

IBM Information Management

Introduction to Integrated Data Management ***Extending Tooling Solution to Manage Data*** ***Over its Lifetime***

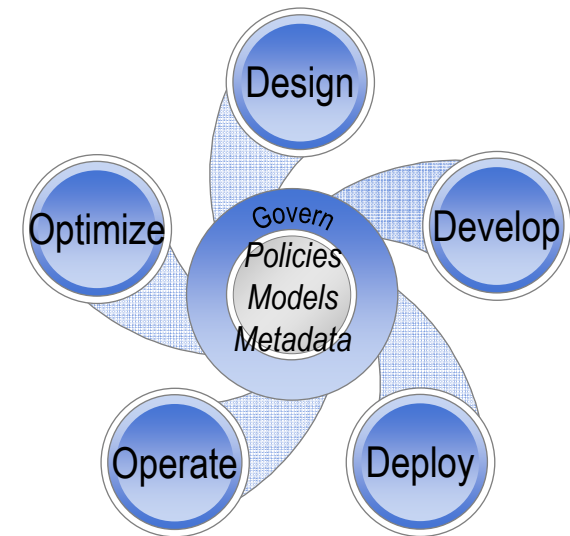
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Optim Query Tuner
IBM Silicon Valley Laboratory

DB2 Technical Forum
Taipei, Taiwan
Oct. 5th-6th, 2009

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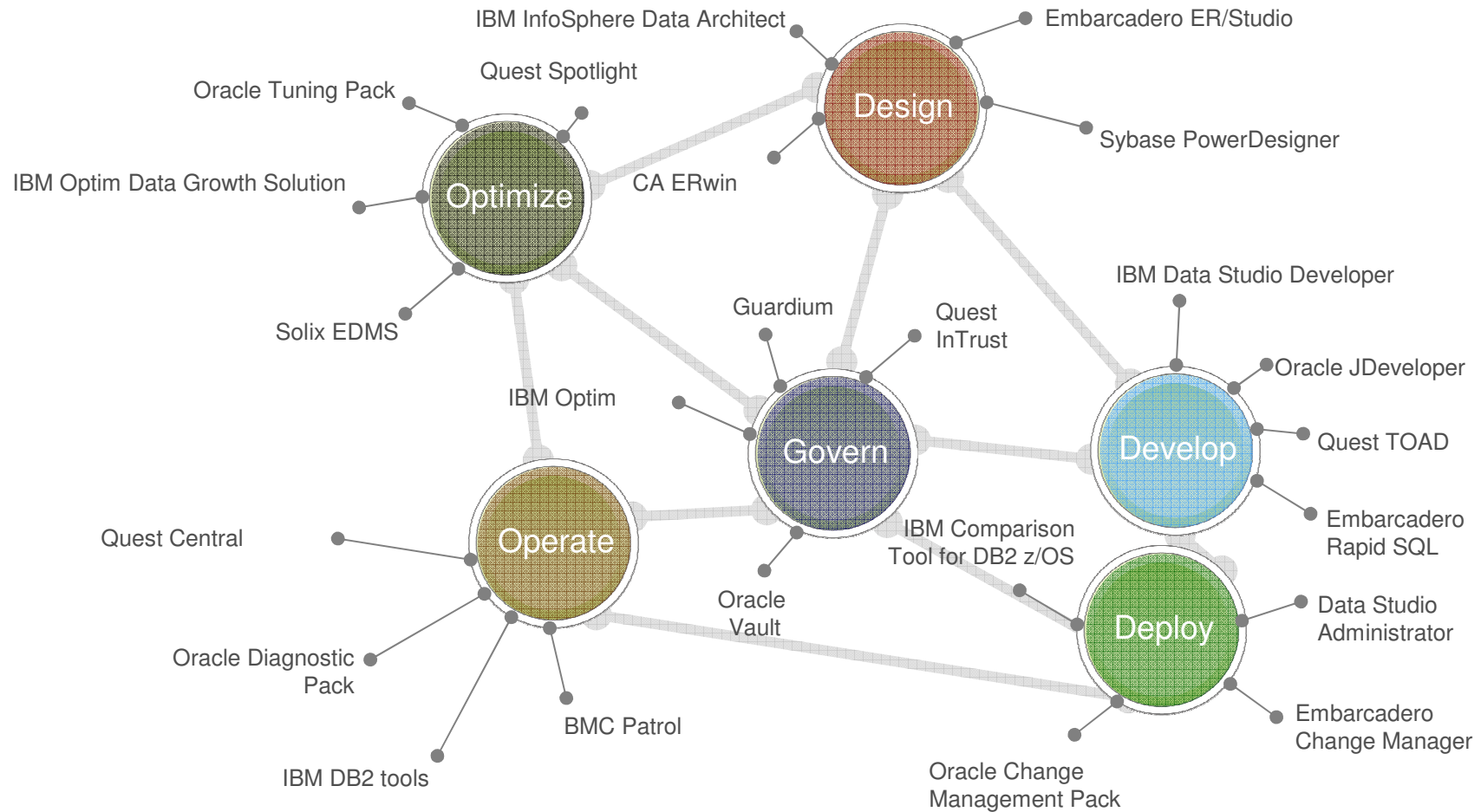
Agenda

- Integrated Data Management
 - Business Challenges Today
 - Solution Overview



What do Businesses Have?

A Collection of Disparate, Single-Purpose Products



The gaps create risk ...

- Loss of customers
 - Average customer churn rate up 2.5% after a breach
- Loss of revenue
 - \$197 USD per customer record leaked
 - Average cost was ~ \$6.3 million / breach in this study
 - Average cost for financial services organizations was 17% higher than average
- Fines, penalties or inability to conduct business based on non-compliance
 - PCI
 - Sarbanes-Oxley (SOX)
 - HIPAA
 - Data Breach Disclosure Laws
 - Gramm-Leach-Bliley Act
 - Basel II

Economics

5pm GMT update

Search Politics for MPs and issues

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Ask Aristotle

Find an MP
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Personal details of every child in UK lost by Revenue & Customs


Deborah Summers and agencies
Tuesday November 20, 2007
[Guardian Unlimited](#)

The personal details of virtually every child in the UK has been lost by HM Revenue and Customs, the chancellor, Alistair Darling, admitted today.

The missing information includes the names, addresses and dates-of-birth of the children and the national insurance numbers, and in some cases the bank details, of parents claiming child benefits.

More than 25 million individuals are affected.

Paul Gray, the chairman of HM Revenue and Customs, today resigned over the "extremely serious failure" of security.

