

DISCOVER, DIAGNOSE, RESOLVE (PART 2):

TOAD™ FOR IBM DB2® XPERT



Agenda

- What is Toad™?
- Functional overview of Toad™ for IBM DB2® 1.0
- SQL Optimizer™
- Scalability testing with Benchmark Factory®
- Live demo

Toad™ for IBM DB2® and the Business Environment

About Toad™

- Industry-leading and award-winning database development and administration tool that maximizes developer productivity and application code quality
- Simplifies skills migration for developers needing to write code for more than one RDBMS
 - More than *500,000* customers trust Toad™ for Oracle for their database development needs
- Provides an interactive community of peers to support the user experience



Toad™ for IBM DB2® and Developers

Toad™ for IBM DB2 on Linux, Unix and Windows provides everything DB2 developers need for:

- Knowledge exchange and online collaboration with other DB2 development experts
- SQL code development and deployment
- Reliable DB2 object management
- DB2 project management



Toad™ Online Community

Knowledge exchange and online collaboration with other DB2 development experts

- Interactive community support from both peers and industry experts:
 - Online discussion groups
 - Quest Pipelines Web site and newsletters
 - Toadsoft.com





TOAD ONLINE

ORACLE SQL SERVER MySQL DB2

Welcome to the Toad Online portal. Use this site to access resources for Toad as well as specific DBMS platforms.

Object Management

- Easily manage objects with create, alter and drop functionality
- Database object search permits location of:
 - Object names
 - Text in objects that include source code
 - Variable names or comments in object source code
- Schema Compare



Toad™ for IBM DB2® Catalog Browser

The screenshot shows the Toad for DB2 - Browser db2admin@SAMPLE interface. The main window displays the catalog browser for the db2admin@LOCAL connection. The left pane shows a tree view of the database structure, including DB2ADMIN, Jwankows, and various objects like Aliases, Functions, Indexes, and Tables. The 'EMPLOYEE' table is selected. The right pane shows the table's columns and their properties.

COLUMN NAME	POS	DATA TYPE	NULLS	DEFAULT	IDENTITY	GENERATED
EMPNO	0	CHARACTER(6)	NOT NULL	{null}	No	
FIRSTNAME	1	VARCHAR(12)	NOT NULL	{null}	No	
MIDINIT	2	CHARACTER(1)	NOT NULL	{null}	No	
LASTNAME	3	VARCHAR(15)	NOT NULL	{null}	No	
WORKDEPT	4	CHARACTER(3)		{null}	No	
PHONENO	5	CHARACTER(4)		{null}	No	
HIREDATE	6	DATE		{null}	No	
JOB	7	CHARACTER(8)		{null}	No	
EDLEVEL	8	SMALLINT	NOT NULL	{null}		
SEX	9	CHARACTER(1)		{null}		
BIRTHDATE	10	DATE		{null}		
SALARY	11	DECIMAL(9,2)		{null}		
BONUS	12	DECIMAL(9,2)		{null}		
COMM	13	DECIMAL(9,2)		{null}		

Record 1 of 14

View all properties and browse/edit data, including LOB data

Connection Manager

- DB2ADMIN
- JWANKOWS
 - a-b Aliases
 - Distinct types
 - f() Functions
 - Indexes
 - MQ Tables
 - Packages
 - p() Procedures
 - 123 Sequences
 - Structured Types
 - Tables
 - CL_SCHED
 - DEPARTMENT
 - EMP_ACT
 - EMP_PHOTO
 - EMP_RESUME
 - EMPLOYEE

Object Palette

Project Manager

Drag a column header here to group by that column

COLUMNNAME	POS	DATA TYPE	NULLS	DEFAULT	IDENTITY	GENERATED
	0	CHARACTER(6)	NOT NULL	{null}	No	
	1	VARCHAR(12)	NOT NULL	{null}	No	
	2	CHARACTER(1)	NOT NULL	{null}	No	
	3	VARCHAR(15)	NOT NULL	{null}	No	
	4	CHARACTER(3)		{null}	No	
	5	CHARACTER(4)		{null}	No	
	6	DATE		{null}	No	
	13	DECIMAL(9,2)		{null}	No	

- Create Table
- Alter Table
- Drop Table
- Create Constraint
- Create Index
- Create Trigger
- Rename Table
- Reorg Table
- Edit Table Privileges
- Export Wizard...
- Refresh Palette
- Add to SQL Modeler
- Generate SQL
- New Window
- Add to Object Details
- Add to Project Manager
- Generate Report

Right mouse click to access all administration and SQL functions

Project Management

The screenshot shows the Toad for DB2 interface with a project named 'Jims Project'. The Project Manager pane on the left lists various items including web links, queries, and tables. A blue callout box with white text states: "Customize project to include links, files, objects, directories, etc." An arrow points from this box to the 'Queries' folder in the Project Manager.

