A Technical Overview of the IBM DB2 Data Base Tools for an SAP Environment

Elaine Morelli
Executive Software IT Specialist

ON DEMAND BUSINESS™

SAP environment - typical characteristics

Characteristics	Needs	Tools
Very Large Number of objects A typical SAP environment would have over 100,000s of objects. A customer might have a database of the size of 4 terabytes (TB)	**Management of large number of objects** **This means a high level of parallelization, asynchronous processing, and managing by exception must be present in almost any tool's activity.**	▪**DB2 Automation Tool** ▪**DB2 Administration Tool** ▪**DB2 Cloning Tool**
Large Size of Objects - tables, indexes, table spaces, databases It is also typical for an SAP environment to have large database objects, e.g. finding 1TB tables is not uncommon in an SAP environment.	**Management of large sized objects** **This means a high level of parallelization, asynchronous processing, and managing by exception must be present in almost any tool's activity.**	▪**DB2 Automation Tool** ▪**DB2 Administration Tool** ▪**DB2 Cloning Tool**
Dynamic Environment SAP has a dynamic environment due to the high volume of transactions and high degree of concurrency that would often cause resource contentions, e.g. deadlocks.	**DB2 tools should assume resource contentions, e.g. deadlocks, will happen and prevent contention by serializing access to objects or automatically retry.**	▪**Tivoli Omegamon XE for DB2 Performance Expert** ▪**DB2 Query Monitor** ▪**DB2 Automation Tool**
Business-critical systems Once in production, companies rely on SAP systems to support their business operations.	**SAP systems requires a high degree of continuous operations. Tools that use non-disruptive techniques such as retry logic on failures and resource checking are critical to prevent disruptive system failures.**	▪**Tivoli Omegamon XE for DB2 Performance Expert** ▪**DB2 Administration Tool**

DBAs in an SAP environment often perform repetitive and/or challenging tasks that could benefit from tools

Tasks	Tools
Routinely performed tasks: 1. Monitor tablespace growth - add space as required 2. Monitor/adjust table extent sizes 3. DR sync process - PRD -> DR system 4. ONLINE/OFFLINE backups 5. Performance tuning/resource management 6. System restores/refreshes 7. Apply data base patches (security APARS) 8. Kernel upgrades to both data base and SAP	DB2 Administration Tool DB2 Automation Tool Tivoli Omegamon XE for DB2 Performance Expert DB2 Query Monitor
Challenging tasks: 1. Data base product upgrade 2. SAP upgrade 3. DB reorgs 4. Developing SQL scripts for automation - alerts 5. Developing scripts (Kornshell/Perl/C/Bourne) for automation - alerts	DB2 Administration Tool DB2 Automation Tool DB2 Cloning Tool

TOOLS for SAP ENVIRONMENT

- Administration Tools
  - DB2 Administration Toolkit for SAP
    - DB2 Administration Tool
    - DB2 Object Comparison Tool
- Performance Tools
  - DB2 Performance Toolkit for SAP
    - Tivoli Omegamon XE for DB2 Performance Expert
    - DB2 Query Monitor
- Automation Tools
  - DB2 Automation Toolkit for SAP
    - DB2 Automation Tool
- Cloning Tools
  - DB2 Cloning Tool

IBM DB2 Administration Toolkit for z/OS the SAP Edition

DB2 Administration Tool V7.2
DB2 Object Comparison Tool V7.2

ON DEMAND BUSINESS™

DB2 ADMINISTRATION TOOL

Catalog Navigation

Change Management

- ✓ Complex Table Alters
- ✓ Migration

- ISPF interface
- Supports DB2 z/OS
- Supports DB2 V9

DB2 ADMINISTRATION TOOL
Catalog Navigation

- Online help
- Primary / Line cmds
- Drill up/down
- Filtering
- Display detail info
- Extract DDL
  - DDL
  - GEN
- Explain SQL statements
- Generate / Execute IBM utilities
- Issue DB2 Commands
- Browse data
- Drop / Revoke Impact reports
- Manage zParms
- Much, much more...

Users seldom alter structures in SAP, however SAP will at times send instructions on how to either reset table space partitions or move tables in segmented tablespaces into partitioned tablespaces

Detailed Key Features

- **Supports DB2 V8 Online Schema Evolution**
  - Drop the partitioning index
  - Change the clustering index
  - Add a partition to the end of a table, which extends the limit value
  - Support for automatic rebalancing of partitions during REORG
  - Support REORG of parts in REORG pending status
  - Add a column to an existing index
- **Allows faster changing of tablespace partitioning via RDEF command**

DB2 ADMINISTRATION TOOL
DB2 V8 Exploitation

- Long names
- 4096 partitions
- Sequence Objects
- Materialized Query Tables
- Partitioned Tables
- Volatile Tables
- Data Partitioned Secondary Indexes (DPSI)
- Index padding
- BACKUP SYSTEM / RESTORE SYSTEM

DB2 Administration Tool reduces the complexity of managing and executing SAP-initiated database changes, enabling DBA's to make faster and more accurate decisions.

Detailed Key Features (cont)

- Guide users through the process of changing zPARMS dynamically
- Useful for problem determination
- Consistent interface for SAP and non-SAP environments

DB2 OBJECT COMPARISON TOOL

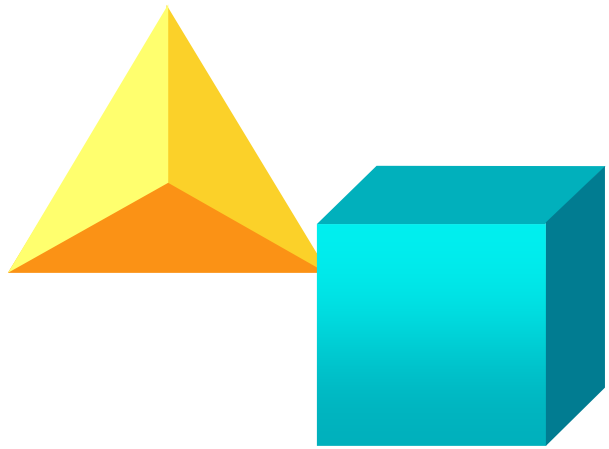
Compare structure of DB2 objects

- ✓ Reports
- ✓ Apply jobs – make target look like the source

- ISPF interface
- Supports DB2 z/OS
- Supports DB2 V9
- Requires DB2 Administration Tool