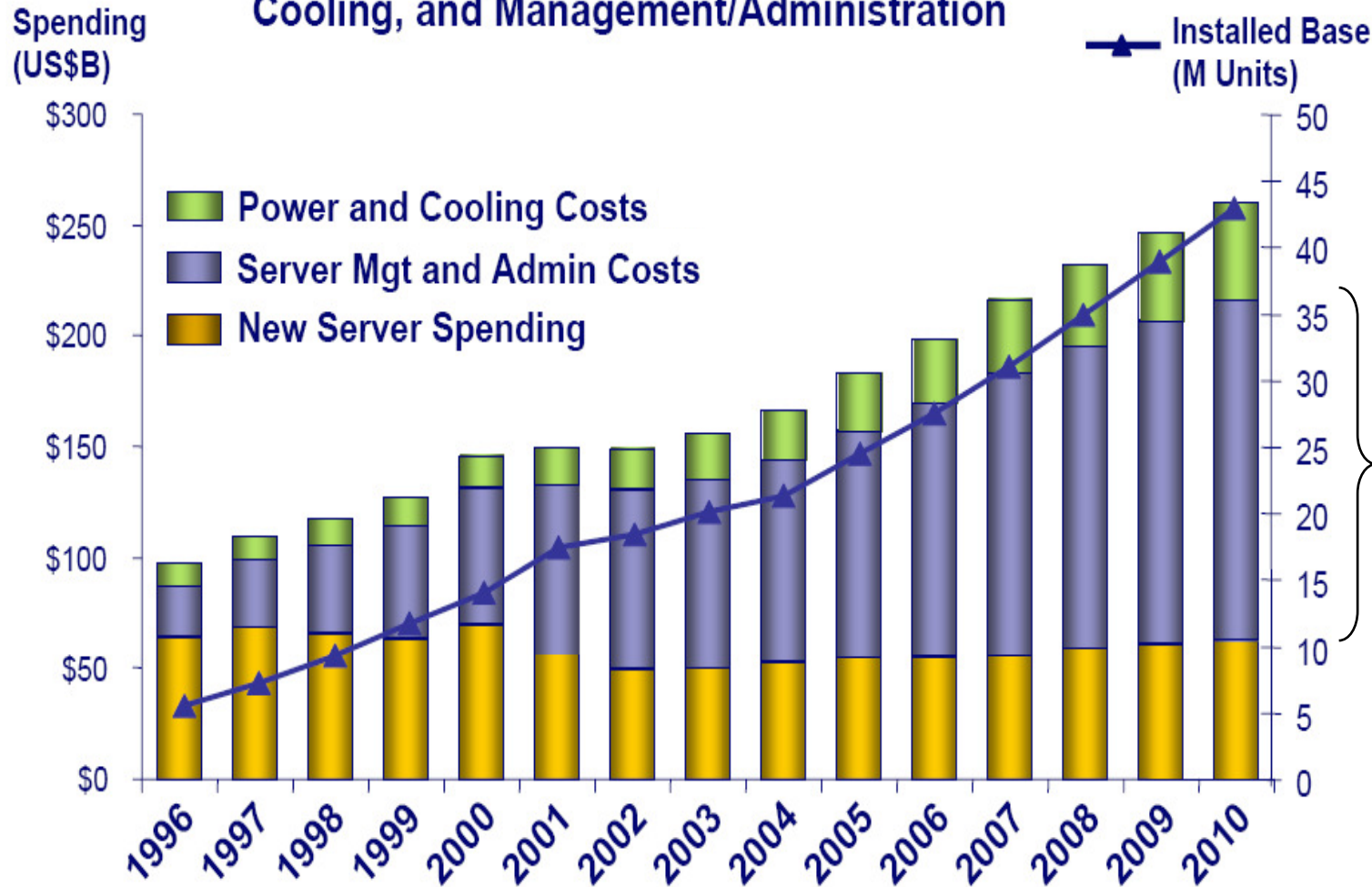


Paul Gray, who has resigned as chairman of HM Revenue and Customs. Photograph: Toby Melville/PA

[Article continues](#)

Source: "2007 Annual Study: Cost of a Data Breach", The Ponemon Institute

Worldwide IT Spending on Servers, Power and Cooling, and Management/Administration



Driven by the increasing numbers of physical systems, system management has become the main component of IT costs and is growing rapidly

Many Servers, Much Capacity, Low Utilization = \$140B unutilized server assets

Source: IDC, 2006

What do Businesses Need?

An integrated environment to span today's flexible roles

- **Manage data throughout its lifecycle**
 - From design to sunset
- **Manage data across complex IT environments**
 - Multiple interrelated databases, applications and platforms
- **Facilitate cross-functional collaboration**
 - Within IT
 - Among Line of Business, Compliance functions
 - Across disparate skill sets
- **Optimize business value**
 - Respond quickly to emerging opportunities
 - Improve quality of service
 - Reduce cost of ownership
 - Mitigate risk



Introducing Integrated Data Management

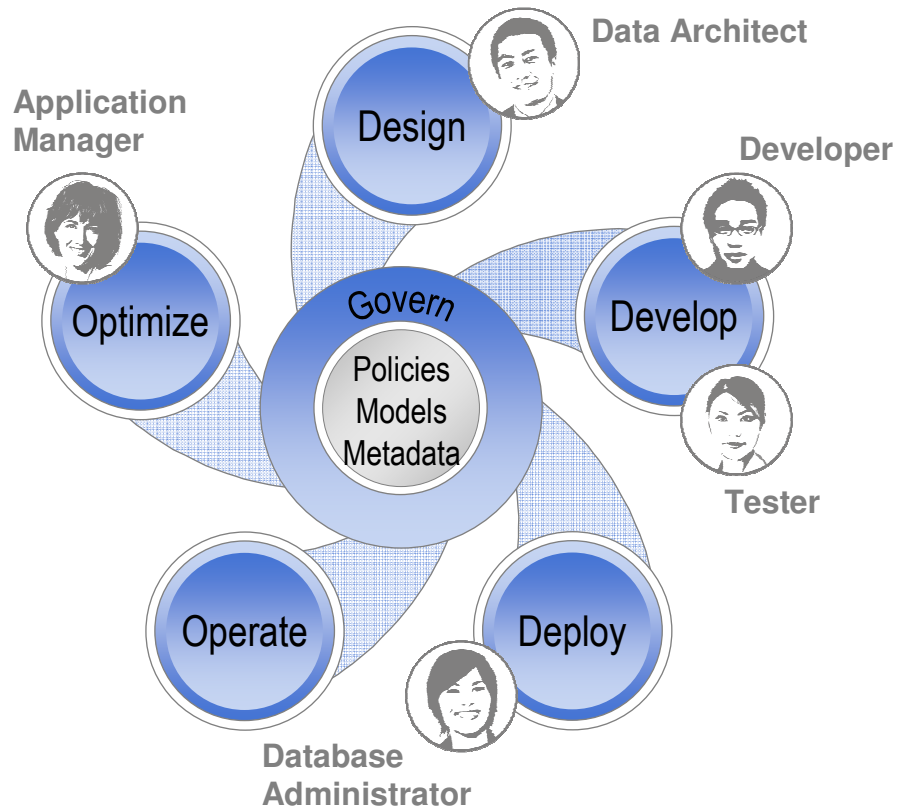
An integrated, modular environment to design, develop, deploy, operate, optimize and govern enterprise data throughout its lifecycle on the System z platform