The main window displays the 'db2admin@LOCAL' database structure, showing Schemas (DB2ADMIN, JWANKOWS) and various objects like Aliases, Distinct types, Functions, Indexes, and MQ Tables. The 'DEPARTMENT' table is selected, and its columns are displayed in the right-hand pane:

COLUMN NAME	POS	DATA TYPE
DEPTNO	0	CHARACTER(3)
DEPTNAME	1	VARCHAR(29)
MGRNO	2	CHARACTER(6)
ADMRDEPT	3	CHARACTER(3)
LOCATION	4	CHARACTER(16)

The bottom status bar shows "1 selected" and "db2admin@SAMPLE".

SQL Editor

- SQL modeling to automate creation of commonly used statements
- Formatting and debugging features that simplify SQL and Stored Procedure refinement.
- SQL EXPLAIN, plus optional integration with Quest's SQL Optimizer™
- Scalability testing with integration with Benchmark Factory®

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SQL Editor

The screenshot shows the Toad for DB2 SQL Editor interface. The main window displays the following SQL query:

```
select beverage_distributor.name, soda.name, quantity
from beverage_distributor, soda_shipments, soda_shipping_detail
where beverage_distributor.distributor_id=soda_shipping_detail.distributor_id
and soda_shipping_detail.shipment_id=soda_shipping_detail.shipment_id
and soda_shipping_detail.soda_id=soda.soda_id
and beverage_distributor.name = 'Ajax Beverage'
```

Below the query, the execution plan is visualized as a tree diagram:

- 12 RETURN (Cost: 0.00)
- 11 H5JOIN (Cost: 70,688.40)
 - 2 TBSCAN (Cost: 66,980.48)
 - 1 Table/Index (Cost: 0.00)
 - 1: DB2ADMIN.SODA
 - 2: DB2ADMIN.SODA
 - 10 H5JOIN (Cost: 3,706.21)
 - 4 TBSCAN (Cost: 3,586.41)
 - 1: DB2ADMIN.SODA
 - 2: DB2ADMIN.SODA
 - 9 H5JOIN (Cost: 100.31)
 - 1: DB2ADMIN.SODA
 - 2: DB2ADMIN.SODA

The interface also includes a menu bar (File, Edit, Editor, Debug, Create, View, Tools, Advanced, Window, Help), a toolbar, and a Code Snippets panel on the right.

Complete SQL Modeling:

- Build SQL
- Format SQL
- Execute
- Browse/edit data
- Explain
- Export data

Integration with SQL Optimizer™

The screenshot shows the Toad for DB2 interface. The main window displays the following SQL query:

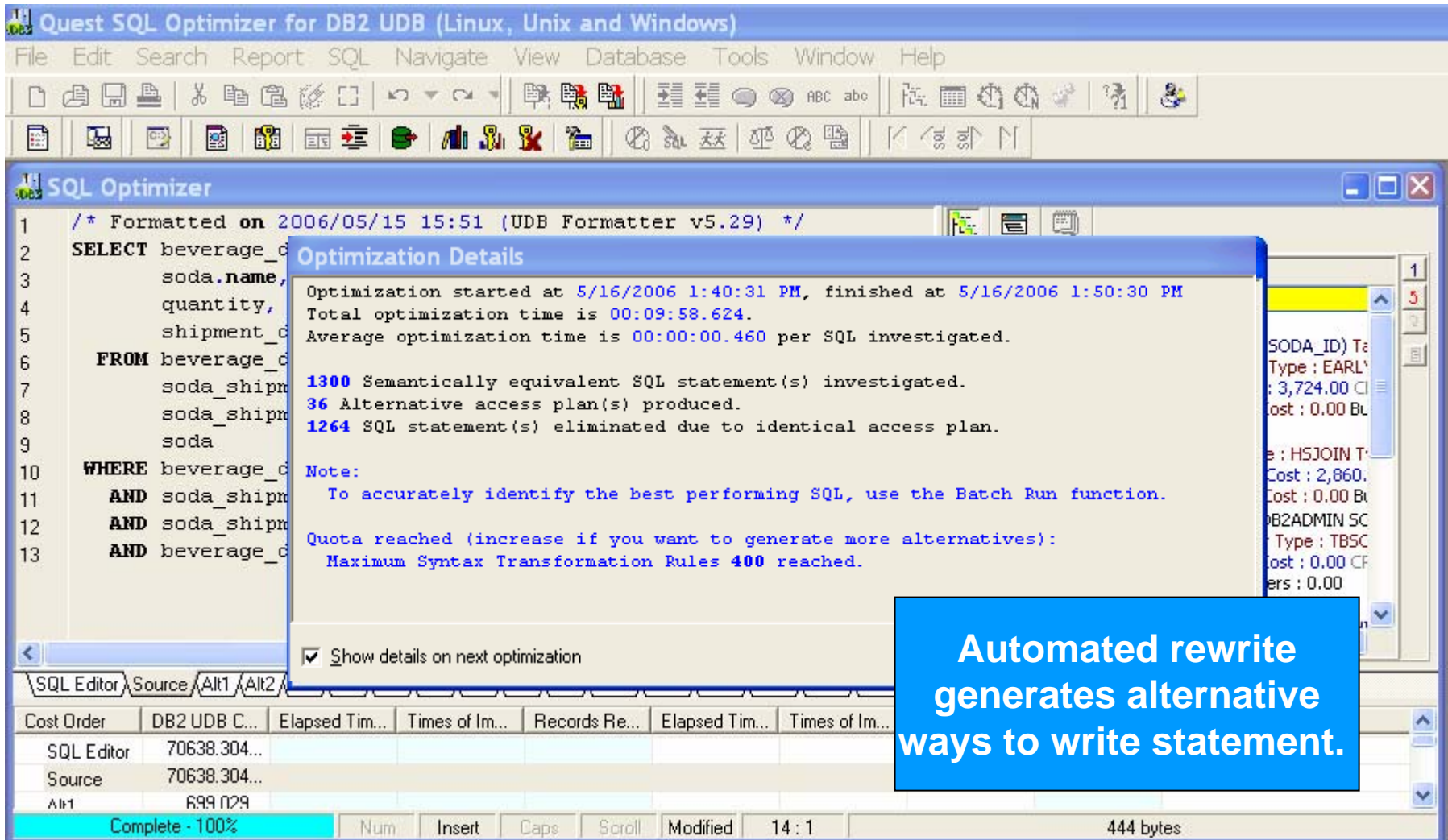
```

/* Formatted on 2006/05/15 15:51 (UDB Formatter v5.29) */
SELECT beverage_distributor.name, soda.name, quantity, shipment_date
FROM beverage_distributor, soda_shipments, soda_shipment_detail, soda
WHERE beverage_distributor.distributor_id = soda_shipments.distributor_id
AND soda_shipments.shipment_id = soda_shipment_detail.shipment_id
AND soda_shipment_detail.soda_id = soda.soda_id
AND beverage_distributor.name = 'Ajax Beverage';
    
```

Below the query, the 'Result Sets' tab shows an 'Explain Plan' with a cost tree. The root node is a 'Table/Index' with a cost of 66,980.48. It branches into three nodes: a 'Table/Index' (cost 3,656.12), a 'TBSCAN' (cost 3,586.41), and an 'HSJOIN' (cost 50.22). The 'HSJOIN' node further branches into a 'Table/Index' (cost 25.15) and a 'FETCH' (cost 25.05). The 'Table/Index' node branches into a 'Table/Index' (cost 25.15) and a 'TBSCAN' (cost 25.15). The 'Table/Index' node further branches into a 'Table/Index' (cost 25.15) and a 'TBSCAN' (cost 25.15).

A blue callout box with white text points to the optimizer icon in the toolbar, stating: "Select the Optimizer shortcut to send SQL to Optimizer".

SQL Optimizer™



The screenshot displays the Quest SQL Optimizer interface. The main window shows a SQL query being optimized. An "Optimization Details" dialog box is open, providing the following information:

- Optimization started at 5/16/2006 1:40:31 PM, finished at 5/16/2006 1:50:30 PM
- Total optimization time is 00:09:58.624.
- Average optimization time is 00:00:00.460 per SQL investigated.
- 1300 Semantically equivalent SQL statement(s) investigated.
- 36 Alternative access plan(s) produced.
- 1264 SQL statement(s) eliminated due to identical access plan.

Note:
To accurately identify the best performing SQL, use the Batch Run function.

Quota reached (increase if you want to generate more alternatives):
Maximum Syntax Transformation Rules 400 reached.

