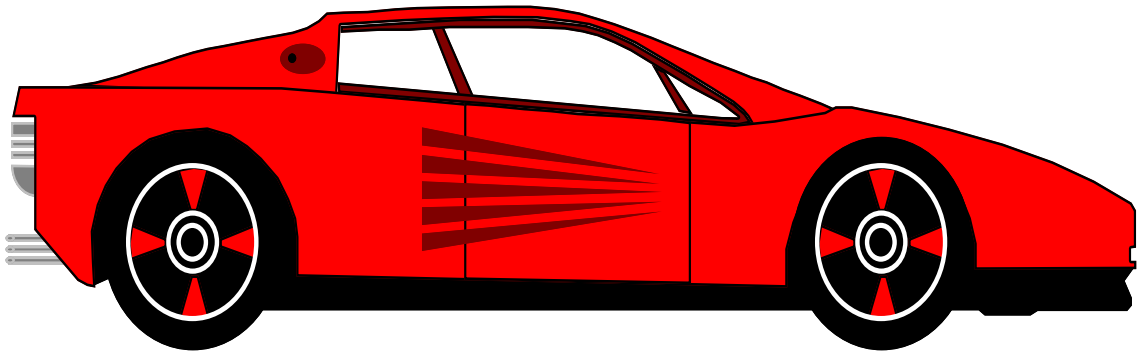
DB2: ALL Platforms

DB2 UDB for Linux, UNIX, and Windows V8: Fasten Your Seatbelts!

Philip K. Gunning
Principal Consultant
Gunning Technology Solutions, LLC



- DB2 ™ is a registered trademark of IBM Corporation. Oracle is a registered trademark of Oracle Corporation and SQL Server is a registered trademark of Microsoft.
- DB2 Universal Database (DB2 UDB) is a registered trademark of International Business Machines Corp.
- Other logos and product/trade names are registered trademarks or trademarks of their respective companies.

Outline

- Present details of of Major Enhancements in the following areas:
  - Availability
  - Performance
  - Manageability
  - Application Development
  - Serviceability
  - SMART
  - Monitoring
- More Futures
- Summary

Availability

- Online Reorganization!!
  - Can “reorg” tables at any time
  - Reorg table in-place
  - no temporary space required
- Significantly improves DB2 Availability
- During reorg can monitor with LOAD QUERY command
- Table can be accessed during reorg

Availability

- Online Index Reorg
  - Table can be read or updated during index
  - Reorg not done in-place
  - Uses a shadow copy
  - All indexes rebuilt using shadow copy
- No access allowed during “switch” phase
- Significantly enhances availability

Availability

- Dynamic Online Configuration Parameters
  - more than 50 configuration parameters can be changed online
  - immediate and deferred class
- Changes can be viewed with Memory Visualizer
- Some can be set to automatic and DB2 will monitor and adjust as necessary

Availability

- ONLINE Buffer Pool Enhancements
  - Create, drop, and alter buffer pools online and have the changes take effect immediately or defer them
- If buffer pool is dropped, DB2 will immediately make the memory available to Database Shared memory so it can be reused

Availability

- Can change buffer pools to support periods of dissimilar work
- New block based buffer pool
  - Block based buffer pools can improve performance of applications accessed in a sequential manner

Availability

- DMS Container Enhancements
  - can drop an existing container
  - reduce the size of a container
  - add new containers above the high water mark such that a rebalance doesn't occur
- Add new container online with container immediately available for use

Availability

- Multidimensional Clustering (MDC)
  - New clustering technology that provides a method for automatic continuous clustering of data along multiple dimensions
  - Benefits primarily BI/DW environments but has OLTP application as well
- MDC lets you physically cluster on more than one dimension (key) simultaneously

Availability

- MDC uses the following terms:
  - Cell
  - Slice
- Dimensions block indexes are automatically created for each dimension specified
- Composite block indexes are automatically created and contain all dimension key columns

Performance

- Catalog and authorization caching for partitioned databases is done on each partition
  - eliminates trips to the catalog partition resulting in improved performance
- Asynchronous I/O enhancements
  - exploits AIX AIO for improved page cleaning performance

Performance

- JAVA Stored Procedure Enhancements
  - now implemented using thread-based model
  - results in significant performance for routines executing concurrently
- JAVA Virtual Machine (JVM) is now shared by JAVA SPs and UDFs
  - previously, a separate JVM was created per routine resulting in lots of overhead

Performance

- Connection Concentration
  - allows many transient connections, such as Internet Connections, to share the same logical coordinating agent
  - as such DB2 uses less memory and can handle many more connections

Performance

- Number of context switches drastically reduced
  - results in improved performance
- Enable by setting MAX_CONNECTIONS greater than the value of MAX_COORDAGENTS

Performance

- Full 64-bit support
- Enables use of large real memories which can be exploited for larger buffer pools, sort memory, and other DB2 memory areas
- New client enables V8 client to connect to 32-bit version of DB2
- DB2 Can Now Scale to The Moon!

Performance

- Type-2 Indexes
  - Type-2 indexes improve performance by eliminating most next-key-share locks
    - entries are now marked as deleted instead of physically deleted
- DB2 will delete the index entries during a period of low system activity
  - If not, new commands are available to identify candidates for cleanup and to actually delete them

Performance

- New INSTEAD OF trigger extents the ability to update views
  - with INSTEAD OF triggers, the update operation against the view gets replaced by the trigger logic, which performs the operation on behalf of the view.
- INFORMATIONAL CONSTRAINTS
  - are rules that can be used in query rewrite but aren’t enforced by the Database Manager

Manageability

- ONLINE LOAD
  - enables load operations to take place at the table level, allowing concurrent access to other tables in a multi-table tablespace
  - with the READ ACCESS option of the LOAD command, existing data can be read while the new data is loaded

Manageability

– new LOAD option LOCK FORCE allows you to force applications to release locks on a table so that a load operation can proceed

Manageability

- SET INTEGRITY statement no longer required for tables that had generated columns and no other constraints, the load utility now generates column values for generated columns
- LOAD QUERY command has been enhanced and can be used to see the status of tables whether or not a load operation is in progress

Manageability

- Autoloader functions have been incorporated into the LOAD utility and the autoloader control file is no longer required

Manageability

- Flush Package Cache
  - new FLASH PACKAGE CACHE SQL statement lets you remove Dynamic SQL statements by invalidating them
    - existing users of those statements will continue to use the old, while new requests will cause a prepare and a new statement entry will be cached
  - can be used in conjunction with changes to online configuration parameters