Enabling organizations to more efficiently and effectively

- **Respond to emergent, data-intensive business opportunities**
- **Meet service level agreements for data-driven applications**
- **Comply with data privacy and data retention regulations**
- **Grow the business while driving down total cost of ownership**

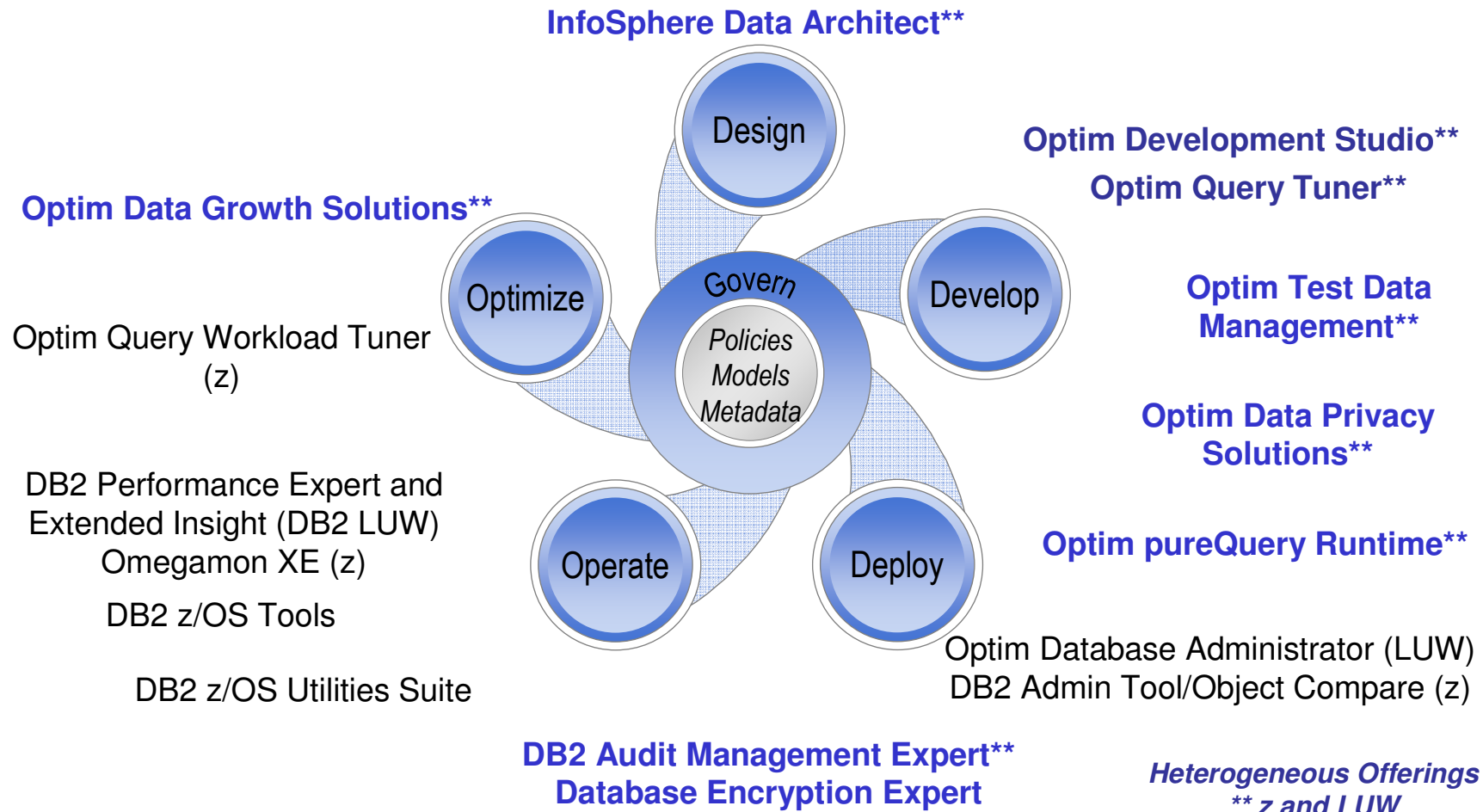
Integrated Data Management



- **Deliver increasing value across the lifecycle**, *from requirements to retirement*
- **Facilitate collaboration and efficiency across roles**, *via shared artifacts, automation and consistent interfaces*
- **Increase ability to meet service level agreements**, *improving problem isolation, performance optimization, capacity planning, and workload and impact analysis*
- **Comply with data security, privacy, and retention policies** *leveraging shared policy, services, and reporting infrastructure*

Integrated Data Management Solutions

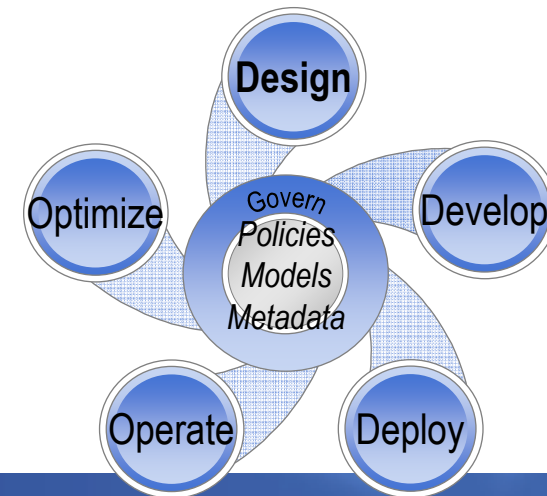
- The broadest range of capabilities for managing the value of your data throughout its lifetime