Show details on next optimization

The background shows a SQL query in the editor:

```

1 /* Formatted on 2006/05/15 15:51 (UDB Formatter v5.29) */
2 SELECT beverage_c
3       soda.name,
4       quantity,
5       shipment_c
6 FROM beverage_c
7       soda_shipm
8       soda_shipm
9       soda
10 WHERE beverage_c
11        AND soda_shipm
12        AND soda_shipm
13        AND beverage_c
    
```

At the bottom, a table shows the status of the optimization process:

Cost Order	DB2 UDB C...	Elapsed Tim...	Times of Im...	Records Re...	Elapsed Tim...	Times of Im...
SQL Editor	70638.304...					
Source	70638.304...					
Alt1	699 029					

Bottom status bar: Complete - 100% | Num | Insert | Caps | Scroll | Modified | 14:1 | 444 bytes

**Automated rewrite
generates alternative
ways to write statement.**



```

1 select beverage_distributor.name,
2       soda.name,
3       quantity,
4       shipment_date
5 from beverage_distributor,
6       soda_shipments,
7       soda_shipment_detail,
8       soda
9 where beverage_distributor.distributor_
10        and soda_shipments.shipment_id = soda
11        and soda_shipment_detail.soda_id = so
12        and beverage_distributor.name = 'Ajax'
    
```

Plan

13 RETURN

13 #HSJOIN

2

Target Operator Type : RETURN Type : S Pa

3,824.00 First Row Cost :