Manageability

- LOGGING ENHANCEMENTS
  - Dual logging is now supported on all platforms
  - Specify logpath through the MIRRORLOGPATH DB CFG parameter
    - replaces old DB2NEWLOGPATH2 registry variable
  - max amount of log space increased to 256 GB from 32 GB

Manageability

- Infinite Logging
  - allows a current unit of work to span primary and archive logs
  - this change will accommodate large units of work that require more log space than that allocated for the primary logs

Manageability

- BLK_ON_LOG_DISK_FUL registry variable has been replaced with the new DB CFG parameter BLK_LOG_DSK_FUL
  - DB2 will retry to write to log every five minutes

Manageability

- BACKUP and RECOVERY Enhancements
- New tablespace history file identifies log files needed for a particular tablespace recovery
  - log filtes that aren't needed are skipped, resulting in faster tablespace recovery
- Local time can now be used for rolling forward to a point-in-time instead of CUT time

Manageability

- DB2DIAG.LOG has been split into two files
  - new file, Admin Notification log will be used to record non-severe errors whilst the DB2DIAG.LOG will be used to capture fatal errors and dumps
  - new DB CFG parameter, NOTIFY LEVEL will control the level of information written

Manageability

- New Database “Maintenance Mode”
- This is akin to ACCESS (MAINT) on DB2 for OS/390 and has been available since the beginning of time:)
- Allows DBAs to force off all other uses to place the database or instance in QUIESCED MODE

Manageability

- REORGCHK has been enhanced to include reporting on pseudo-deleted index entries and also includes an ON SCHEMA option to specify a particular schema

Manageability

- ASTs now called Materialized Query Tables (MQTs)
  - New User-maintained MQT enables users to load tables with precomputed data using the MAINTAINED BY USER option of the CREATE SUMMARY TABLE statement

Manageability

- MQTs can now be defined on NICKNAMES
  - If a remote table with a nickname is not available, DB2 can use the local MQT if all routing criteria is met
    - Significant availability and performance improvement is gained

Manageability

- Compression of NULL and DEFAULTs
  - new feature benefits DWs and large databases
  - new commands to implement are VALUE COMPRESSION and COMPRESS SYSTEM DEFAULT options of CREAT TABLE statement
  - With this turned on, DB2 uses new internal row format
- This reduces disk storage requirements and can increase performance of table scans

Application Development

- CALL statement is now a fully compiled statement
  - can be prepared dynamically
- SQL Assist has been enhanced and has an easy to use interface
  - can copy and paste SQL
  - syntax checking
  - Assistance in writing joins

Application Development

- XML Extender Support for Web Services
- Read-only SQL can now be used in external UDFs and methods
- Stored Procedure support for more than 90 parameters

Application Development

- New Development Center incorporates and replaces the SPB
  - Can develop and deploy SPs
- Microsoft Add-ins and Websphere plug-ins have been tightly integrated to ease development of components and XML development
- Enables Rapid Application Development

Application Development

- Add-ins and Plug-ins for:
  - MS Visual C++, Visual Basic, Visual InterDev
  - Borland Kylix and C++ Builder
- DB2 UDB V8 Universal Developers Edition includes:
  - Websphere Studio
  - Websphere Application Server
- Enables development and deployment of DB2 based Web Services

ect File Edit Debug Selected View Tools Help

ect_View Server_View

ect View

Projects

ut View

us Action

Default View*

Messages Parameters Results

Development Center Launchpad

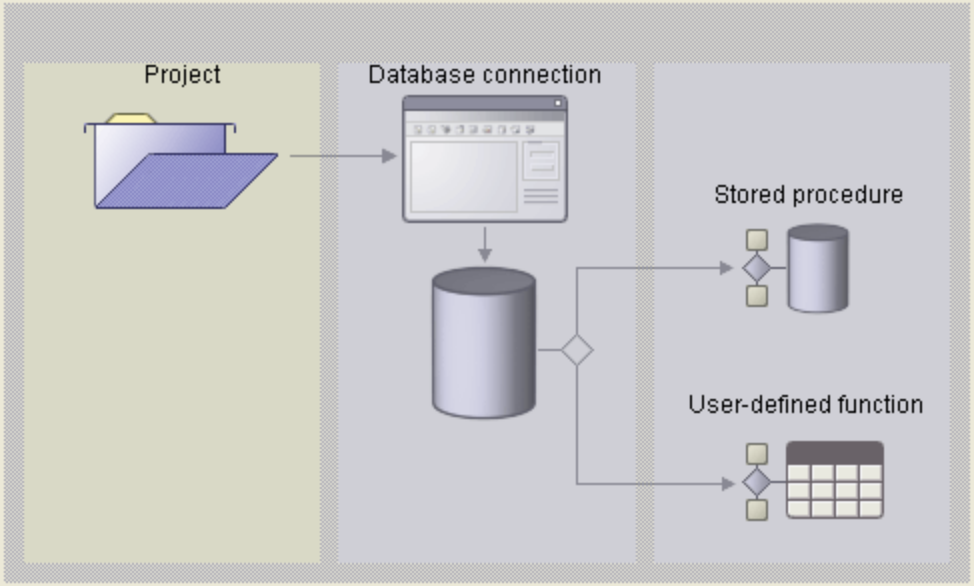
Welcome to the IBM DB2 Development Center

1. Create Project
2. Add Connection
3. Create Object

The first step is to create a project.

1. Click **Create Project**.
2. In the window that opens, type the name and path for the new project, and click **OK**.

The new project is displayed in the project tree view.



Do not show this again

Serviceability

- New INSPECT command lets you check architectural integrity of tablespaces and tables online
  - can also be used to see what kind of indexes are on a given table
- DB2TRACE has been significantly enhanced and it can now be run without significantly impacting response time!