IBM Information Management

InfoSphere Data Architect

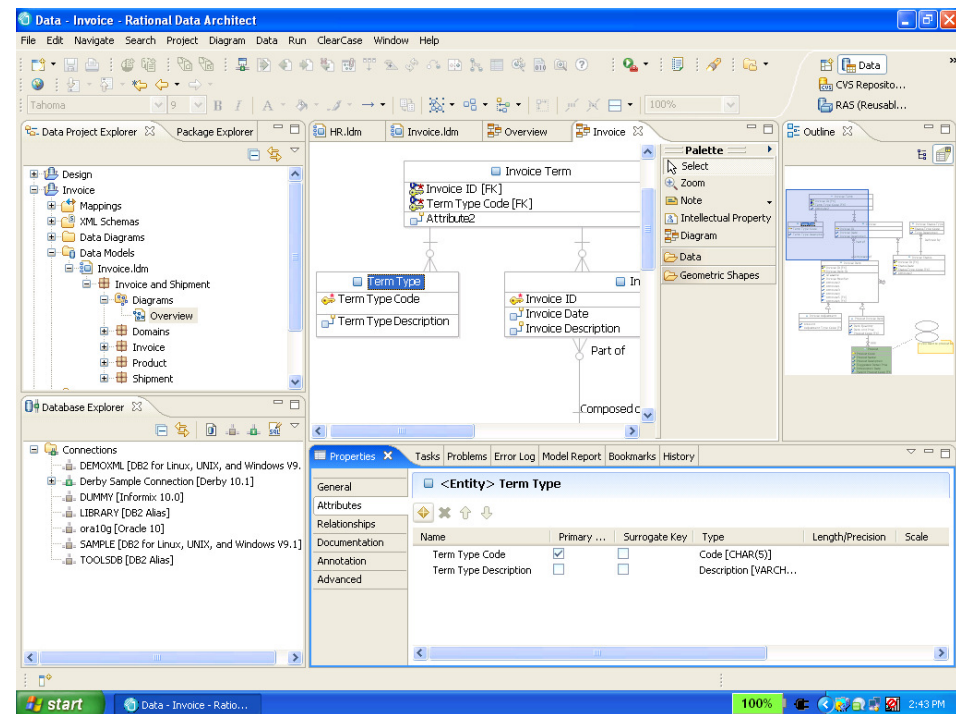


InfoSphere Data Architect

A collaborative, data design solution to discover, model, relate, and standardize diverse data assets.

Key Features

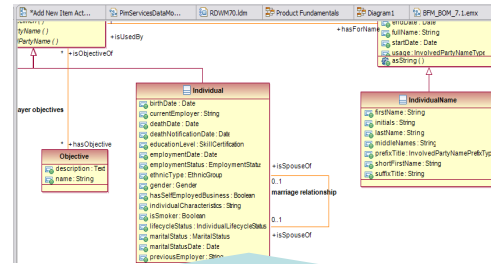
- Create logical and physical data models
- Discover, explore, and visualize the structure of data sources
- Discover or identify relationships between disparate data sources
- Compare and synchronize the structure of two data sources
- Analyze and enforce compliance to enterprise standards
- Support across heterogeneous databases
- Integration with the Rational Software Delivery Platform, Optim, IBM Information Server, and IBM Industry Models