Filter Factor : 0.000152

N Argument Type : TABLO

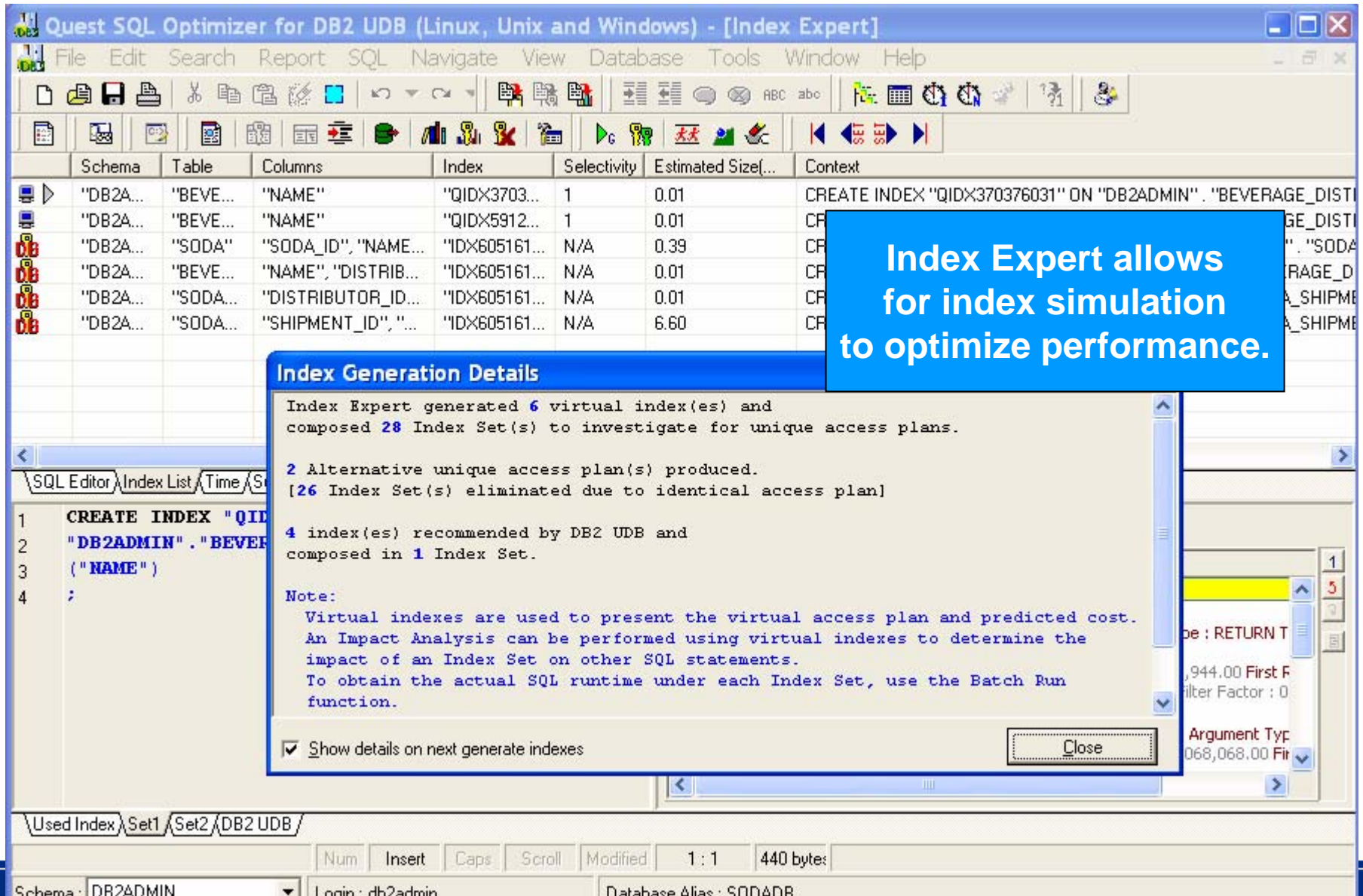
,068,068.00 First Row Co

Target Operator Type : TBSCAN Type : S Parallel : N

Batch Run allows for benchmarking rewritten statements.

Cost Order	DB2 UDB C...	Elapsed Time (All Records)	Times of Im...	Records Returned (All Re...	Elapsed Tim...	Times of Im...	Records Re...	Remark
SQL Editor	70638.304...							
Source	70638.304...	00:00:00.140000		1691				2nd Run time; Run a
Alt1	568.788...	00:00:00.310000		0				Row mismatch with s
Alt2	699.029...	>00:00:05.094						Terminated by criteria
Alt3	699.029...	>00:00:05.093						Terminated by criteria
Alt4	723.648...	00:00:01.469001		1691				Run all records
Alt5	723.673...	00:00:01.344000		1691				Run all records
Alt6	723.736...	00:00:01.313000		1691				Run all records
Alt7	723.956...	00:00:01.344001		1691				Run all records
Alt8	740.764...	00:00:01.570001		1691				Run all records

Index Expert



The screenshot displays the Quest SQL Optimizer for DB2 UDB (Linux, Unix and Windows) - [Index Expert] interface. The main window shows a table with columns: Schema, Table, Columns, Index, Selectivity, Estimated Size, and Context. The table lists several indexes for tables like BEVERAGE and SODA. A blue callout box highlights the text: "Index Expert allows for index simulation to optimize performance."

The 'Index Generation Details' dialog box provides the following information:

- Index Expert generated **6** virtual index(es) and composed **28** Index Set(s) to investigate for unique access plans.
- 2** Alternative unique access plan(s) produced. [26 Index Set(s) eliminated due to identical access plan]
- 4** index(es) recommended by DB2 UDB and composed in **1** Index Set.

Note:
 Virtual indexes are used to present the virtual access plan and predicted cost. An Impact Analysis can be performed using virtual indexes to determine the impact of an Index Set on other SQL statements. To obtain the actual SQL runtime under each Index Set, use the Batch Run function.

Show details on next generate indexes

Buttons: Close

Bottom status bar: Schema: DB2ADMIN, Login: db2admin, Database Alias: SODA08

Quest SQL Optimizer for DB2 UDB (Linux, Unix and Windows) - [Index Expert]

File Edit Search Report SQL Navigate View Database Tools Window Help

Index Set	Virtual Pla...	Actual Pla...	Estimated Size(...)	Elapsed Tim...	Times of Improve...	Reco...	Elapsed Tim...	Times...	Reco...	Remark
Used Index	N/A	70688.39...	N/A	00:00:00.21...		1691				2nd Run time; Run all recor
Set1	70663.304...	70638.30...	0.01	00:00:00.26...		1691				Run all records
Set2	70663.304...	70638.30...	0.01	00:00:00.29...		1691				Run all records
DB2 UDB	3091.701...	818.1814...	7.00	00:00:00.15...	1.45	1691				Run all records

Access plan changed by index Access plan changed but index

SQL Editor / Index List / Time / Summary

```

1 CREATE UNIQUE INDEX IDX605161923120000 ON
2 "DB2ADMIN" ."SODA"
3 ("SODA_ID" ASC)
4 INCLUDE ("NAME")
5 ALLOW REVERSE SCANS ;
6 ;
7 CREATE INDEX IDX605161923440000 ON
8 "DB2ADMIN" ."BEVERAGE_DISTRIBUTOR"
9 ("NAME" ASC, "DISTRIBUTOR_ID" ASC)
10 ALLOW REVERSE SCANS ;
11 ;