Serviceability

- DB2DART is now officially supported
  - can be used to identify and repair damaged objects
- New DB2SUPPORT command can be used to provide “support bundle” to DB2 support

SMART

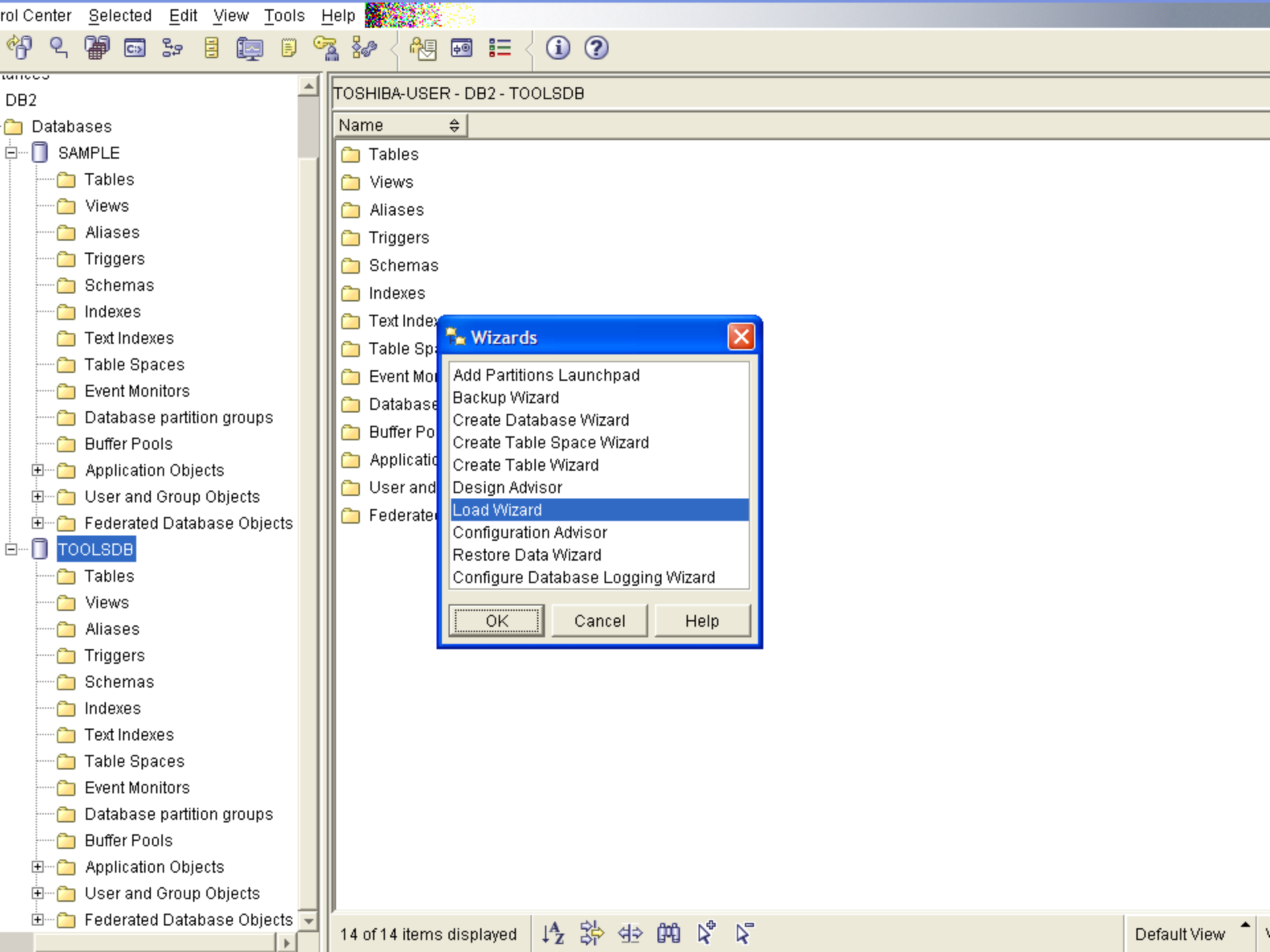
- SMART Wizards and automation are evident throughout the product
  - First step towards “autonomic computing”where resources are “self-monitoring and tuning”
- A few memory parameters can now be set to “automatic”

