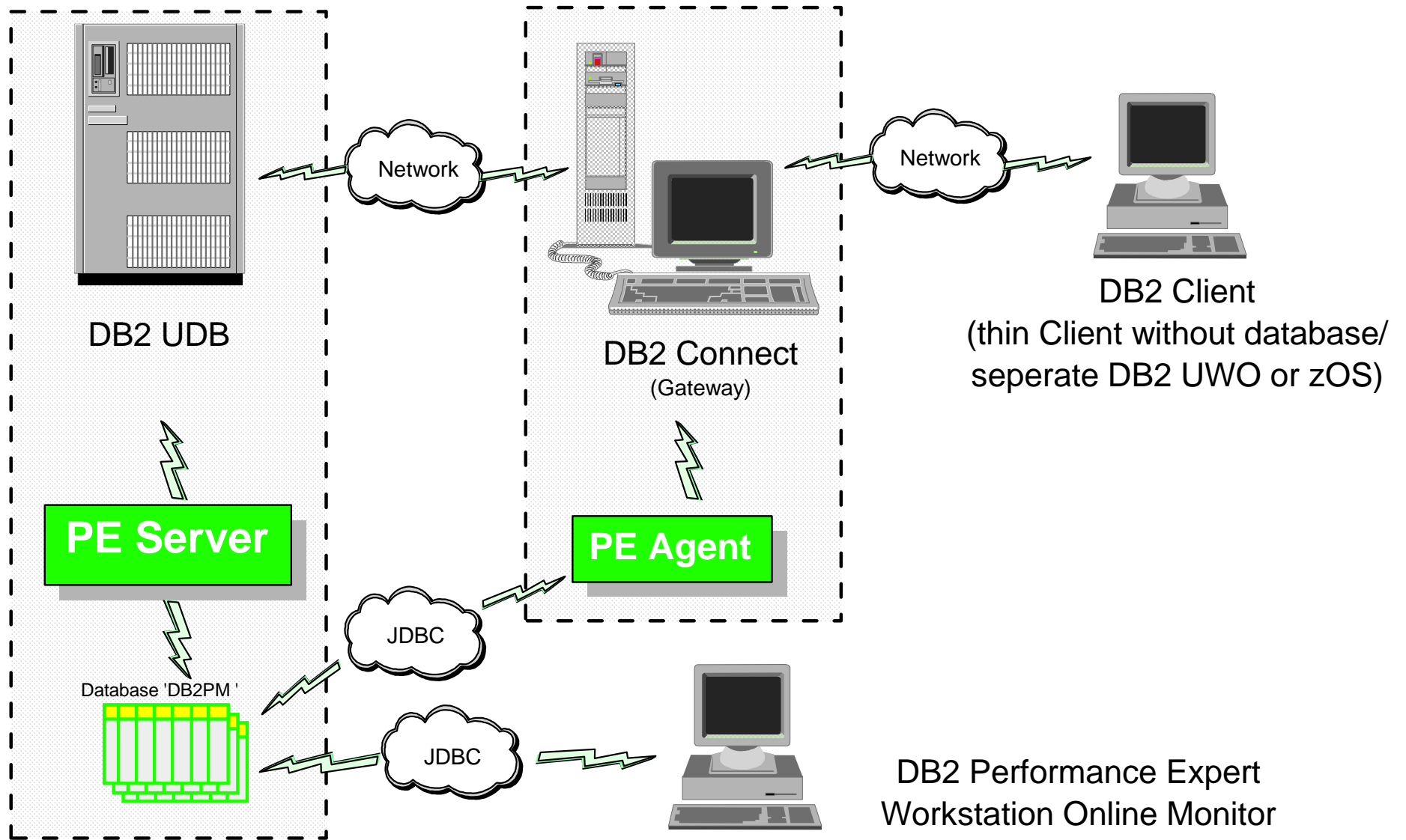
Name	Value
------	-------

# Buffer Pool analysis

- ▶ DB2 event trace data are collected and stored in DB2 tables
- ▶ Generates various reports and displays results in multiple formats (including graphical end-user interface)
  - Browser window
  - Data Views
- ▶ Specific SQL queries and Rule-of-Thumb can be used for additional analysis