```

Plan

```

11 RETURN
  11 HSJOIN
      JOIN (Q2.SODA_ID = Q1.SODA_ID) Target Operator Type : RETURN T
      N Subquery : N Argument Type : HASHCODE
      Cost : 818.18 IO Cost : 70.70 CPU Cost : 19,404,912.00 First Row Cos
      Remote Total Cost : 0.00 Buffers : 73.70 Filter Factor : 0.000152
  8 NLJOIN
      JOIN (Q3.SHIPMENT_ID = Q2.SHIPMENT_ID) Target Operator Ty
      : S Parallel : N Subquery : N Argument Type : EARLYOUT

```

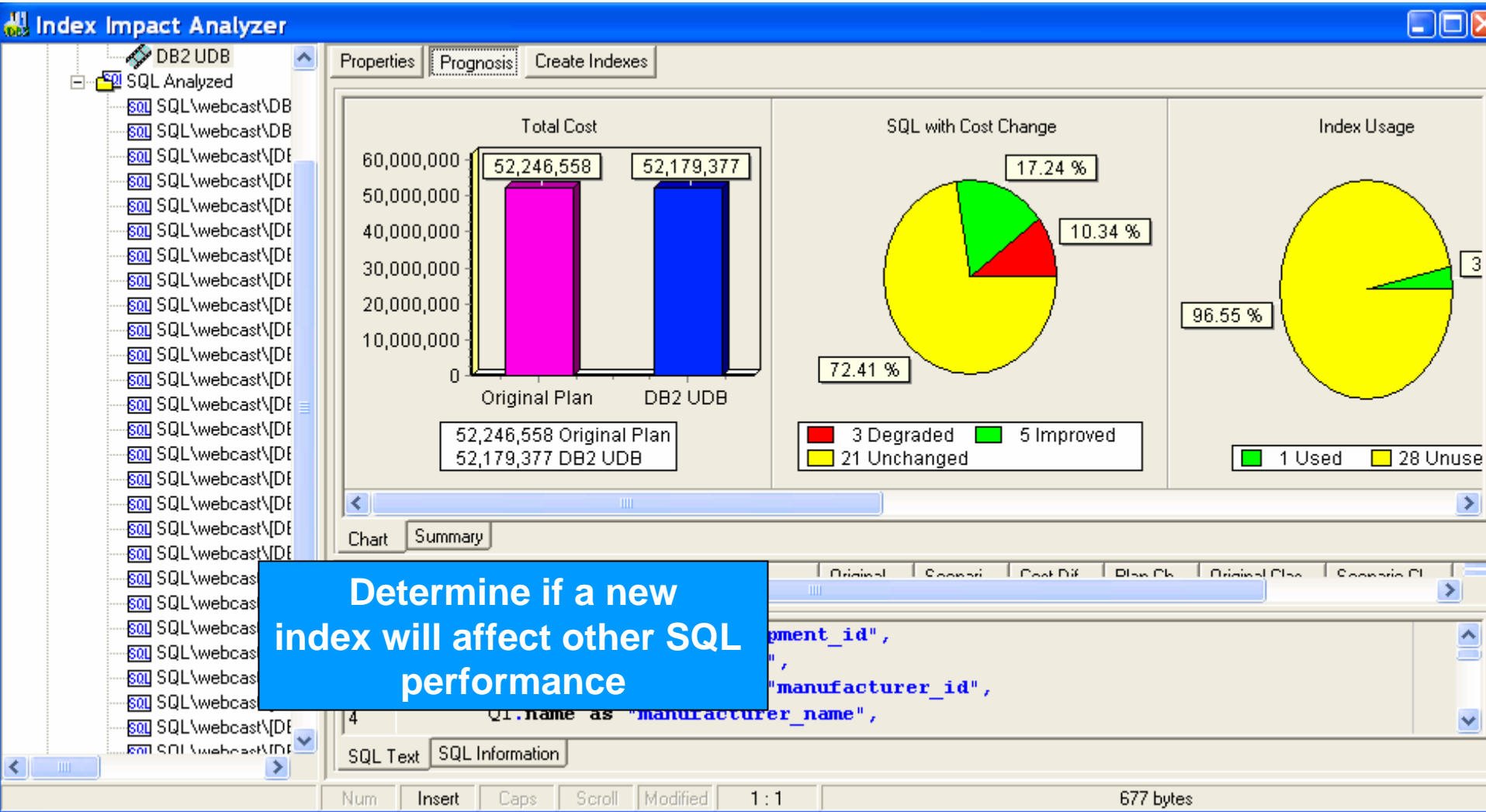
Used Index / Set1 / Set2 / DB2 UDB