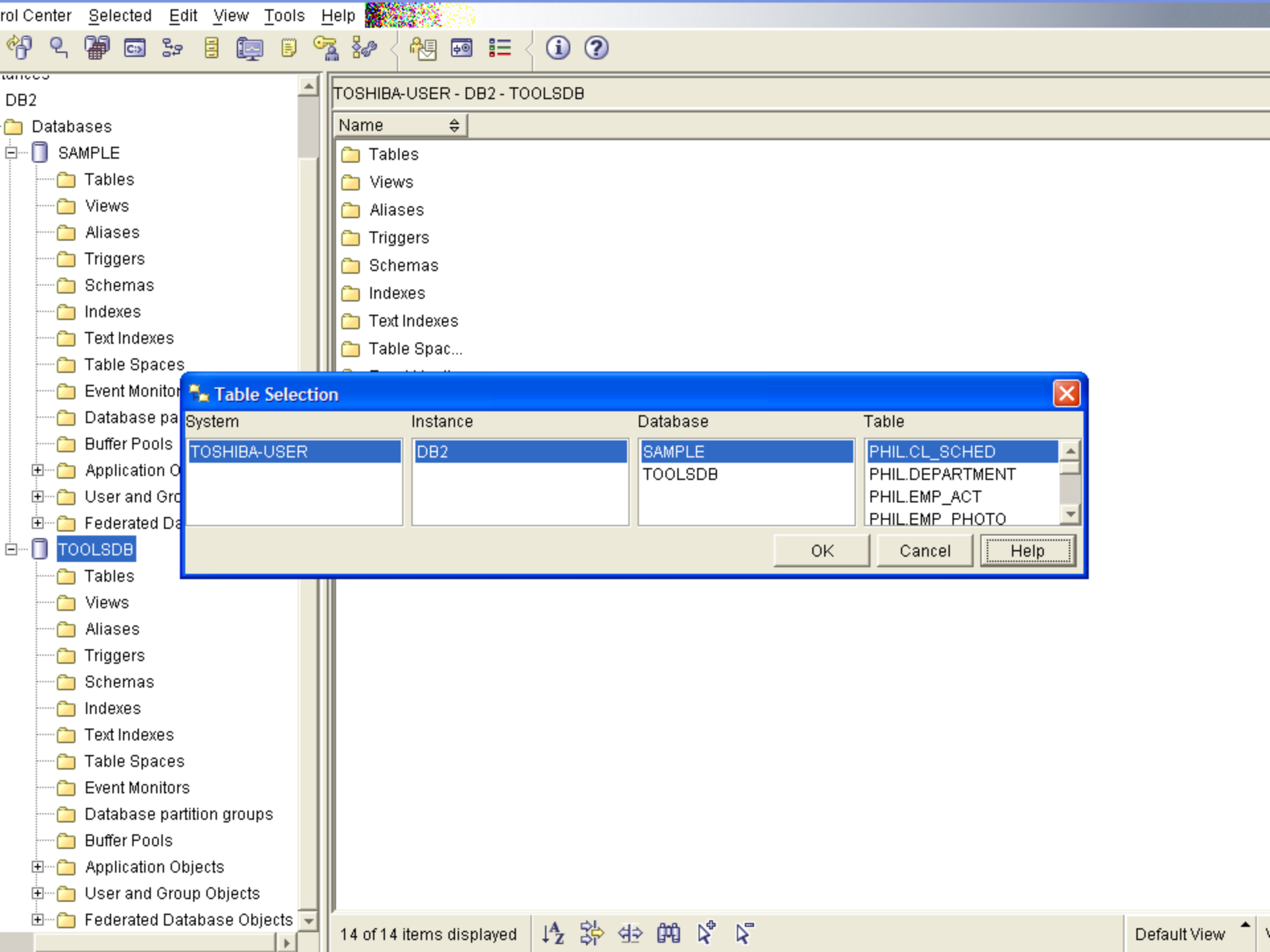
SMART

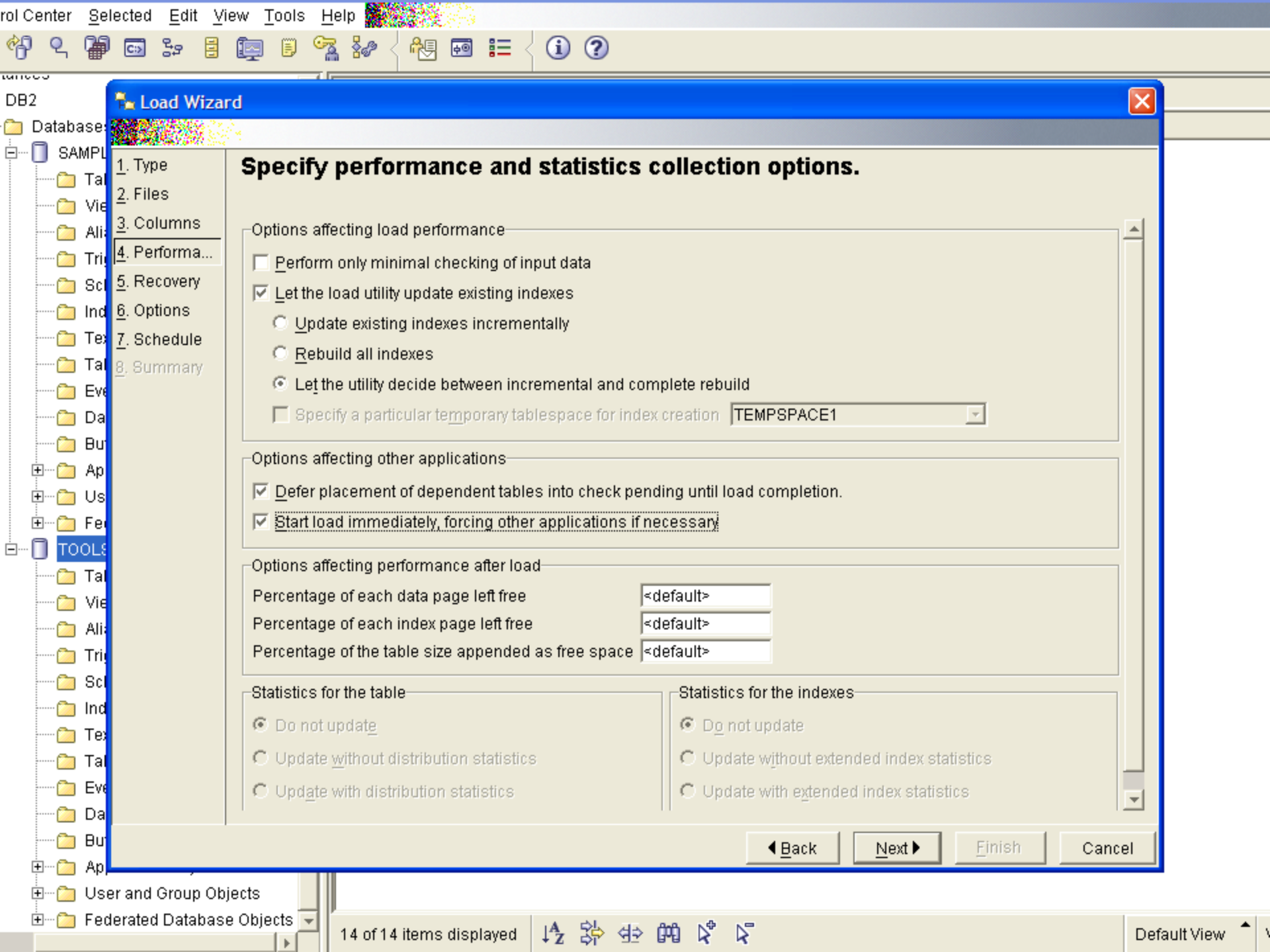
- New Wizards and Advisors have been developed or enhanced as follows:
  - Memory Visualizer
  - Redistribute Data Wizard
  - Backup and Restore Wizard
  - Configure Database Logging Wizard
  - Add Partition Wizard
  - Storage Management view