Automate Data Design via Model-driven Transformation

Rational Software Architect

- Built-in transformation
- Compare and sync facilitates merge



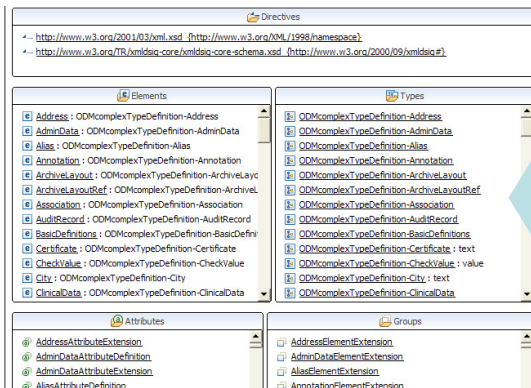
SOLUTION ARCHITECT

UML

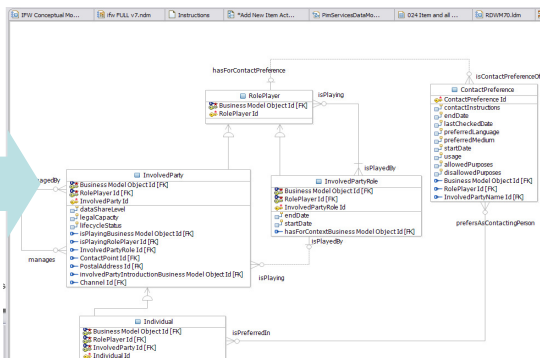
Optim DataBase Administrator

WebSphere Business Modeler

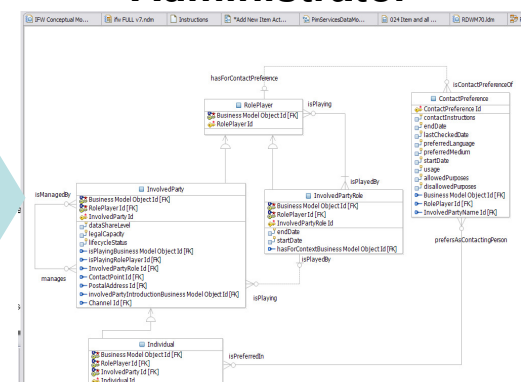
InfoSphere Data Architect



XSD



PDM



INTEGRATION DEVELOPER



DATA ARCHITECT



DATABASE ADMINISTRATOR



IBM Information Management

Optim Test Data Management Solution

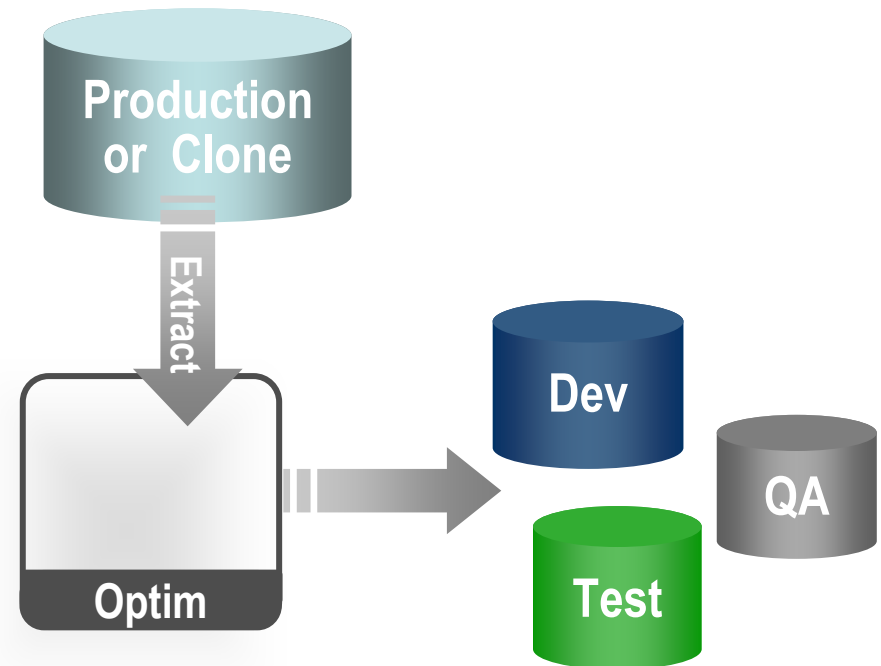
Optim data Privacy Solutions

Optim Test Data Management Solution

Streamline building test databases, improve application quality, cut IT costs and accelerate solution delivery



- **Accelerate time to market**
 - Create “right sized” test databases
 - Extract referentially intact subsets
 - Compare baseline data against test results to pinpoint and resolve application defects faster
 - Edit test data to create error and boundary conditions
 - Easily refresh, reset and maintain test environments
- **Cut storage costs**
 - Reduce storage requirements by using smaller subsets for testing
- **Enable compliance**
 - De-identify or mask data



Enterprise Challenge: Data Privacy

Optim Data Privacy Solution

- *Application-aware masking capabilities ensure data is realistic but fictional*
 - *Prepackaged data masking routines make it easy to de-identify elements*
- *E.g. credit card numbers & email addresses*

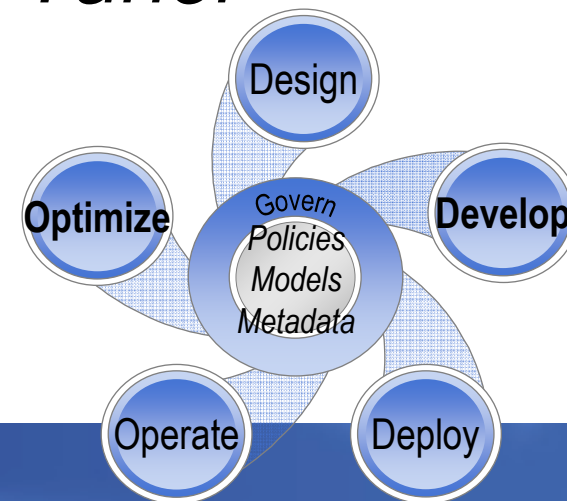
The image shows two views of SAP HR data. The top view shows a person record with 'Pers. No.' 100052 and 'Name' Mrs Anika Schäfer. A callout box highlights the 'SSN' field with the value 120-54-8464. The bottom view shows a different person record with 'Pers. No.' 100052, 'Name' Mrs Amanda Winters, and 'SSN' 200-11-3333. A callout box highlights the 'SSN' field with the value 200-11-3333. A text box on the right states 'Data is masked with realistic but fictional information'.

A comprehensive set of data masking techniques to transform or de-identify data, including:

- String literal values
- Character substrings
- Random or sequential numbers
- Arithmetic expressions
- Concatenated expressions
- Date aging
- Lookup values
- Intelligence



Optim Query Tuner
Optim Query Workload Tuner



Optim Query Tuner

Maximize performance and reduce specialized skill requirements

- ***Optim Query Tuner (a.k.a. Optimization Expert)***
- ***Empowers Developers and DBAs to proactively tune queries for improved SQL performance***
- ***Reduces the complexity and manual effort required to perform query tuning***
- ***Decreases the reliance on specialized Query Optimization and SQL tuning skills***
- ***Provides a rich set of SQL tuning tools and design advisors that can be used over Data Lifetime***
- ***Eclipse Based with integration and shell sharing with:***
 - *InfoSphere data Architect*
 - *Optim Development Studio (with pureQuery)*
 - *Optim Database Administrator*
- ***Support both DB2 for z/OS and LUW***

Optim Query Tuner Key Features at a Glance

Query Tuner User Interface

Eclipse

Query Based Tools and Advisors

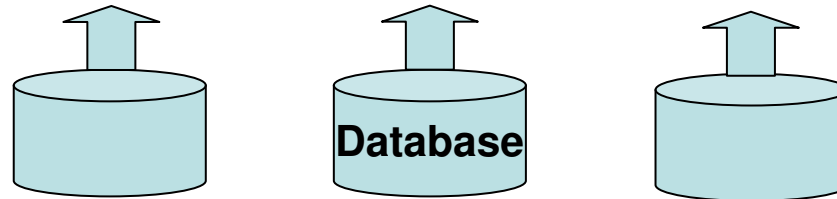
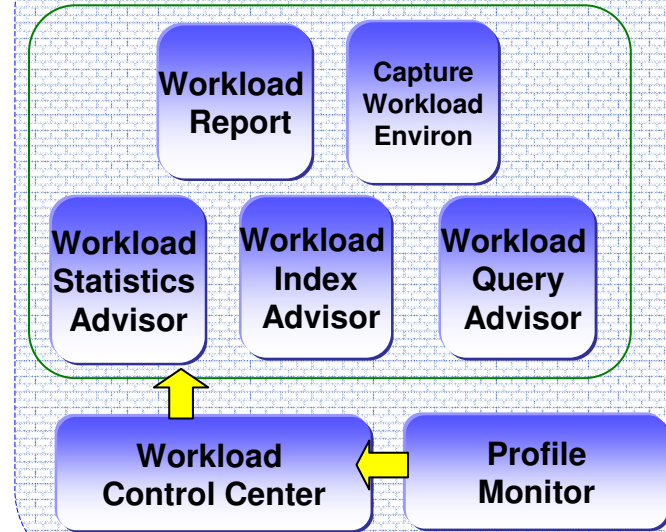
Query Tools