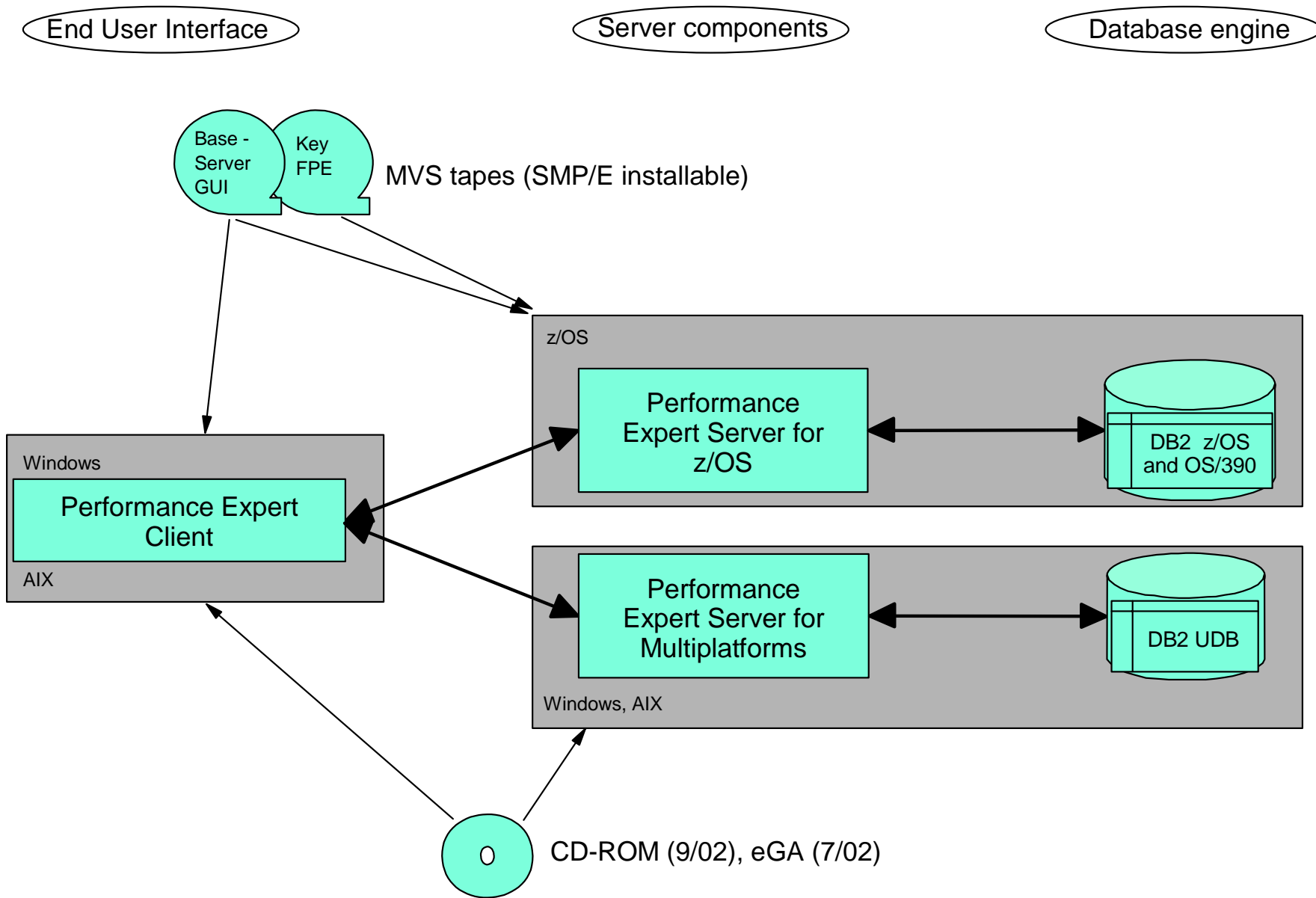


# DB2 Connect Monitoring





# Installation Consideration



# Bibliography

## DB2 Performance Expert

Fact Sheet DB2 Performance Expert GC27-1633

## DB2 Performance Expert for Multiplatforms (5724-B92)

License Information GC27-1663

Installation and Customization SC27-1646

Monitoring User's Guide -- Workstation SC27-1645

## DB2 Performance Expert for z/OS (5655-I21)

License Information GC27-1599

Installation and Customization SC27-1646

Monitoring User's Guide -- Workstation SC27-1645

Monitoring User's Guide -- ISPF SC27-1652

Reporting User's Guide SC27-1651

Buffer Pool Analyzer User's Guide SC27-1653

Report Reference SC27-1647

Report Command Reference SC27-1649

Messages SC27-1650

# References

## Internet:

### DB2 Performance Expert

<http://www-3.ibm.com/software/data/db2imstools/db2tools/db2pe/index.html>

### DB2 Performance Monitor for OS/390 V7

<http://www-3.ibm.com/software/data/db2imstools/db2tools/db2pm/index.html>

### DB2 Buffer Pool Analyzer for z/OS

<http://www-3.ibm.com/software/data/db2imstools/db2tools/bpa/index.html>

## Redbooks:

### DB2 for z/OS and OS/390 Tools for Performance Management

<http://publib-b.boulder.ibm.com/Redbooks.nsf/RedbookAbstracts/sg246508.html>  
(Nov.2001)

### DB2 for z/OS and OS/390 Version 7 Performance Topics

<http://publib-b.boulder.ibm.com/Redbooks.nsf/RedbookAbstracts/sg246129.html>  
(July 2001)

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**End**

**Thank you  
Danke**