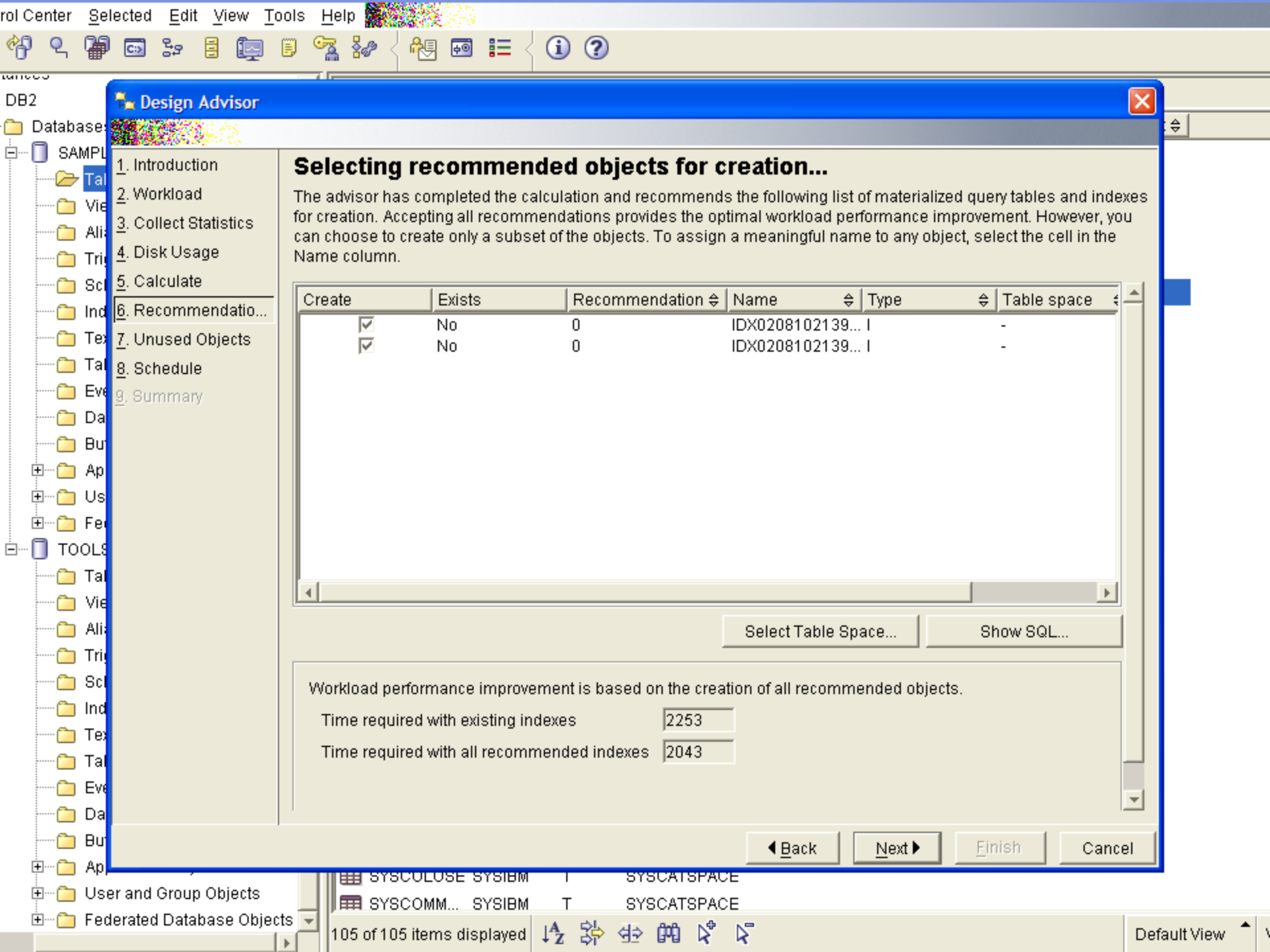
SMART

  - Design Advisor (formerly Index Advisor)
  - Load Wizard
  - Performance Configuration Wizard
- Additional new tools that are separately priced along with several ISV offerings


rol Center Selected Edit View Tools Help
DB2
Databases
SAMPLE
Tables
Views
Aliases
Triggers
Schemas
Indexes
Text Indexes
Table Spaces
Event Monitors
Database partition groups
Buffer Pools
Application Objects
User and Group Objects
Federated Database Objects
TOOLSDB
Tables
Views
Aliases
Triggers
Schemas
Indexes
Text Indexes
Table Spaces
Event Monitors
Database partition groups
Buffer Pools
Application Objects
User and Group Objects
Federated Database Objects
TOSHIBA-USER - DB2 - TOOLSDB
Name
Tables
Views
Aliases
Triggers
Schemas
Indexes
Wizards
Add Partitions Launchpad
Backup Wizard
Create Database Wizard
Create Table Space Wizard
Create Table Wizard
Design Advisor
Load Wizard
Configuration Advisor
Restore Data Wizard
Configure Database Logging Wizard
OK
Cancel
Help
14 of 14 items displayed
Default View


rol Center Selected Edit View Tools Help
DB2
Databases
SAMPLE
Tables
Views
Aliases
Triggers
Schemas
Indexes
Text Indexes
Table Spaces
Event Monitor
Database pa
Buffer Pools
Application C
User and Gro
Federated Da
TOOLSDB
Tables
Views
Aliases
Triggers
Schemas
Indexes
Text Indexes
Table Spaces
Event Monitors
Database partition groups
Buffer Pools
Application Objects
User and Group Objects
Federated Database Objects
TOSHIBA-USER - DB2 - TOOLSDB
Name
Tables
Views
Aliases
Triggers
Schemas
Indexes
Text Indexes
Table Spac...
Table Selection
System
Instance
Database
Table
TOSHIBA-USER
DB2
SAMPLE
TOOLSDB
PHIL.CL_SCHED
PHIL.DEPARTMENT
PHIL.EMP_ACT
PHIL.EMP_PHOTO
OK
Cancel
Help
14 of 14 items displayed
Default View


rol Center Selected Edit View Tools Help
DB2
Database
SAMPL
TOOLS
User and Group Objects
Federated Database Objects
14 of 14 items displayed
Default View
Load Wizard
1. Type
2. Files
3. Columns
4. Performa...
5. Recovery
6. Options
7. Schedule
8. Summary
Specify performance and statistics collection options.
Options affecting load performance
Perform only minimal checking of input data
Let the load utility update existing indexes
Update existing indexes incrementally
Rebuild all indexes
Let the utility decide between incremental and complete rebuild
Specify a particular temporary tablespace for index creation
TEMPSPACE1
Options affecting other applications
Defer placement of dependent tables into check pending until load completion.
Start load immediately, forcing other applications if necessary
Options affecting performance after load
Percentage of each data page left free
<default>
Percentage of each index page left free
<default>
Percentage of the table size appended as free space
<default>
Statistics for the table
Do not update
Update without distribution statistics
Update with distribution statistics
Statistics for the indexes
Do not update
Update without extended index statistics
Update with extended index statistics
Back
Next
Finish
Cancel