Num Insert Caps Scroll Modified 1 : 1 440 bytes

Schema : DB2ADMIN Login : db2admin Database Alias : SODADB

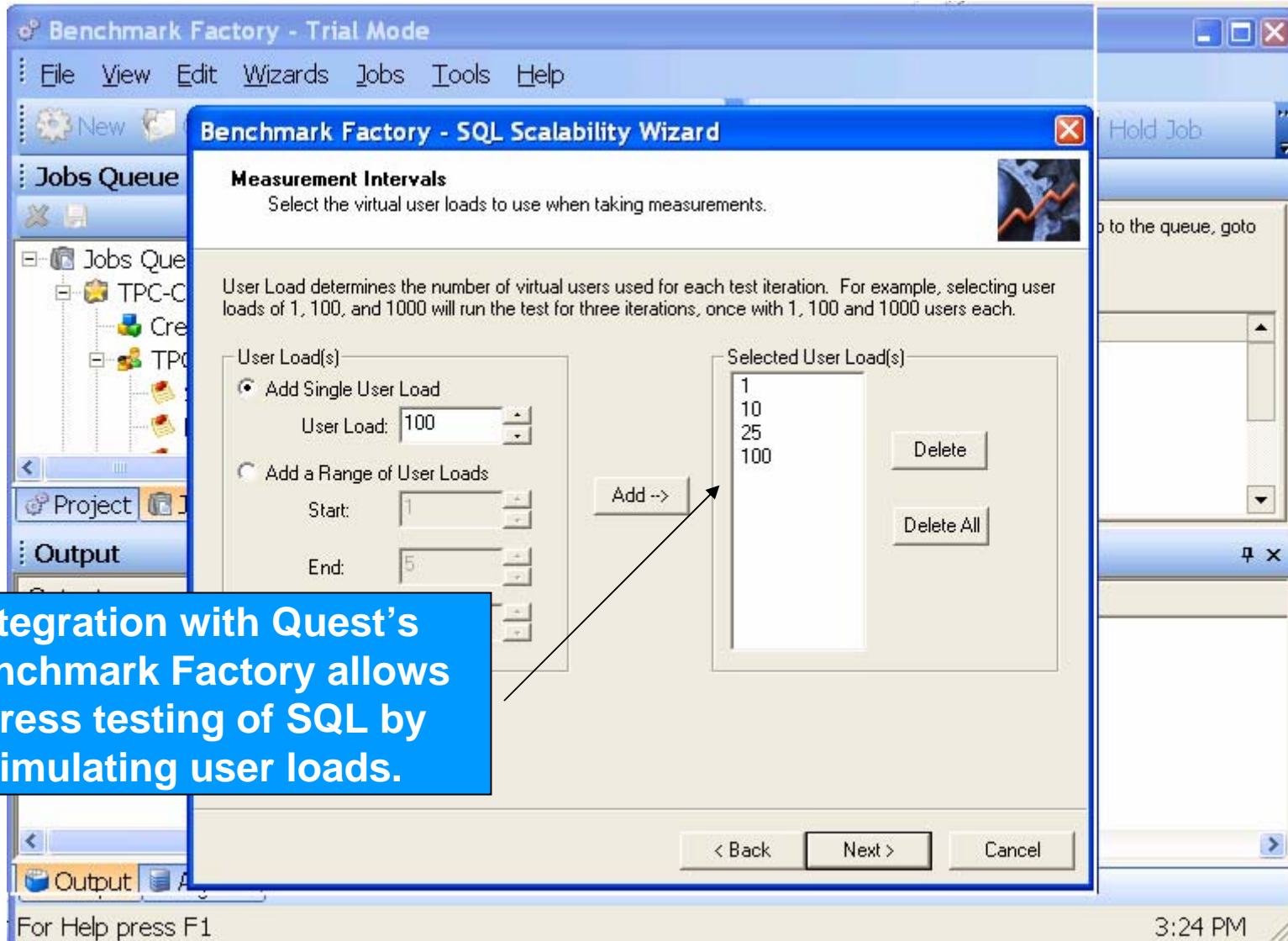
Benchmark indexes to determine actual Performance.

Index Impact Analysis



Determine if a new index will affect other SQL performance

Scalability Testing



Benchmark Factory - Trial Mode

File View Edit Wizards Jobs Tools Help

Benchmark Factory - SQL Scalability Wizard

Measurement Intervals
Select the virtual user loads to use when taking measurements.