Query Advisors



Workload Advisors



IBM Optim Query Tuner key functions

Functions	Query Tuner for DB2 for z/OS and LUW (single Query)	Query Workload Tuner for DB2 for z/OS
Query Formatter	Yes	Yes
Query Annotation	Yes	Yes
Access Plan Graph	Yes	Yes
Visual Plan Hint**	Yes	Yes
Query Advisor	Yes	Yes
Access Path Advisor	Yes	Yes
Statistics Advisor	Yes	Yes
Index Advisor	Yes	Yes
Query Reports	Yes	Yes
Query Environment Capture**	Yes	Yes
Workload Query Advisor		Yes
Workload Statistics Advisor		Yes
Workload Index Advisor		Yes
Workload Query Reports		Yes
Workload Environment Capture		Yes
Profile Based Monitor *		Yes

• *DB2 for z/OS V9.1 NFM

• ** functions for DB2 for z/OS

IBM Optim Query Tuner

The screenshot shows the IBM Optim Query Tuner Client interface. Several components are highlighted with callouts:

- Query Annotation:** Points to the 'Query Format and Annotation' panel, which shows the original and transformed SQL query.
- Access Plan Graph:** Points to the 'Access Plan Graph' panel, which displays a graphical representation of the query execution plan, including nodes like @QUERY, @QB1, and @WFSCAN.
- Advisor Recommendation Overview:** Points to the 'Advisor Recommendation Overview' panel, which displays a table of recommendations.
- Advisor Detail:** Points to the 'Statistics Recommendation Detail' panel, which shows detailed recommendations for statistics.
- Maximum the editor:** Points to a maximize button in the top right corner of the application window.

The 'Advisor Recommendation Overview' table contains the following data:

Advisor	Priority	Description
Recommendations		
Statistics Advisor	HIGH	Repair statistics problems for
Access Path Advisor	HIGH	The optimizer chooses a join
Access Path Advisor	HIGH	The optimizer chooses a join

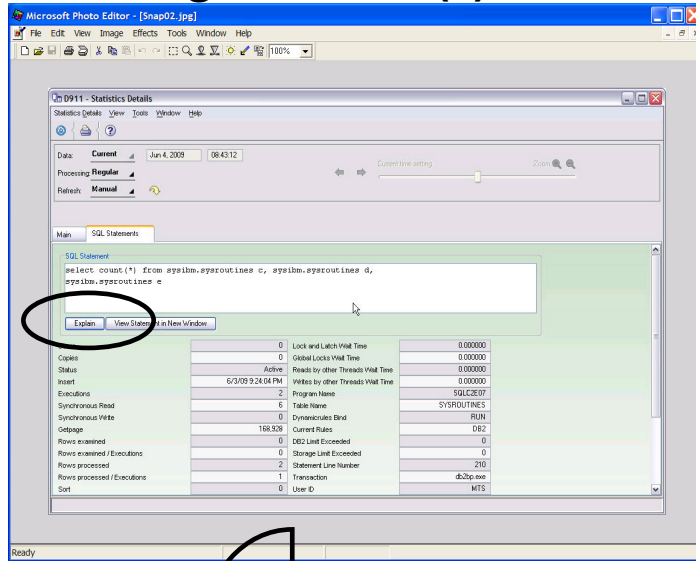
The 'Statistics Recommendation Detail' panel shows the following RUNSTATS Control Statements:

```

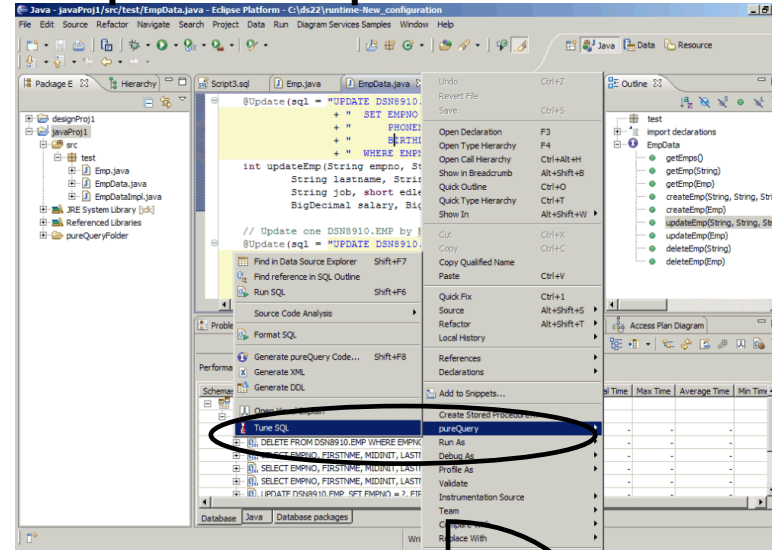
RUNSTATS TABLESPACE DB4SUPPLY.TSSUPPLY
TABLE(SYSADM.SUPPLIER)
COLUMN(S_NATIONKEY)
INDEX(SYSADM.PX5@SKNK HISTOGRAM NUMCOLS 1
NUMQUANTILES 25)
SHRLEVEL CHANGE REPORT YES UPDATE ALL HISTORY NONE
    
```

Accelerate SQL Performance with OMPE and Optim Development Studio

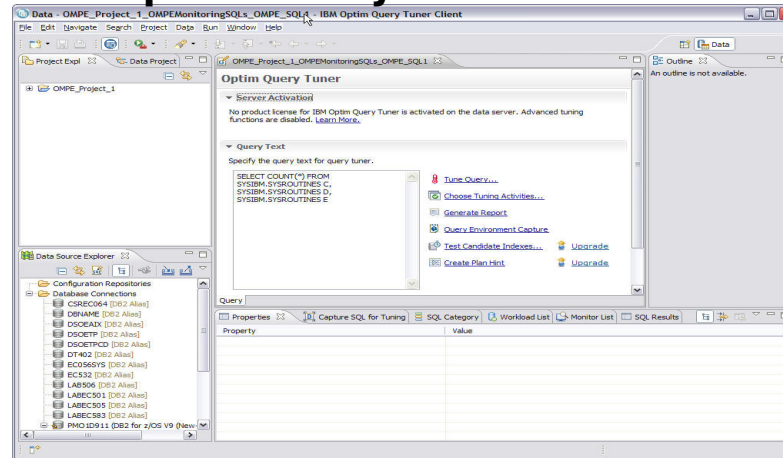
■ Omegamon XE (z)



■ Optim Development Studio



■ Optim Query Tuner



- OPME launch
- OQT to tune
- SQL performance

- ODS Launch OQT
- For application tuning

Use IBM Optim Query Tuner/Workload Query Tuner Solutions

- **Identify query/workload candidates**
 - DB2 Catalog,
 - Dynamic statement Cache,
 - Text, File, package, QMF and more
- **Prevent problems before they impact the business**
 - Get early warning from Statistics advice, Access path advice, Query advice, index advice of emergent problems
 - Isolate problems quickly
 - Identify and optimize high cost queries proactively from workload Query Tuner tooling and advices
- **Improves quality of service/application development**
 - Use expert advice for performance optimization
 - Accelerate responses to performances issues
 - Enable fixes in applications before run on production systems
- **Reduce costs**
 - Increase capacity of existing systems
 - Free up DBA time for value creation activities
 - Optimize SQL in development while costs and impact are low

Why Query Formatting/Annotation?