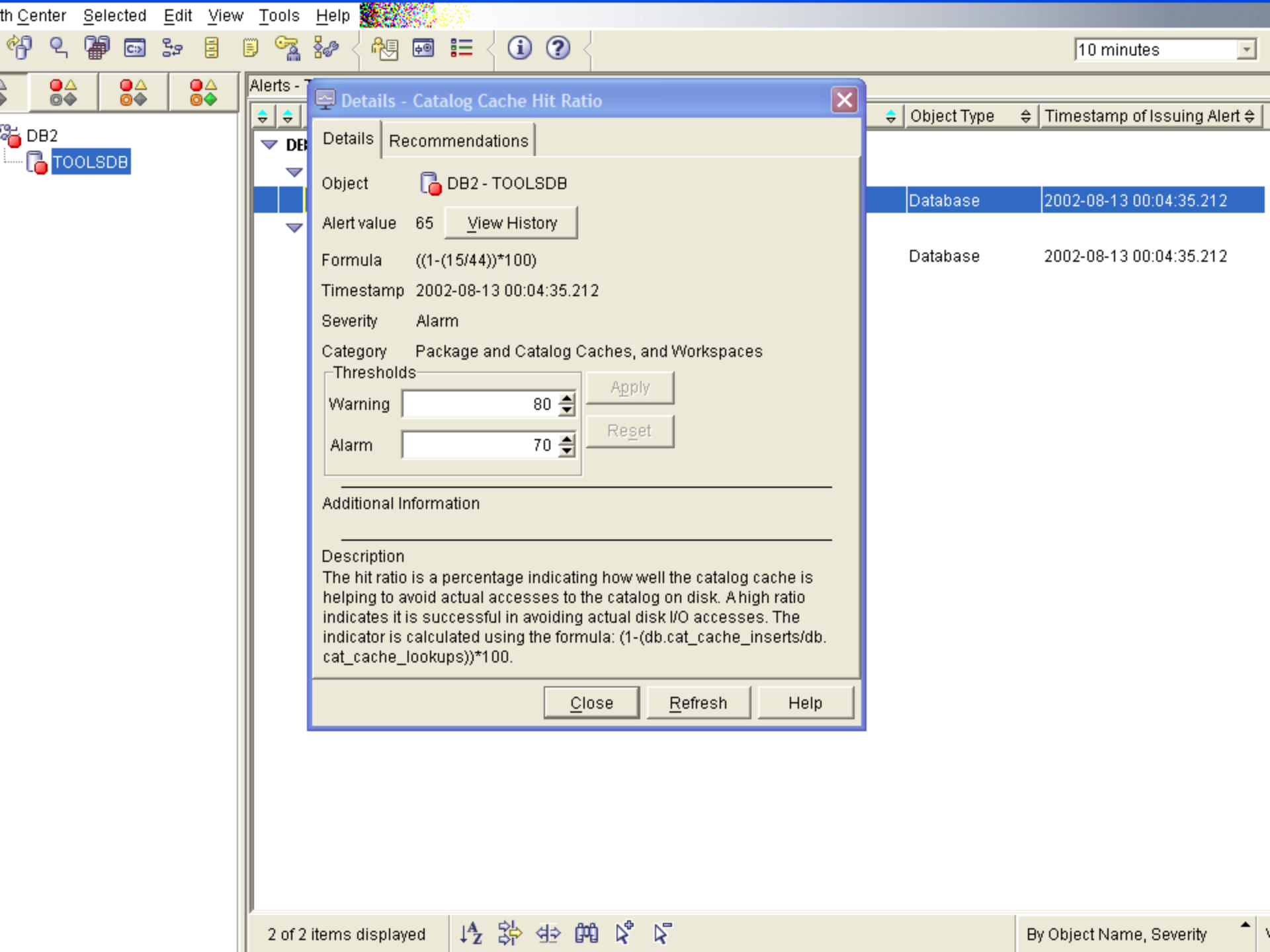

rol Center Selected Edit View Tools Help
DB2
Database
SAMPL
TOOLS
User and Group Objects
Federated Database Objects
Design Advisor
1. Introduction
2. Workload
3. Collect Statistics
4. Disk Usage
5. Calculate
6. Recommendatio...
7. Unused Objects
8. Schedule
9. Summary
Selecting recommended objects for creation...
The advisor has completed the calculation and recommends the following list of materialized query tables and indexes for creation. Accepting all recommendations provides the optimal workload performance improvement. However, you can choose to create only a subset of the objects. To assign a meaningful name to any object, select the cell in the Name column.
Create
Exists
Recommendation
Name
Type
Table space
No 0 IDX0208102139... I -
No 0 IDX0208102139... I -
Select Table Space...
Show SQL...
Workload performance improvement is based on the creation of all recommended objects.
Time required with existing indexes 2253
Time required with all recommended indexes 2043
Back
Next
Finish
Cancel
SYSCOLUSE SYSIBM T SYSCATSPACE
SYSCOMM... SYSIBM T SYSCATSPACE
105 of 105 items displayed
Default View