DB2 OBJECT COMPARISON

COMPARE STRUCTURE OF DB2 OBJECTS

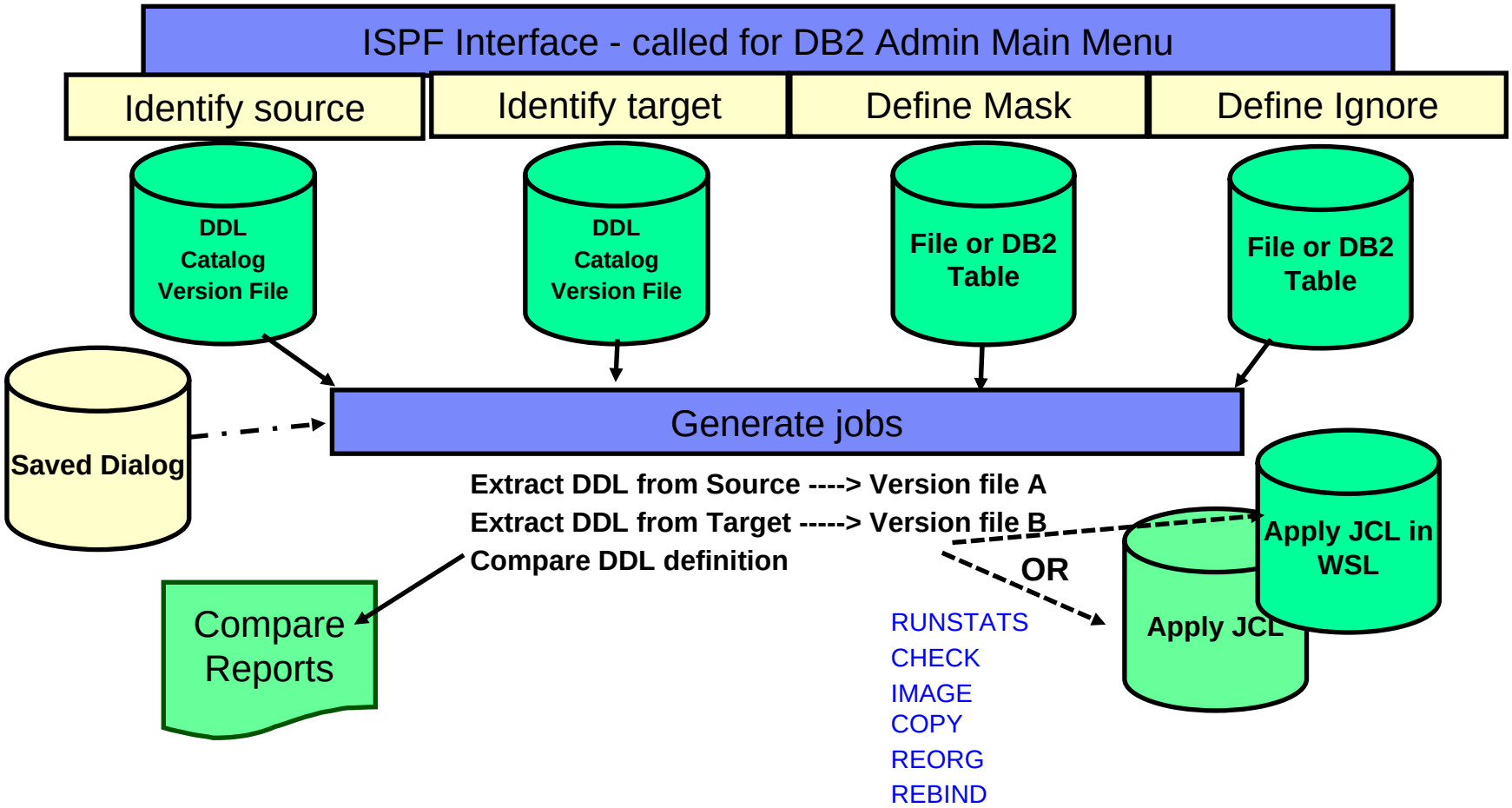


- DDL
  - DB2 Catalog
  - Flat file
  - Versioning file
- Supports an ignore capability
- Supports a masking file
- Generate report(s)
- Generate JCL to make the target look like the source - APPLY JOBS
  - Generate native JCL jobs or use Work Statement List
- Save the compare parameters in a file for recall (dialog)
- Ability to generate apply jobs against multiple targets

DB2 OBJECT COMPARISON TOOL

Product Architecture

Supports DB2 V9



DB2 Object Comparison Tool promotes database object integrity when objects are transported from test to production

Detailed Key Features

- **Alerts DBA of any user-defined objects (usually indexes) that will be affected by applying the change**
- **Compare objects in SAP databases before they are transported, e.g. from test to production**
  - Identify potential risks of long running changes
- **Reduces the time to verify that changes are propagated to each SAP instance**

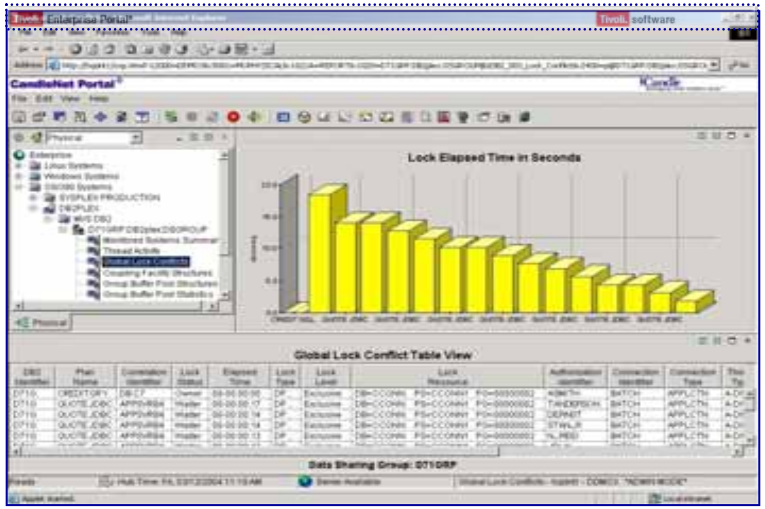
IBM DB2 Performance Toolkit for z/OS the SAP Edition

Tivoli Omegamon XE for DB2 Performance Expert (OMPE)
DB2 Query Monitor

ON DEMAND BUSINESS™

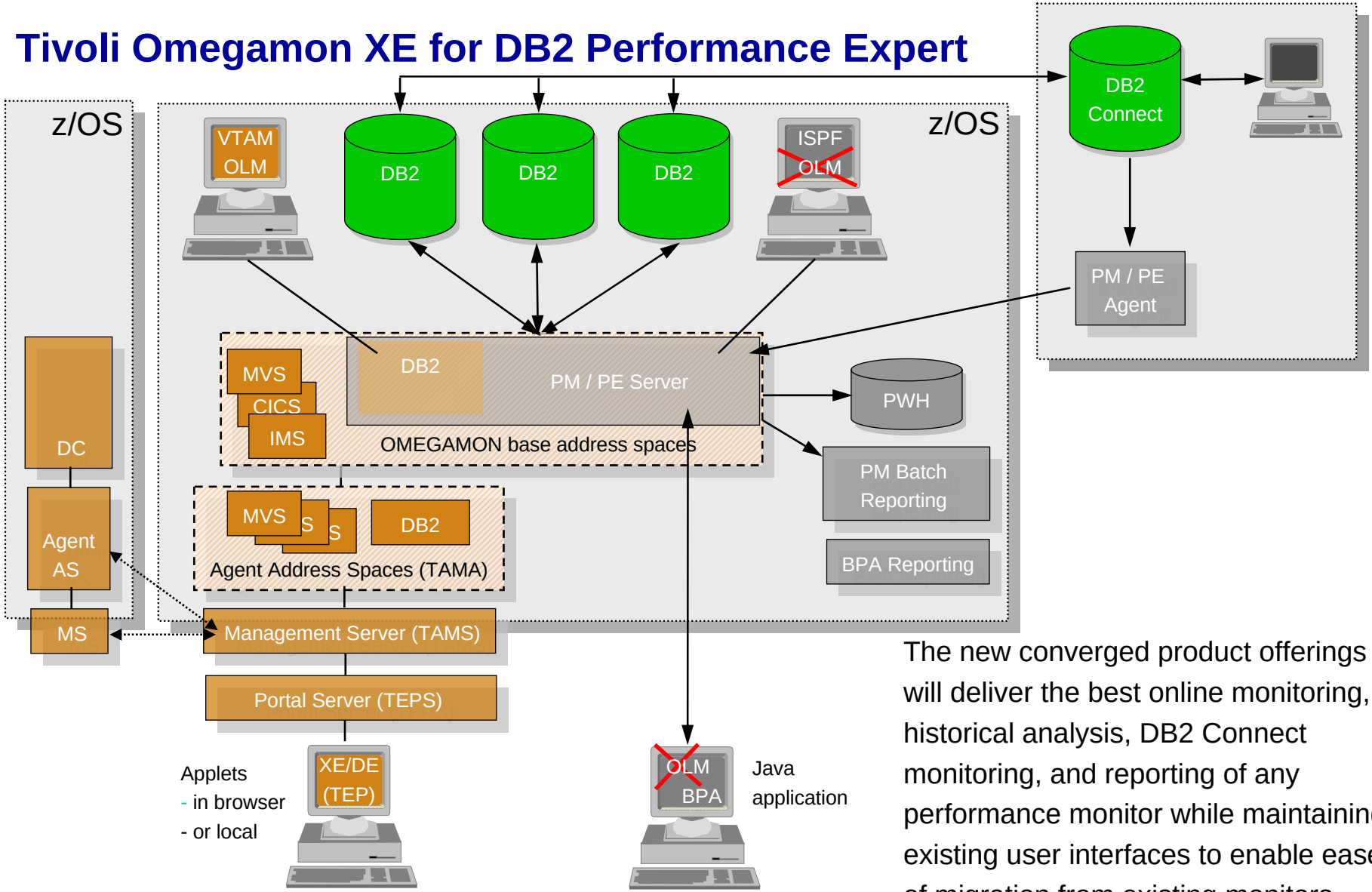
TIVOLI OMEGAMON XE for DB2 PERFORMANCE EXPERT (OMPE)

- Real Time Monitoring
- History
- Batch Reporting
- DB2 Connect Monitoring
- Object Analysis
- Performance Warehouse
- Buffer Pool Analyzer



- VTAM, Web Browser, GUI & ISPF interfaces
- Supports DB2 z/OS
- Supports DB2 V8

Tivoli Omegamon XE for DB2 Performance Expert



The new converged product offerings will deliver the best online monitoring, historical analysis, DB2 Connect monitoring, and reporting of any performance monitor while maintaining existing user interfaces to enable ease of migration from existing monitors.