A peek at an unformatted Query

```
SELECT B.BRANCH_NO, B.BRANCH_NAME ,B.BRANCH_ACCT_NO,
B.BRANCH_CITY, B.BRANCH_ST, A.BRANCH_ADDR_TYPE_CD ,
S.TRANS_SETL_AMT FROM TRANS_SETLMNT S ,BRANCH C ,
BRANCH_ADDR A
WHERE S.TRANS_NO = ? AND S.TRANS_PROC_DT < '9999-12-31'
AND YEAR(S.TRANS_TARGET_DT) = '2002' S.TRANS_TYPE IN
('A1', 'A2', 'A3', 'Z9')
AND S.TRANS_CD IN ('EOD', 'IMD', 'UGT') AND
S.TRANS_SETL_DT = ? AND S.BRANCH_NO = C.BRANCH_NO AND
B.BRANCH_EFF_DT <= ? AND B.BRANCH_INACTIVE_DT > ? AND
A.BRANCH_NO = C.BRANCH_NO AND A.BRANCH_EFF_DT <= ?
AND A.BRANCH_INACTIVE_DT > ? AND
A.BRANCH_ADDR_TYPE_CD = ''
```

Query Annotation - Annotate a statement

The screenshot shows the IBM Optim Query Tuner Client interface. At the top, there are tabs for 'Original' and 'Transformed'. A callout box points to the 'Original' tab with the text 'Click to show the tab of original query'. Below the tabs is a 'Query Format and Annotation' section with a dropdown menu set to 'All'. A red box highlights a toolbar with buttons for 'Expand All', 'Collapse All', 'Customize', 'Save', 'Print', and 'Clear Highlights'. A callout box points to this toolbar with the text 'Tool bar'. The main area is divided into two sections: 'Formatted Query' and 'Annotation'. The 'Formatted Query' section contains a SQL query snippet. A callout box points to this section with the text 'Formatted Query Area'. The 'Annotation' section contains a table of annotations. A callout box points to this section with the text 'Annotation Area'.

Original **Transformed**

Click to show the tab of original query

Original Transformed

Annotation to display: All

Expand All Collapse All Customize Save Print Clear Highlights

Formatted Query

```

SELECT *
FROM SYSADM.NATION
, SYSADM.LITEM_UIV_NOGBY
WHERE ( SYSADM.LITEM_UIV_NOGBY.ORDERKEY BETWEEN 6000001 AND 4500000
AND SYSADM.NATION.N_NATIONKEY > 1
AND SYSADM.NATION.N_NATIONKEY = SYSADM.LITEM_UIV_NOGBY.ORDERKEY
AND SYSADM.NATION.N_NATIONKEY IN (
)
)
    
```

Annotation

Annotation	Additional Inf
CARDF=25	QUALIFIED_ROWS=1
COLCARDF=(not applicable)	MAX_FRE
COLCARDF=25	MAX_FREQ=
COLCARDF=25/(not applicable)	MAX_FF
COLCARDF=25	MAX_FREQ=

Formatted Query Area

Annotation Area

Context

Query Analysis Result 3

Tune Query...

Query Annotation - Transformed Query Annotation

The screenshot shows the 'Query Format and Annotation' window in the IBM Optim Query Tuner Client. The 'Original' and 'Transformed' tabs are circled in red. A blue callout box points to the 'Transformed' tab with the text 'Click to show the tab of transformed query'. The 'Formatted Query' pane displays a complex SQL query with annotations. The 'Annotation' column shows various statistics like 'CARDF=2', 'CARDF=1', and 'COLCARDF=45,000,000'.

Formatted Query	Annotation	Additional Info
(SELECT *	CARDF=2	
FROM SYSADM.NATION	CARDF=1	
, SYSADM.LINEITEM		
WHERE (SYSADM.LINEITEM.L_ORDERKEY BETWEEN (EXPR) AND (EXPR)	COLCARDF=45,000,000	
AND SYSADM.LINEITEM.L_ORDERKEY BETWEEN 6000001 AND 45000000	COLCARDF=45,000,000	
AND SYSADM.LINEITEM.L_ORDERKEY > 1	COLCARDF=45,000,000	
AND SYSADM.NATION.N_NATIONKEY BETWEEN 6000001 AND 45000000	COLCARDF=25	
AND SYSADM.NATION.N_NATIONKEY BETWEEN (EXPR) AND (EXPR)	COLCARDF=25	
AND SYSADM.NATION.N_NATIONKEY > 1	COLCARDF=25	
AND SYSADM."DSNWFQB(08)".R_REGIONKEY	COLCARDF=(not applicable)	
BETWEEN (EXPR) AND (EXPR)		
AND SYSADM."DSNWFQB(08)".R_REGIONKEY > 1	COLCARDF=(not applicable)	
AND SYSADM."DSNWFQB(08)".R_REGIONKEY BETWEEN 6000001 AND 45000000	COLCARDF=(not applicable)	
AND SYSADM.NATION.N_NATIONKEY = SYSADM.LINEITEM.L_ORDERKEY	COLCARDF=25/45,000,000	
AND SYSADM.NATION.N_NATIONKEY = SYSADM."DSNWFQB(08)".R_REGIONKEY	COLCARDF=25/(not applica	
AND SYSADM.LINEITEM.L ORDERKEY = SYSADM."DSNWFQB(08)".R REGIONKEY	COLCARDF=45,000,000/(n	

Stats Advisor – Recommendation Summary

The screenshot displays the 'Advisor Recommendation Overview' window. A table lists recommendations with columns for Advisor, Priority, and Description. A red box highlights three entries with different priorities: HIGH, MEDIUM, and MAINTENANCE. A blue callout box points to these entries with the text 'Recommendations with different priority'.

Advisor	Priority	Description
Statistics Advisor	HIGH	Repair statistics problems for this...
Statistics Advisor	MEDIUM	Determine the access path again...
Statistics Advisor	MAINTENANCE	Gather and recollect all of relev...