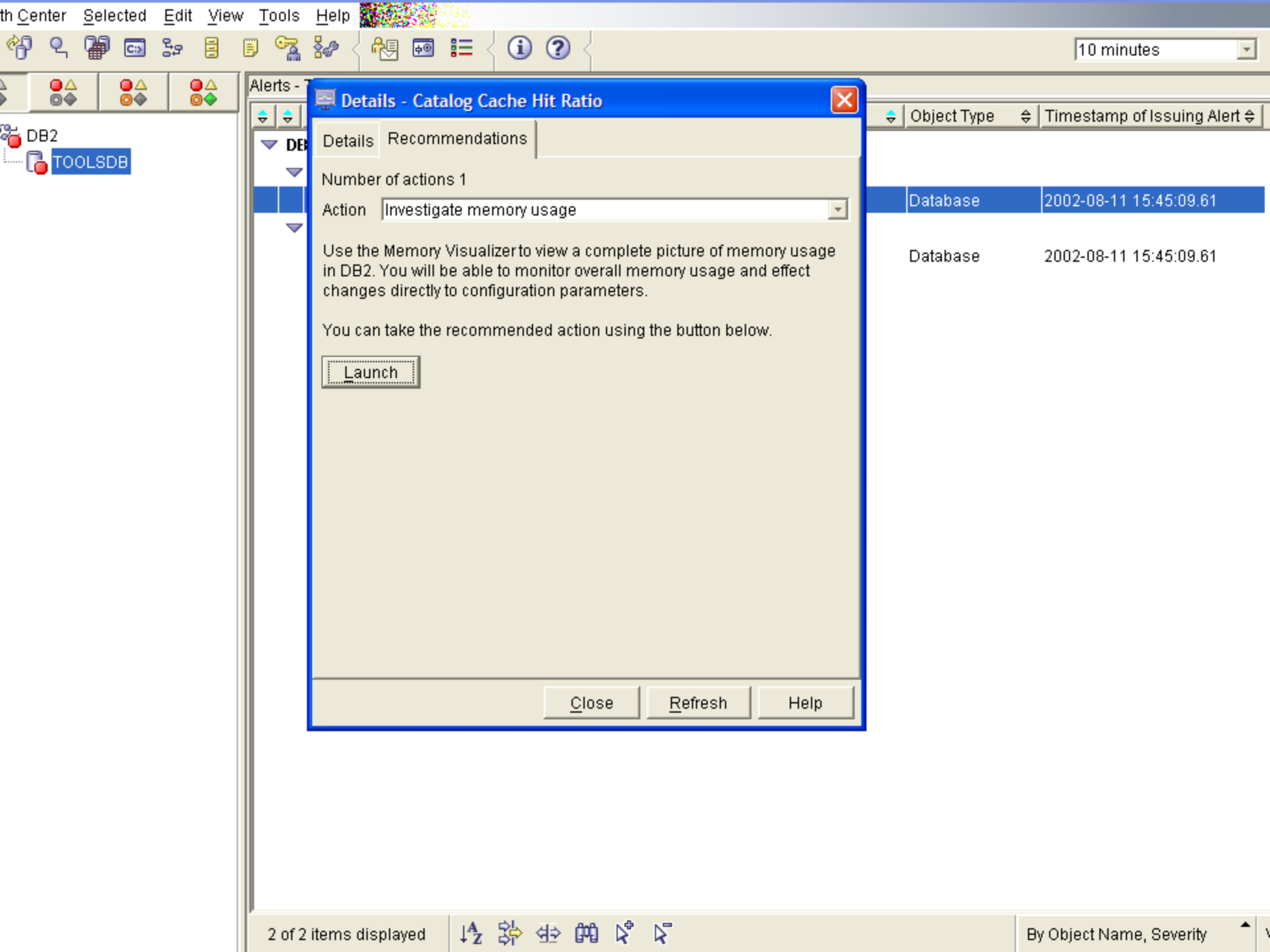
Monitoring

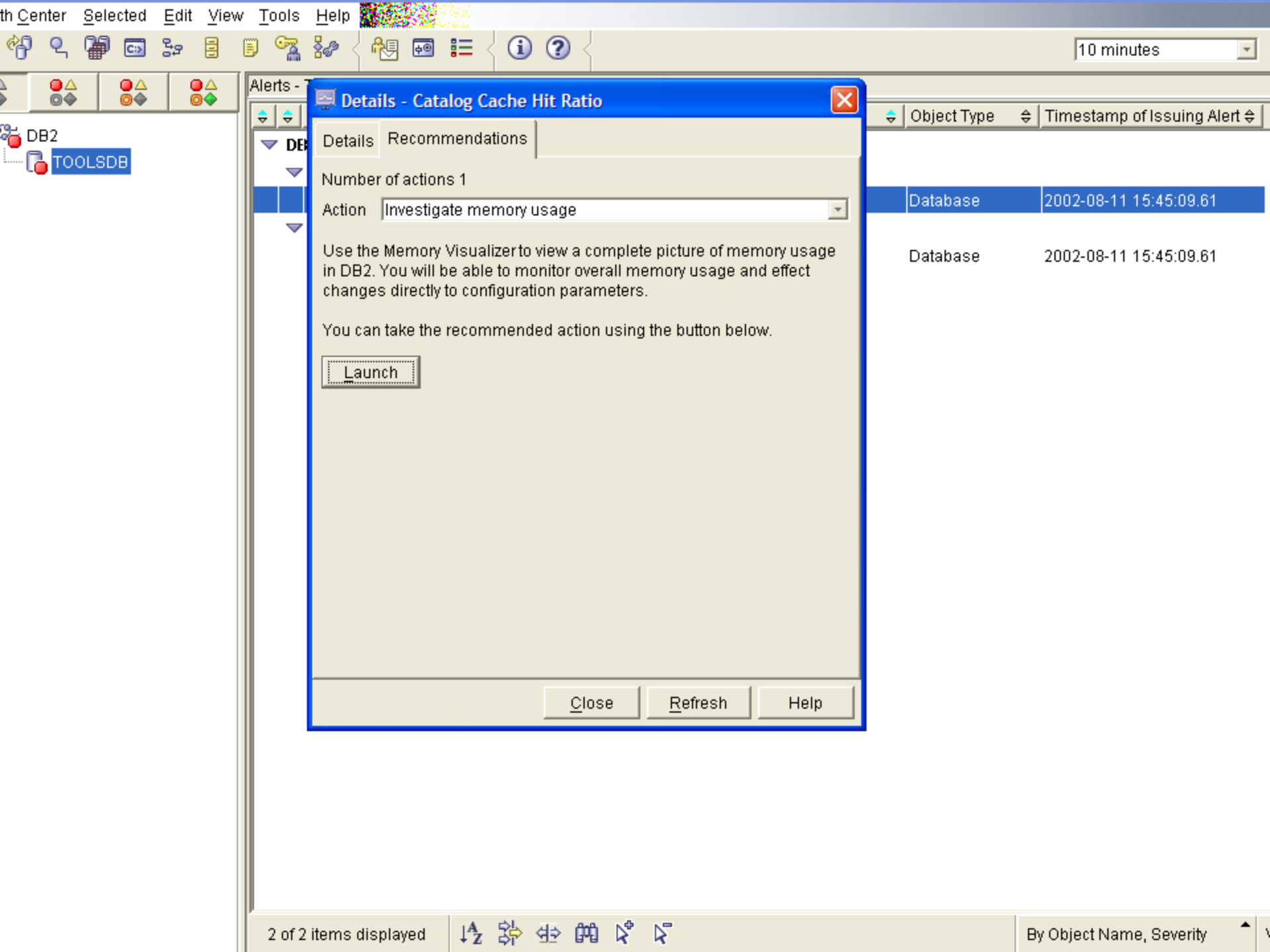
- Event monitors can now write to tables
- New SQL functions allow snapshots to be taken
  - previously only available via command line or API
- Health Monitor provides server-side agent for health checking