OMPE for z/OS optimizes DBA's time by providing timely & relevant statistics through REAL TIME MONITORING

- **System Information**
  - Summary of DB2 activity
  - Issue console commands
  - View messages
- **Exception Analysis**
  - Monitor for problems related to threads / CICS / IMS / system operations
  - View messages
  - Online recommendations
- **Locking conflict information**
- **Thread Information**
  - View all threads connected to DB2
  - Thread summary – TSO, CICS, IMS, Background
  - Inactive threads
  - Thread detail
  - Cancel thread
  - Threads having DB2 Connect gateway connections
- **Resource managers – logs, EDM pools, RID pools, dynamic SQL cache, DSNZPARMS**

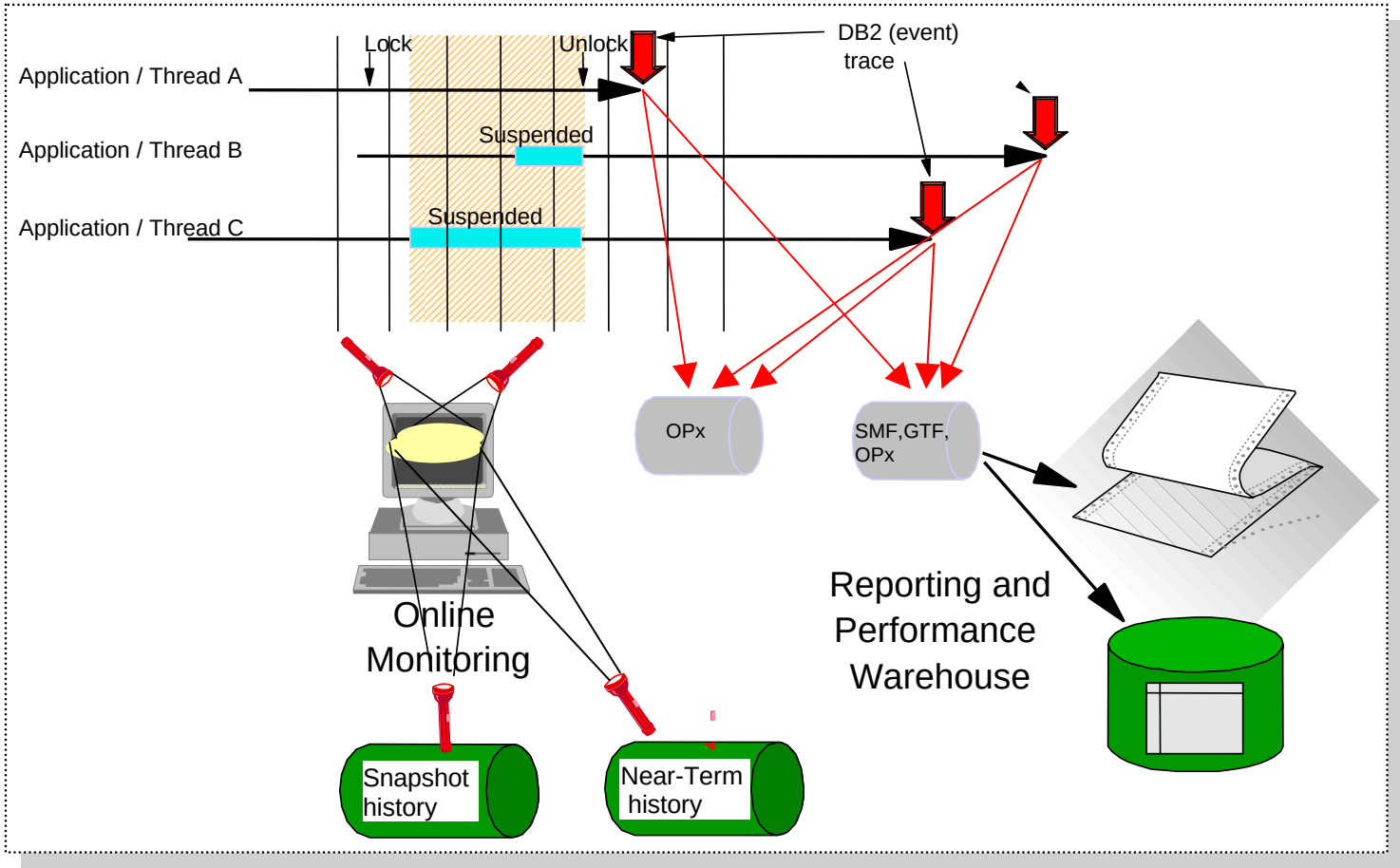
OMPE HISTORY DATA - General

- Near-term history — Online monitor
- Long-term history — Reports, Perform.DB
- Snapshot history — Online Monitor
- Short-Term history — TEP GUI

Near-term history, Long-term history → Based on DB2 (event) traces

Snapshot history → Based on DB2 snapshot data

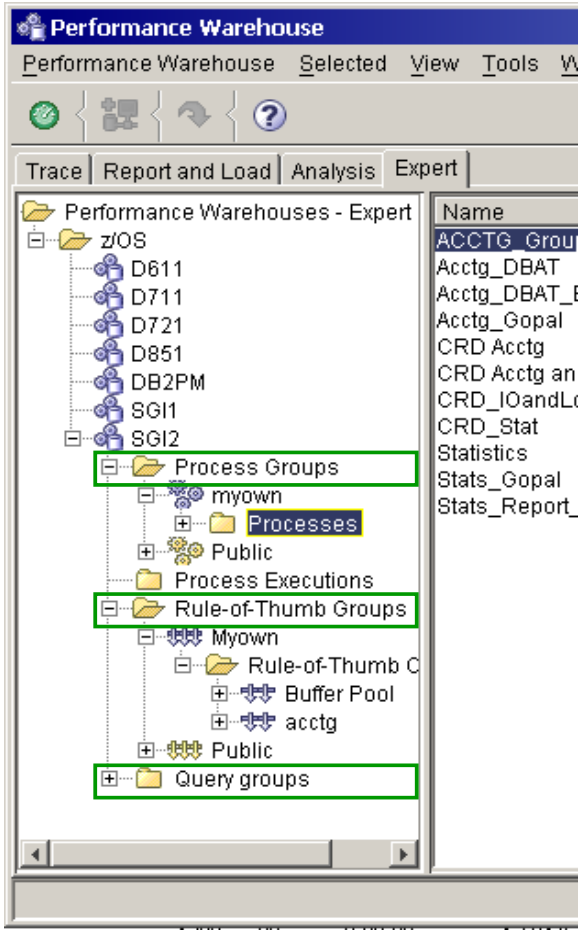
Short-Term history → Collected and saved by TEMS or TEMA



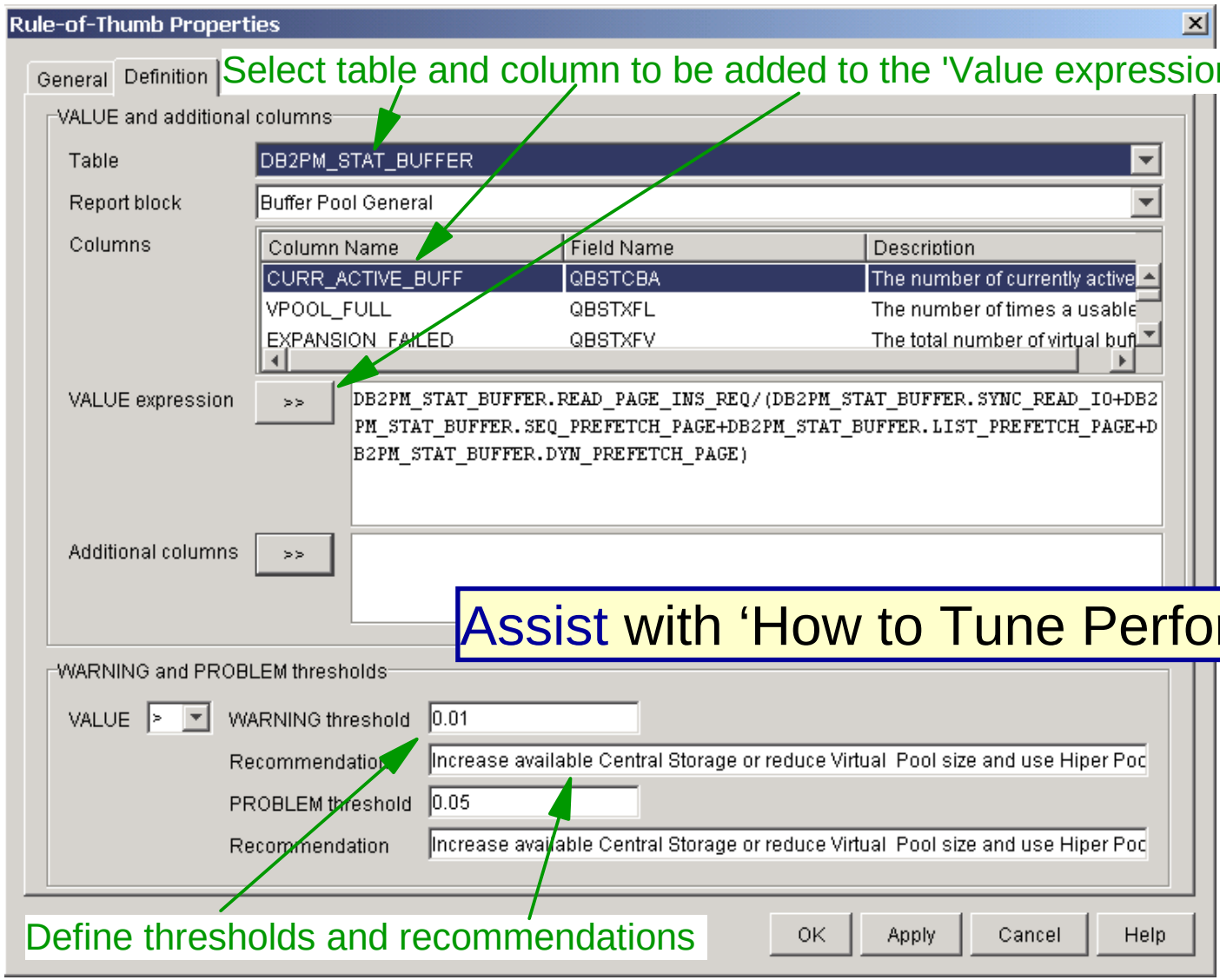
OMPE PERFORMANCE WAREHOUSE

can assist you to efficiently make better decisions and recommending actions to tune performance