User Load determines the number of virtual users used for each test iteration. For example, selecting user loads of 1, 100, and 1000 will run the test for three iterations, once with 1, 100 and 1000 users each.

User Load(s)

Add Single User Load
User Load: 100

Add a Range of User Loads
Start: 1 End: 5

Add -->

Selected User Load(s)

1
10
25
100

Delete

Delete All

< Back Next > Cancel

For Help press F1 3:24 PM

Integration with Quest's Benchmark Factory allows stress testing of SQL by simulating user loads.

SQL Scalability - Benchmark Factory

Overview Transactions Real-time Statistics Summary Messages

SQL Scalability

Status: Sampling

Userload: 10

TPS: 4.25 Avg. Time: 0.760

Total Rows: 30438 Min. Time: 0.138

Total Errors: 0 Max. Time: 1.297

Remaining Time for Iteration: (00:00:44)

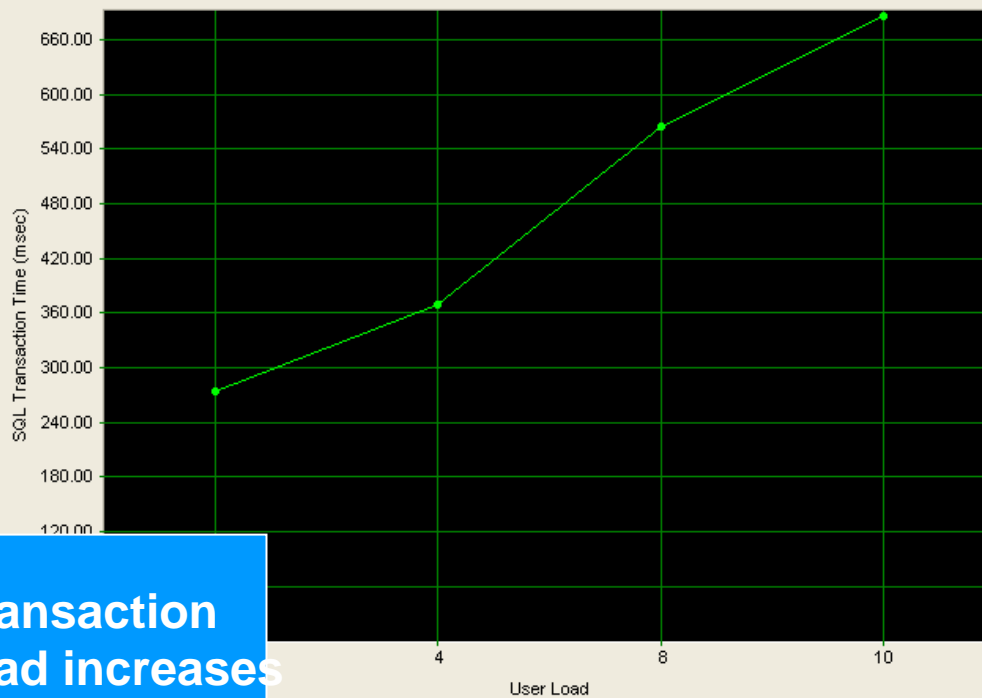
Remaining Time for Test: (00:00:44)

Run Stop

SQL Scalability - Benchmark Factory

Overview Transactions Real-time Statistics Summary Messages

Transaction Time



SQL Editor

Run Stop

Benchmark Factory

Run Reports

Plot out change in transaction performance as user load increases

Toad™ for IBM DB2® Roadmap

- **V 2.0 Sept. '06**
 - DB2 LUW
 - Initial Viper support
 - DB2 z/OS
 - V8 baseline
 - UIs address changes to DDL (max number of partitions, etc.)
 - Alters/Extended Alters to take into account advancements
 - Unicode Support
 - New Objects: MQTs / Sequences
 - Plus many other V8 features
 - Support for Schema Objects
 - Complete Toad SQL editing/browsing support
 - Visual Explain
- **V 3.0 May '07**
 - For DB2 z/OS & DB2 LUW developers and administrators
 - DB2 utilities
 - Commands and Physical Objects
 - Advanced Migrations
 - Extended Alters

For More Information

Download Toad™ for IBM DB2® and SQL Optimizer™ for DB2 Trials:

- www.quest.com/toad_for_db2

Download the Toad™ for IBM DB2® Flash Demo:

- www.quest.com/toad_for_db2