Monitoring

- Health Center GUI provides graphical interface for configuring Health Monitor and for raising and reporting on alerts
  - health beacons used to signal state of database
  - recommendations provided to correct problems raised


th Center Selected Edit View Tools Help
10 minutes
DB2
TOOLSDB
Alerts -
Details - Catalog Cache Hit Ratio
Details
Recommendations
Object
DB2 - TOOLSDB
Alert value
65
View History
Formula
((1-(15/44))*100)
Timestamp
2002-08-13 00:04:35.212
Severity
Alarm
Category
Package and Catalog Caches, and Workspaces
Thresholds
Warning
80
Alarm
70
Apply
Reset
Additional Information
Description
The hit ratio is a percentage indicating how well the catalog cache is helping to avoid actual accesses to the catalog on disk. A high ratio indicates it is successful in avoiding actual disk I/O accesses. The indicator is calculated using the formula: (1-(db.cat_cache_inserts/db.cat_cache_lookups))*100.
Close
Refresh
Help
Object Type
Timestamp of Issuing Alert
Database
2002-08-13 00:04:35.212
Database
2002-08-13 00:04:35.212
2 of 2 items displayed
By Object Name, Severity


th Center Selected Edit View Tools Help
10 minutes
DB2
TOOLSDB
Alerts -
Details - Catalog Cache Hit Ratio
Details
Recommendations
Number of actions 1
Action
Investigate memory usage
Use the Memory Visualizer to view a complete picture of memory usage in DB2. You will be able to monitor overall memory usage and effect changes directly to configuration parameters.
You can take the recommended action using the button below.
Launch
Close
Refresh
Help
Object Type
Timestamp of Issuing Alert
Database
2002-08-11 15:45:09.61
Database
2002-08-11 15:45:09.61
2 of 2 items displayed
By Object Name, Severity


th Center Selected Edit View Tools Help
10 minutes
DB2
TOOLSDB
Alerts -
Details - Catalog Cache Hit Ratio
Details
Recommendations
Number of actions 1
Action
Investigate memory usage
Use the Memory Visualizer to view a complete picture of memory usage in DB2. You will be able to monitor overall memory usage and effect changes directly to configuration parameters.
You can take the recommended action using the button below.
Launch
Close
Refresh
Help
Object Type
Timestamp of Issuing Alert
Database
2002-08-11 15:45:09.61
Database
2002-08-11 15:45:09.61
2 of 2 items displayed
By Object Name, Severity

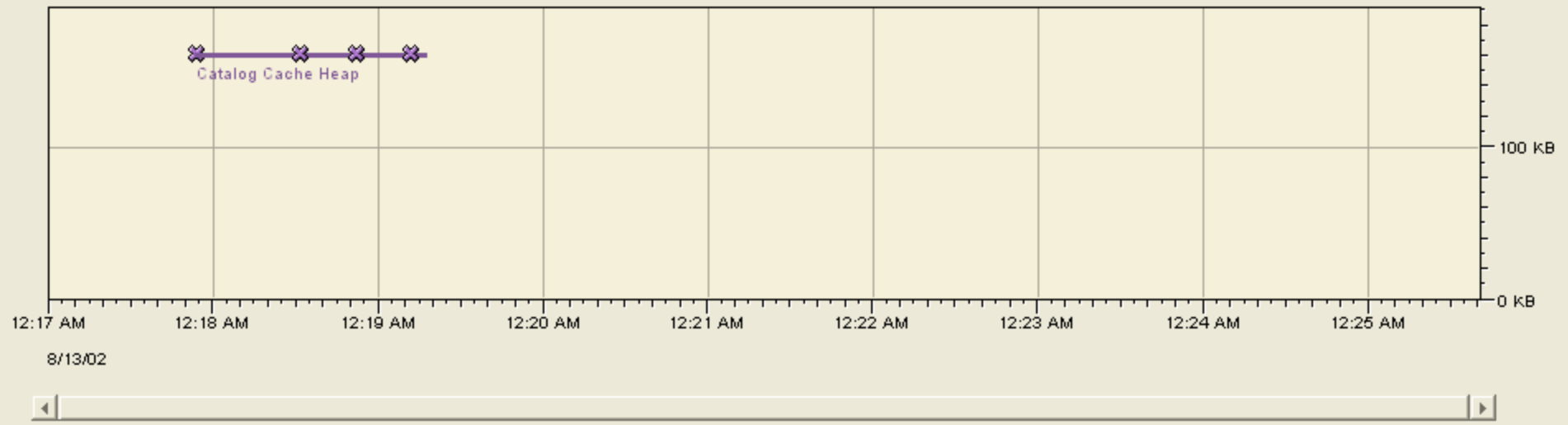
ory Visualizer Selected Edit View Tools Help

5 seconds

mory Resources/Parameters	Show Plot	Plot Legend	Utilization	Parameter Value	Upper Alarm (%) Threshold	Upper Warning (%) Th
0						
DBM Shared Memory						
Backup/Restore/Utilit	☐		0.08% (16 KB/19.7 MB)	--	98	90
backbufsz	☐		--	1024	--	--
restbufsz	☐		--	1024	--	--
Package Cache	☐		(160 KB/Unknown)	--	--	--
Catalog Cache Heap	☑	✖	(160 KB/Unknown)	--	--	--
Buffer Pools	☐		(10.62 MB/Unknown)			

nts

Memory Usage Plot



Time Unit Minute

InfiniBand

- DB2 V8 is first RDBMS to include InfiniBand support
- InfiniBand was developed by the InfiniBand Trade Association (IBTA) of which IBM is a charter member

InfiniBand

- Former in August 1999, it is the outgrowth of the INTEL/Microsoft led NGIO (3GIO), and IBM, Compaq, and SUN FUTURE IO effort.
- InfiniBand is an industry standard, channel based, switched fabric interconnect architecture for server
- Infinband offers speeds up to 6GB which is 50 times higher than the theoretical limit of Gigabit Ethernet!!!!

InfiniBand

- HCAs - Host Channel Adapters are used to interface with PCI and later directly with OS
- TCA - is a disk interface to a physical hard drive
- Routers and switches
- Offload IO processing from Database servers
- RDMA

Futures

- Future Enhancements are already planned for Fixpacks. Some of them are:
  - Identity and Sequence datatype support for partitioned databases
  - Backup compression
  - KERBEROS support on UNIX platforms
  - Merge/Upsert support
  - Utility Throttling
  - Net search extender ehancements
  - Additional SMART initiatives

Summary

- DB2 V8 is the most significant release to date and contains the manageability, availability, and application development enhancements to meet business demands now and into the future
- IBM will continue to improve “ease of use” key areas while all along continuing to lead the way in performance through continued optimization and performance improvements

References

- SC09-4821, Administration Guide: Performance
- SC09-4822, Administration Guide: Planning
- SC09-4820, Administration Guide: Implementation
- SC09-4848, What's New, DB2 UDB V8

References

- DB2 UDB v8 Announcement, 202-14, http://www.ibmlink.ibm.com/usalets&parms=H_202-214
- DB2 Connect v8 Announcement, 202-215http://www.ibmlink.ibm.com/usalets&parms=H_202-215
- SC09-4828, Command Reference