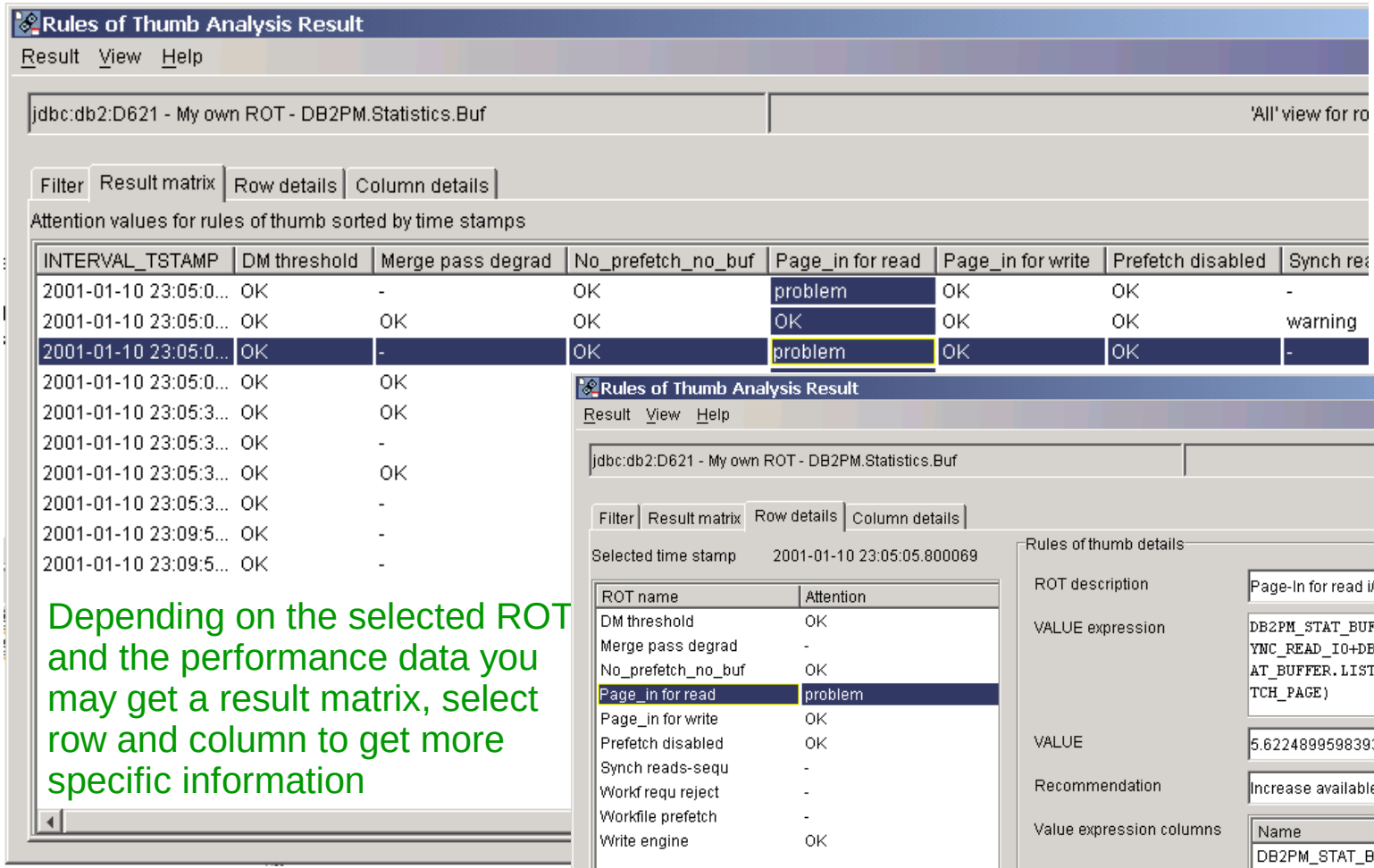
- **Holds raw and aggregate DB2 trace information (**long term history)
- **Used for** performance trend analysis
- Rules of Thumb **(ROT)**
  - Expert rules help ID more complex performance problems
  - Provides recommendations
- SQL Performance Queries



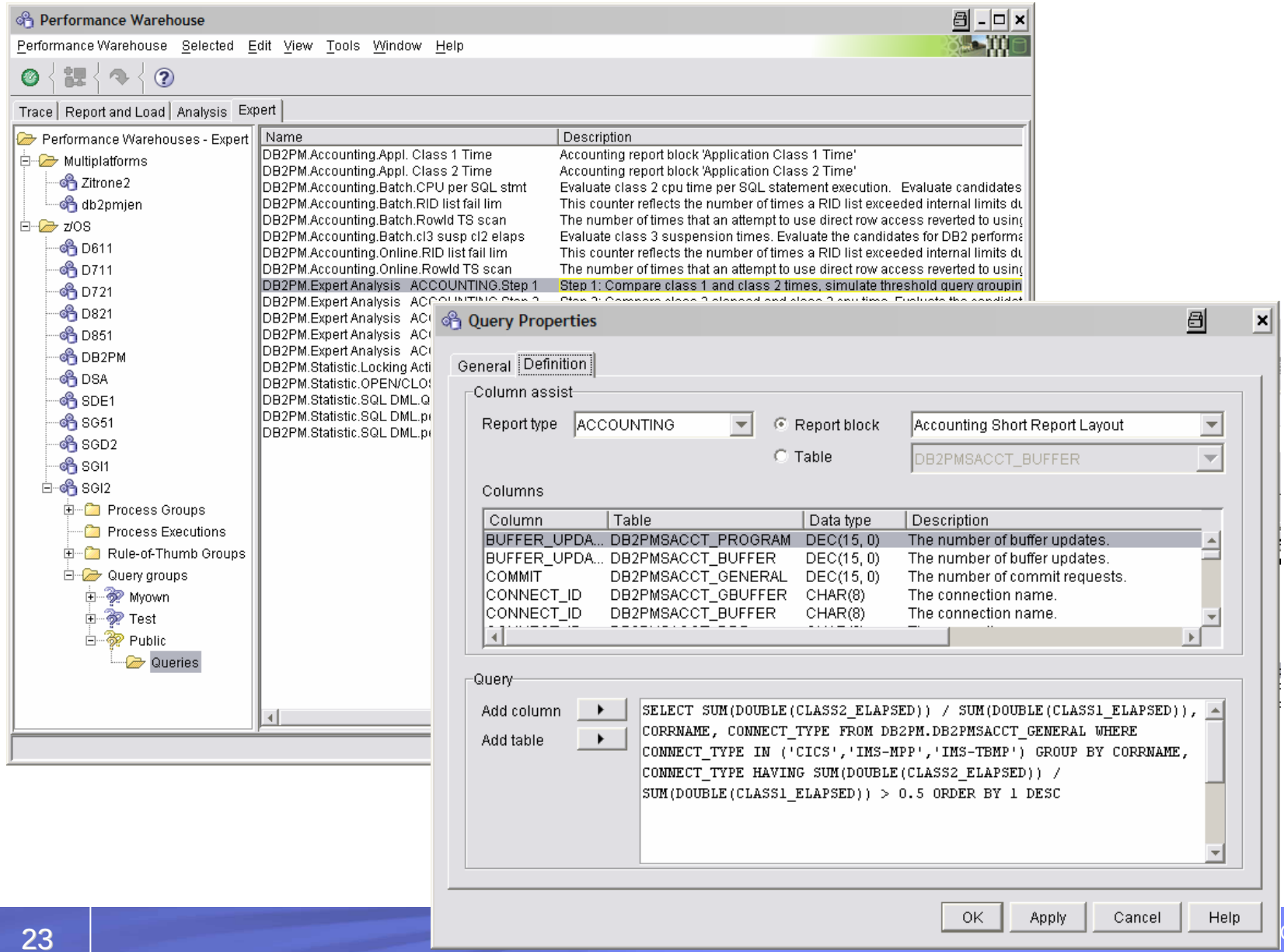
OMPE RULE OF THUMB (ROT)



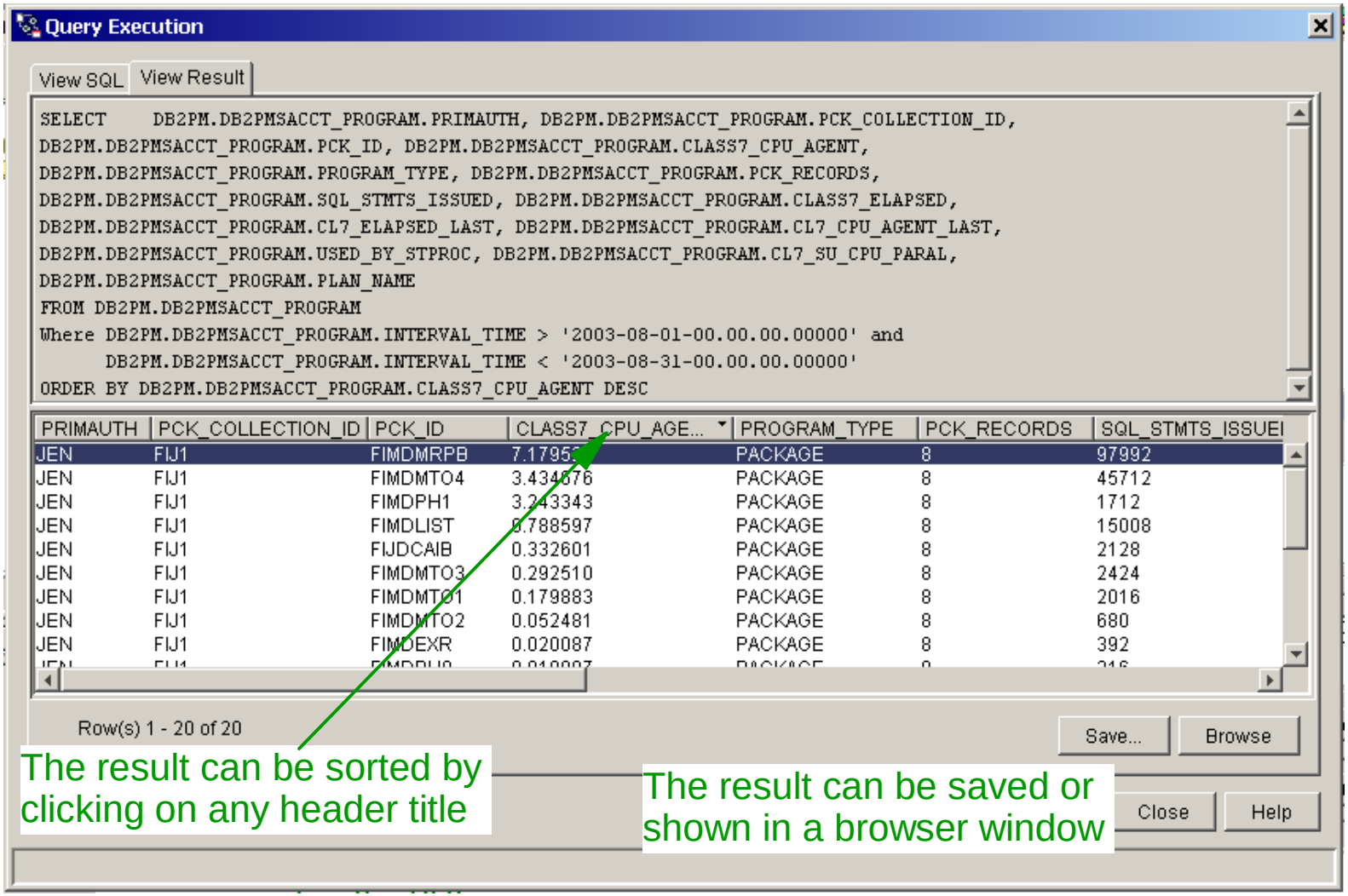
OMPE RULE OF THUMB



OMPE SQL PERFORMANCE QUERIES



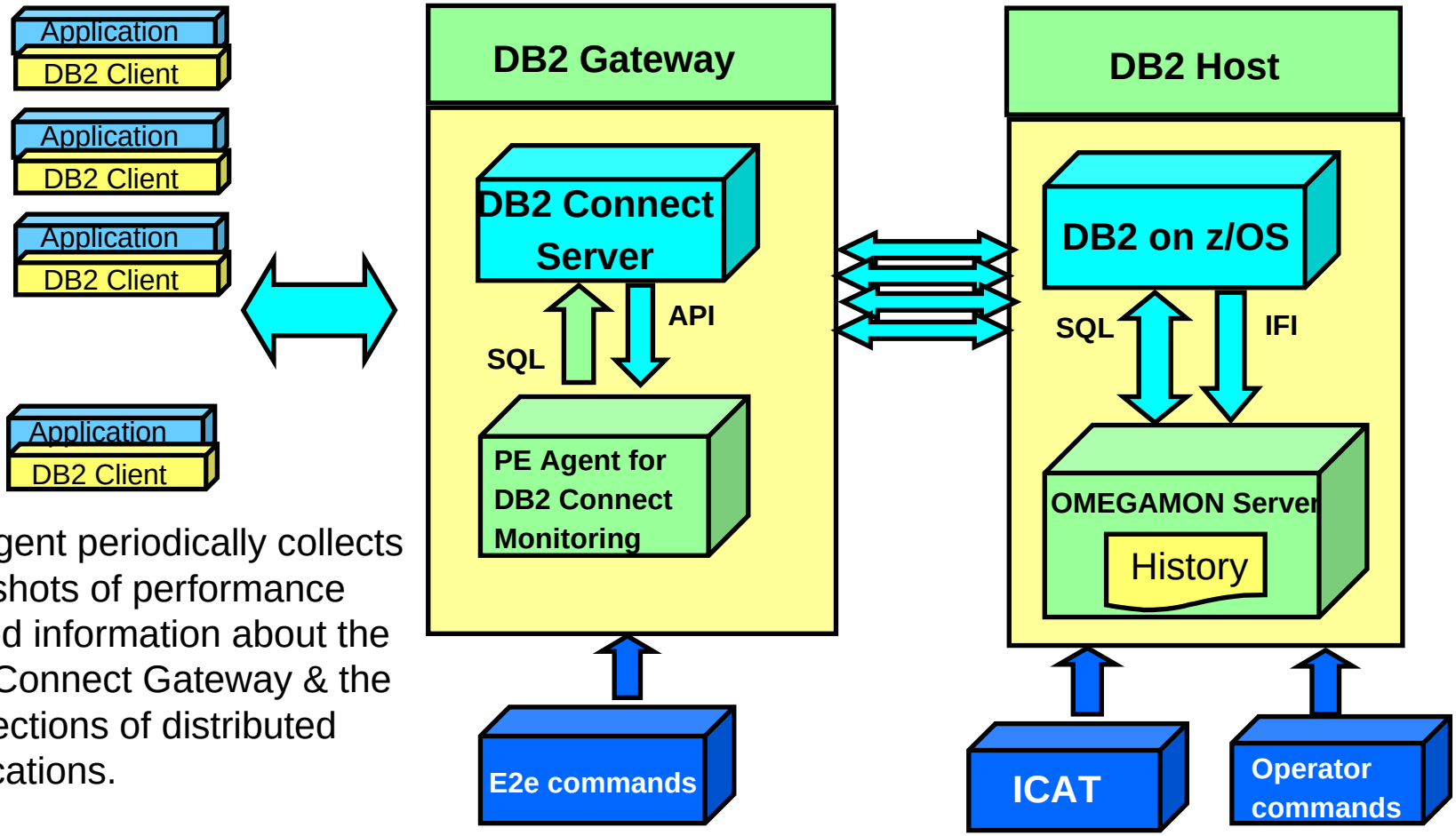
OMPE PERFORMANCE QUERIES



OMPE BATCH REPORTING

- Report facility which
  - Takes SMF, GTF or TSO data sets as input (collected by 'Collect Report Data')
  - Generates a variety of customizable reports and traces:
    - Statistics
    - Accounting
    - Subsystem Parameters
    - Locking
    - SQL Activity
    - I/O Activity
    - Utility
    - Audit
    - Record Trace
    - Explain
  - Related data of different IFCIDs belonging to the same object are reported together
  - Additional derivated counters are shown
  - are customizable by using of
    - Reduce, Include/Exclude, From/to
    - Summarizedby, Orderby
    - Layout
    - ....
  - differentiate mainly between "reports" and "traces"
  - Allows to tailor online the layout of Accounting and Statistics reports and traces

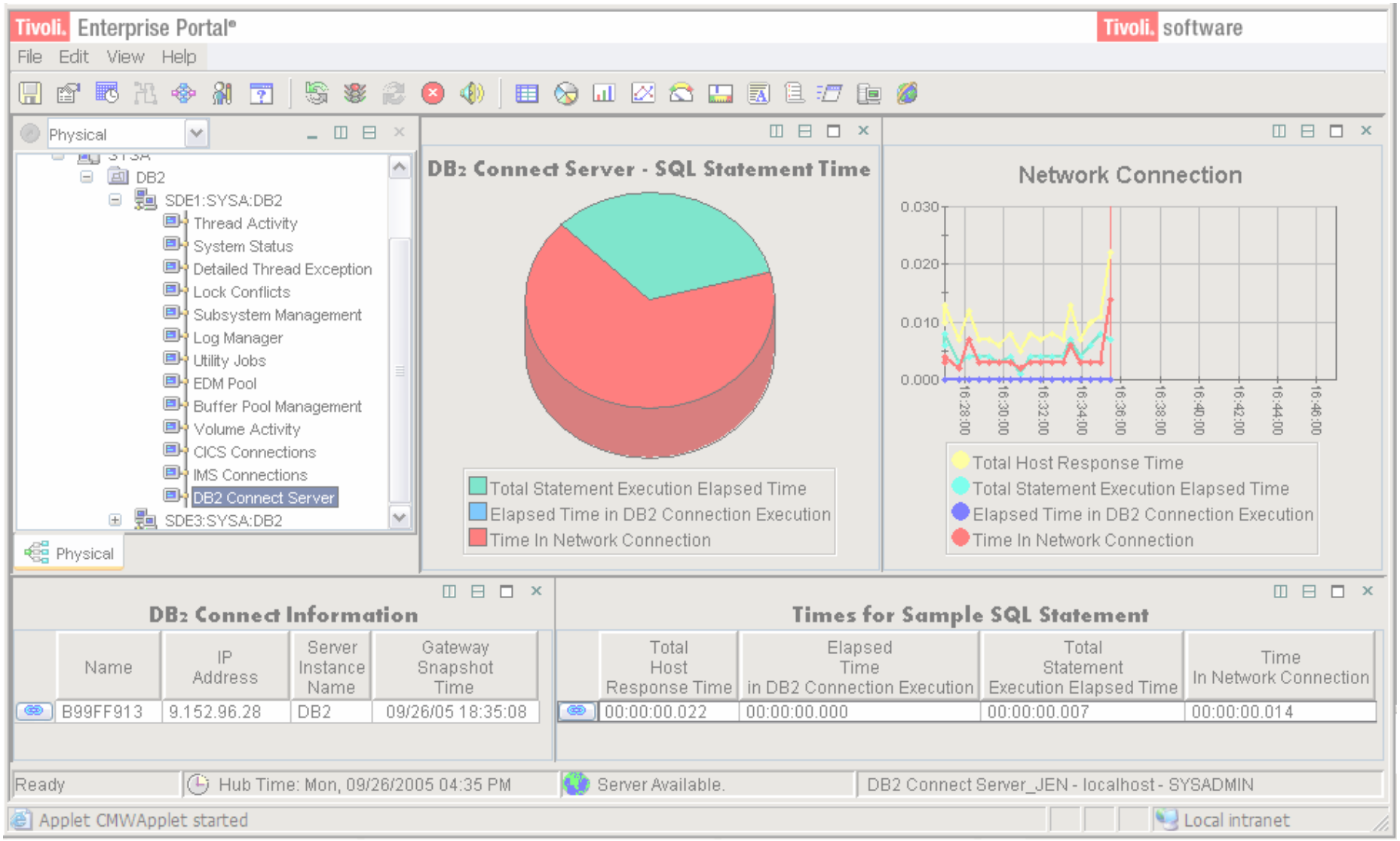
OMPE DB2 CONNECT GATEWAY MONITOR



PE Agent periodically collects snapshots of performance related information about the DB2 Connect Gateway & the connections of distributed applications.

Stores in the PWH

OMPE DB2 CONNECT MONITOR – TEP Interface



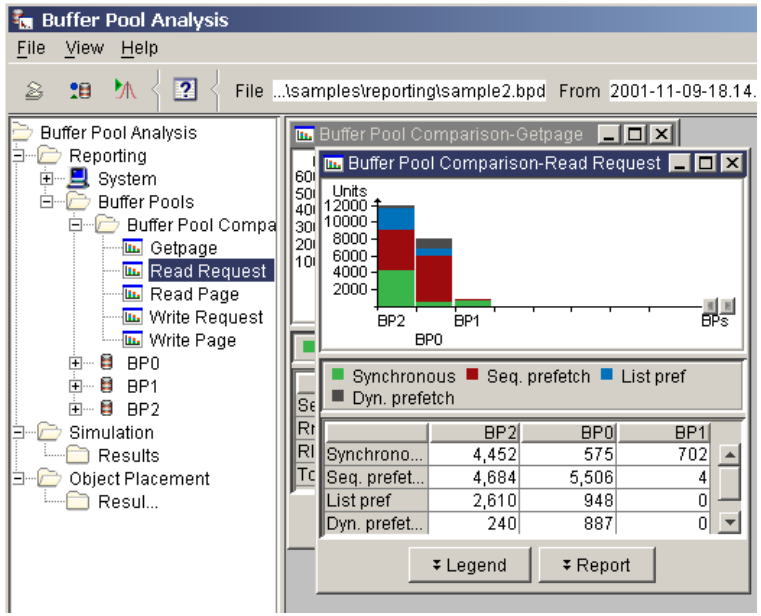
OMPE OBJECT ANALYSIS

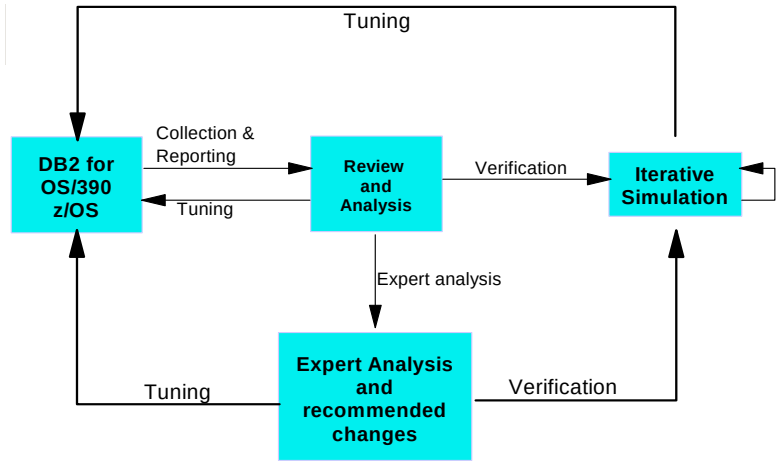
- **Aids in the analysis of DB2 object allocations**
- **Linear VSAM dataset extend activity**
- **I/O activity at DASD volume level**
- **Object activity from a DB2 perspective**

Scenario: Customer implements SMS which places objects based on defined constructs
Most of the time SMS makes good choices, but occasionally poor object placement occurs
Example – a highly active index on the same DASD device as the tablespace part
I/O increases for both data sets

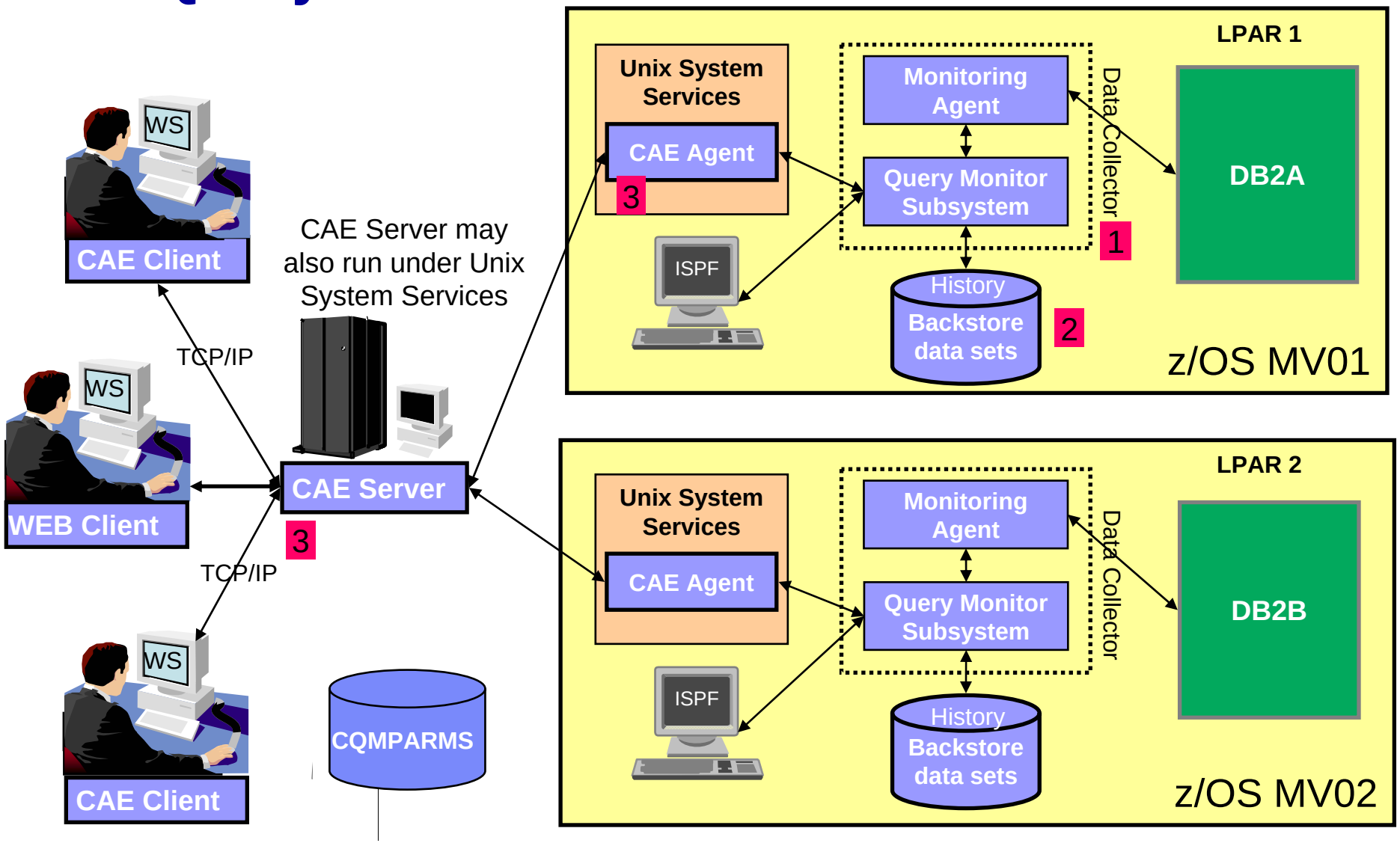
DB2 BUFFER POOL ANALYZER

- Collects buffer pool data
  - as summary or detailed data
  - continuously or in sampling mode
  - in Online and Batch
- Generates various reports and displays results in multiple formats for BP and GBP (including graphical end-user interface)
- Provides expert knowledge and recommendations
- Recommends object placements, BP size & thresholds
- Generates ALTER statements for the recommendation
- Provides simulation for planned changes
- Makes it easy to tune your buffer pools





DB2 Query Monitor for z/OS Architecture



SAP Environment – DB2 Query Monitor

DB2 Query Monitor helps DBA's to optimize system resources by providing timely & relevant statistics from multiple sub-systems.

- Provides a complete history on statements
- Shows host variables for statements
- Provides information object accessed for executed statements
- Provides statement level alerts
  - Can capture alerts and show performance data from multiple sub-systems on multiple LPARs using the CAE GUI interface
- Transaction ID support assists in problem identification
- Provides reports on all SQL statements, not just the first occurrence
- Integrated with explain solutions
  - DB2 SQL Performance Analyzer on z/OS
  - Visual Explain off of GUI

IBM DB2 Automation Toolkit for z/OS the SAP Edition

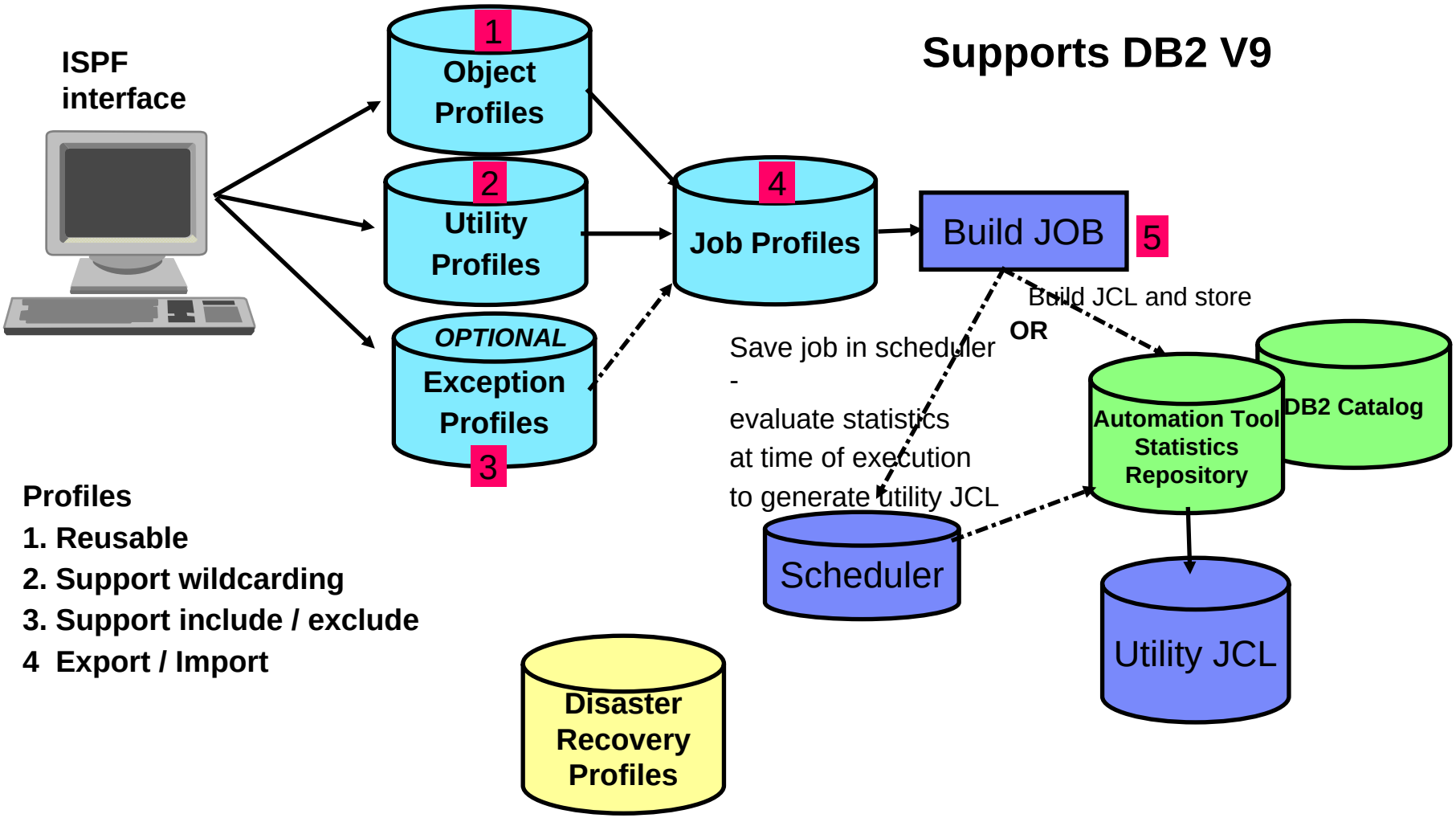
DB2 Automation Tool

DB2 AUTOMATION TOOL

- **Automate the generation of utility JCL on an as needed basis**
- **Disaster Recovery**
- **Auxiliary Functions**
  - Data Set Manager
  - Data Page Display

•ISPF interface
•Supports DB2 z/OS
•Supports DB2 V9

DB2 AUTOMATION TOOL
Product Architecture



SAP Environment – DB2 Automation Tool

DB2 Automation Tool helps businesses optimize their data infrastructure investments through better management of system resources and reducing the complexity in recovery.

- Object Profile supports wildcarding capabilities to include / exclude objects
  - Saves the need for manual intervention
  - Avoids JCL errors
- Utility Profile provides
  - Support for a set of utilities to assist in Point in Time (PIT) data recovery
  - Can generate multiple RECOVER steps
  - LOAD balancing – based on time or space
- Support for BACKUP SYSTEM / RECOVER SYSTEM

SAP Environment – DB2 Automation Tool

- Exception Profile criteria can assist in determining when to execute utilities against an object or group of objects
- Offers a variety of statistical sources – many SAP users use real time statistics
  - Real time statistics
    - Check statistics directly
    - Or use the DSNACCOR stored procedure to determine which objects do not need utility JCL to be generated
- Provides an exit that you can use to make smarter decisions when a utility needs to be executed
- Displays an object counter on the screen, showing, for example, "50 of 12,000." This automatic and error-free object counter enhances your efficiency, helping you to deal with the large number of objects displayed in SAP environments.

IBM DB2 Cloning

DB2 Cloning Tool

DB2 CLONING TOOL

Clone a DB2 subsystem

Clone an application

- Batch
- Supports DB2 z/OS
- Supports DB2 V8

Why Clone??

- **Create a production quality assurance environment**
- **Online inquiry**
- **Data mining**
- **Data warehouse**
- **Test new functions**
- **Give end users access to applications that are updated on a continual basis**

Cloning: act of replicating data, making it accessible, then reusing the replica in lieu of the original

DB2 CLONING TOOL

- **How it works**
  - Select volumes
  - Initiate copy
  - Rename data sets
  - Optional DB2 commands initiated
  - DONE
- **Requirements**
  - Need a job scheduler
  - Data replication tools – snapshot, mirroring, PIT copy
  - DB2 Cloning Tool

DB2 CLONING TOOL

- **Setup jobs**
  - Setup copy job
  - Select volumes to clone
    - Volser numbers
    - Masking – ensures you have all the data
    - SMS storage group
- **Initiate copy (Flashcopy / STK Snapshot / EMC timefinder …)**
  - Issue some commands
    - Shut down DB2 subsystem
    - OR
    - Suspend DB2 subsystem / SET LOG LOAD / SET LOG SUS PENDING

ICF Catalog (VSAM space & GDG information) – a lot of times not on the same volumes as DB2

DB2 CLONING TOOL

- **Rename data sets**
  - Names are chosen during initial JCL setup
  - Catalogs target volume data sets
  - Fixes the VTOC, VTOCIX, VVDS conflicts

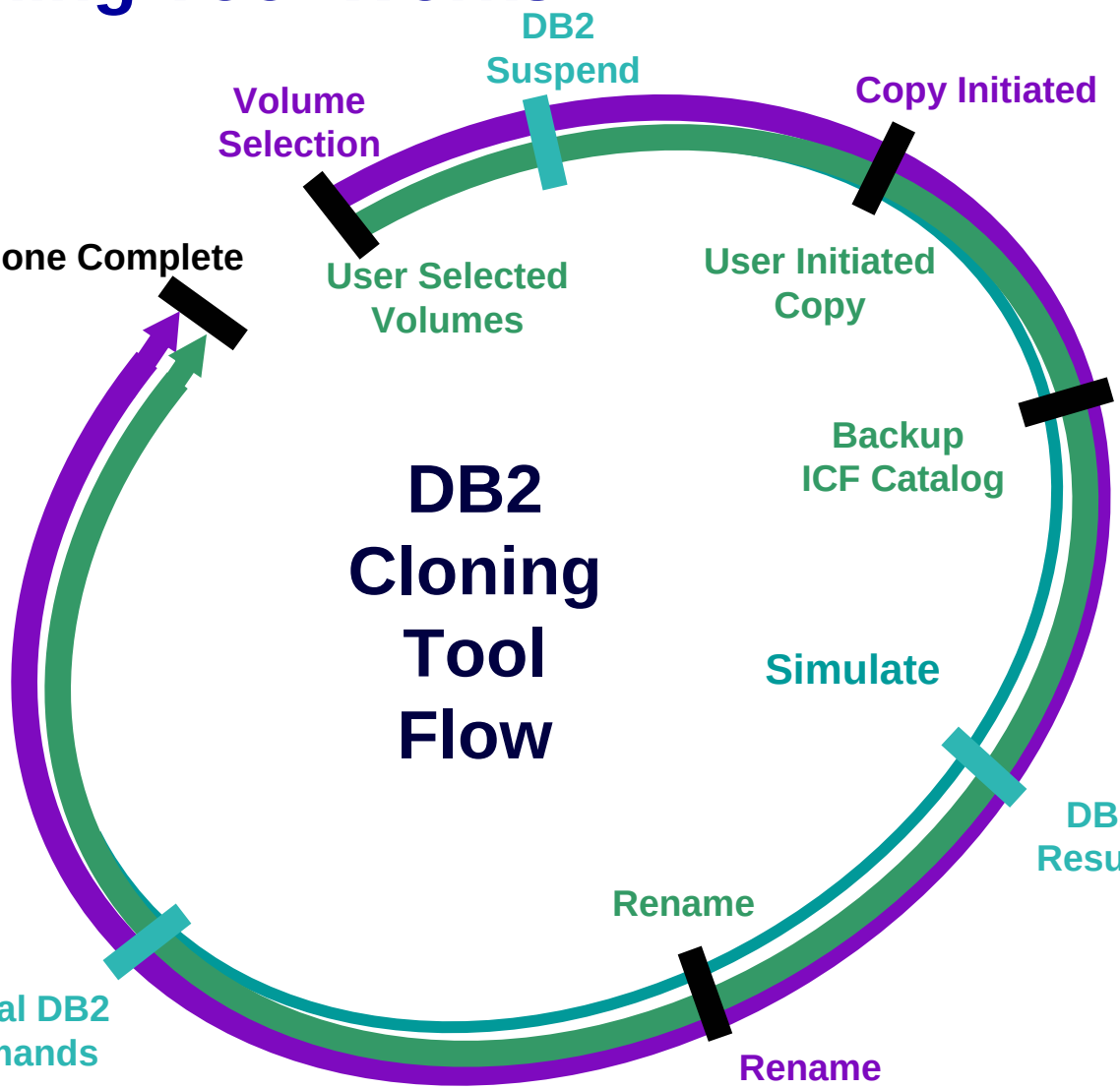
```
RENAME – VOLBKUP -  DDN(VOLBKUP)
- JOURNAL – DDN(JOURNAL)
- RENAME – MASKS(DB2AXX,DB2BXX
```

- **Optional commands**
  - Start/Stop new target DB2
  - Update DB2 internals with new names – BSDS, Directory, DB2 Catalog
  - Fix restricted table space

DB2 CLONING TOOL

- **Can clone offline (DB2 is stopped and started) or online (DB2 Suspend and Resume)**
- **Updates internal control information**
  - BSDS
  - Directory
  - DB2 Catalog
- **Supports data sharing**
  - Can clone data sharing to non-data sharing
  - Can reduce the number of data sharing members
- **Simulate**

How DB2 Cloning Tool Works



When using IBM FlashCopy and STK SnapShot

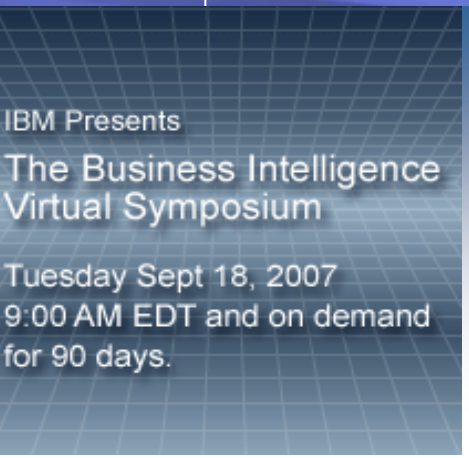
When using all other replication products

SAP Environment – DB2 Cloning Tool

- DB2 *provides fast cloning of your SAP system, e.g. from production to test, allowing DBA's to focus more on verifying the SAP system integrity in the test environment.*
  - Allows fast cloning of SAP systems – one of the most common things done is cloning an SAP system for test purposes. Since SAP is generally the only thing running on this DB2 instance the clone is for the entire system.
  - DB2 Cloning Tool uses disk technologies (e.g. FLASHCOPY) to accomplish the copy and then performs all necessary steps to complete the clone (e.g. rename datasets, reset OBIDs, etc.)

SUMMARY

- Administration Tools
  - **DB2 Administration Toolkit for SAP**
    - DB2 Administration Tool
    - DB2 Object Comparison Tool
- Performance Tools
  - **DB2 Performance Toolkit for SAP**
    - Tivoli Omegamon XE for DB2 Performance Expert
    - DB2 Query Monitor
- Automation Tools
  - **DB2 Automation Toolkit for SAP**
    - DB2 Automation Tool
- Cloning Tools
  - **DB2 Cloning Tool**



IBM presents the Business Intelligence Virtual Symposium
Attend From Your Desktop On Demand

Introducing "From Insight to Foresight", a complimentary Business Intelligence Virtual Conference and Exposition brought to you by IBM, KnowledgeStorm and CIOView.

Through a state of the art interactive technology, you can experience this live event from the convenience of your desktop.

For more information and to register:
http://events.unisfair.com/rt/ibmbi~bi?code=V01

This virtual conference will provide you with unique insight into approaching some of the most prevailing issues in turning business data into knowledge. Hear speakers like Claudia Imhoff (Intelligent Solutions), Scott McReady (CIOView) and Bill O'Connell (Data Warehousing CTO for IBM) discussing how Business Intelligence is changing and the way your business can benefit.

Exchange ideas in the wiki forum and visit the booths to find out more about the innovative solutions to help you move from Insight to Foresight. Topics will include:

- Managing information and compliance
- Ensuring a single consistent view of your data
- Delivering knowledge
- Moving beyond insight to foresight and pro-active change
- Easing your mind around security and the privacy of your data & knowledge

Simply register now to reserve your spot in the on-line conference and then log-in on September 18th with your email address and password starting at 9am EDT.

IOD CONFERENCE

- **DATE: October 14 – 19 (Sunday – Friday)**
- **LOCATION: Mandalay Bay, Las Vegas**

- **EXPO: Opens on October 14 (Sunday) at 5:00 PM**
- **DEMO SUITES**
  - Located at THEHotel Mandalay Bay – Marble B
  - Open October 15 – October 17 (Monday - Wednesday)

THANK YOU