Below the overview, the 'Statistics Recommendation Detail' window is shown. It includes sections for 'RUNSTATS Control Statements', 'Previous RUNSTATS statement stored in database', and 'Table, index, column, and column group details'. The 'Table, index, column, and column group details' section shows a search for 'key word' and results for 'TABLE SYSADM.SUPPLIER'.

Access Path Advisor – Access Path Warning

The screenshot displays the IBM Optim Query Tuner Client interface. At the top, the title bar reads "Data - New Project1_Query Group 1_Query 1 - IBM Optim Query Tuner Client". The main window is titled "Advisor Recommendation Overview" and contains a table of recommendations. A red box highlights the "Access Path Advisor" entries. A callout box labeled "Recommendations List" points to this table. Below the overview, the "Advisor Detail" window is open, showing "Path Recommendation Detail". Two callout boxes, "Warning Description" and "Warning Explanation", point to the respective text areas in this window. At the bottom, a table titled "plan table related with this warning." is shown, with a callout box "Corresponding records in PLAN_TABLE" pointing to it.

Advisor	Priority	Description
Statistics Advisor	HIGH	Repair statistics problems for this query. Gather missing statistics. Recollect con
Access Path Advisor	HIGH	The optimizer chooses a join sequence that contains a new table SYSADM.ORDI
Access Path Advisor	HIGH	The SYSADM.ORDER table is accessed by a non-matching index scan (QBLOCKM
Query Advisor	MEDIUM	No join predicate exists between table SYSADM.SUPPLIER and other tables. Co
Access Path Advisor	LOW	The SYSADM.SUPPLIER table is accessed by a relational scan (QBLOCKM = 1

Description	Explanation
The optimizer chooses a join sequence that contains a new table SYSADM.ORDER without join predicates to any of the composite tables. When a large number of records are returned, DB2 might be using an inefficient access path. Check the explanation for this warning for more details about the possible cause and solution.	The optimizer chooses a join sequence that contains a Cartesian join. A Cartesian join is a form of nested loop join in which there are no join predicates between the two tables. However, a Cartesian join is generally not the best access path if the number of qualified rows from the outer table or the inner table is large. This problem is often caused by lack of applicable joined predicates.

ID	MIXOPSEQ	METHOD	CREATOR	TNAME	CORREL...	ACCESS...	ACCESS...	ACCESS...	MATCHC...	MERGE_...	INDEXO...	PREFE
1	5	0	3						0		N	
1	4	0	3						0		N	
1	3	0	2	SYSADM	LINEITEM	I	SYSADM	PXL@OK...	0	1	Y	S
1	2	0	1	SYSADM	ORDER	I	SYSADM	PXO@OK...	0		Y	S
1	1	0	0	SYSADM	SUPPLIER	R			0		N	S

Query Advisor - Recommendations

Advisor Recommendation Overview

Advisor	Priority	Description
Statistics Advisor	HIGH	Repair statistics problems for this query. Gather missing statistics. Recollect con
Access Path Advisor	HIGH	The optimizer chooses a join sequence that contains a new table SYSADM,ORDE
Access Path Advisor	HIGH	The SYSADM.ORDER table is accessed by a non-matching index scan (QBLOCKM
Query Advisor	MEDIUM	No join predicate exists between table SYSADM.SUPPLIER and other tables. Co
Access Path Advisor	LOW	The SYSADM.SUPPLIER table is accessed by a non-matching index scan (QBLOCKM

Advisor Detail

Query Recommendation Detail

SQL Text

```

SELECT SYSADM.SUPPLIER.S_SUPPKEY
      , SYSADM.SUPPLIER.S_NAME
      , SUM( SYSADM.LINEITEM.L_DISCOUNT ) AS REVENUE
FROM SYSADM.SUPPLIER
     , SYSADM.ORDER
     , SYSADM.LINEITEM
WHERE ( SYSADM.LINEITEM.L_EXTENDEDPRICE > 200.0
      AND SYSADM.ORDER.O_ORDERDATE >= DATE( '1993-10-01' )
      AND SYSADM.ORDER.O_ORDERDATE < ( DATE( '1993-10-01' ) + 3 MONTHS )
      AND SYSADM.ORDER.O_ORDERKEY IN (
          SELECT LLL.L_ORDERKEY
          FROM SYSADM.LINEITEM AS LLL
        )
    
```

Selected Recommendation:

Description	Explanation
No join predicate exists between table SYSADM.SUPPLIER and other tables. Consider adding join predicates for SYSADM.SUPPLIER to avoid a costly Cartesian join. Check the explanation for this warning for more details about possible impact and examples.	A Cartesian join is a form of join in which no join predicate exists between the two joined tables. Suppose that table T1 and T2 both have millions of rows and are joined as follows: <pre> SELECT T1.C1, T2.C2 FROM T1, T2 WHERE T1.C2>0 </pre> The SQL statement is likely to return a large number of rows, which is very CPU intensive. If possible, consider rewriting the SQL statement by adding join predicates as

Recommendation Description

Recommendations List

Formatted SQL Text

Recommendation Explanation

Index Advisor - Recommendations

- ❑ Query Tuner Index Advisor – with advice on indexes with estimated performance improvement below.

Advisor Recommendation Overview

Advisor	Priority	Description
Recommendations		
Index Advisor	LOW	Index recommendations found.

Advisor Detail

Performance Improvement:

Estimated performance improvement: 98.74 %

Disk space required (DASD space): 132.36 MB

Customized and Recommended Indexes

Feature Details	Creator	Object Name	Columns	Estimated Disk Space
<input checked="" type="checkbox"/> ORDER				
<input checked="" type="checkbox"/> Index	DB2OE	ORDER_VIRT_IDX_124417...	O_ORDERDATE(ASC) ,O_...	27.62109375 M
<input checked="" type="checkbox"/> LINEITEM				
<input checked="" type="checkbox"/> Index	DB2OE	LINEITEM_VIRT_IDX_1244...	L_ORDERKEY(ASC) ,L_EXT...	96.83203125 M
<input checked="" type="checkbox"/> CUSTOMER				
<input checked="" type="checkbox"/> Index	DB2OE	CUSTOMER_VIRT_IDX_12...	C_NAME(ASC) ,C_MKTSEG...	7.8828125 M
<input checked="" type="checkbox"/> NATION				
<input checked="" type="checkbox"/> Index	DB2OE	NATION_VIRT_IDX_12441...	N_NATIONKEY(ASC) ,N_N...	0.0234375 M

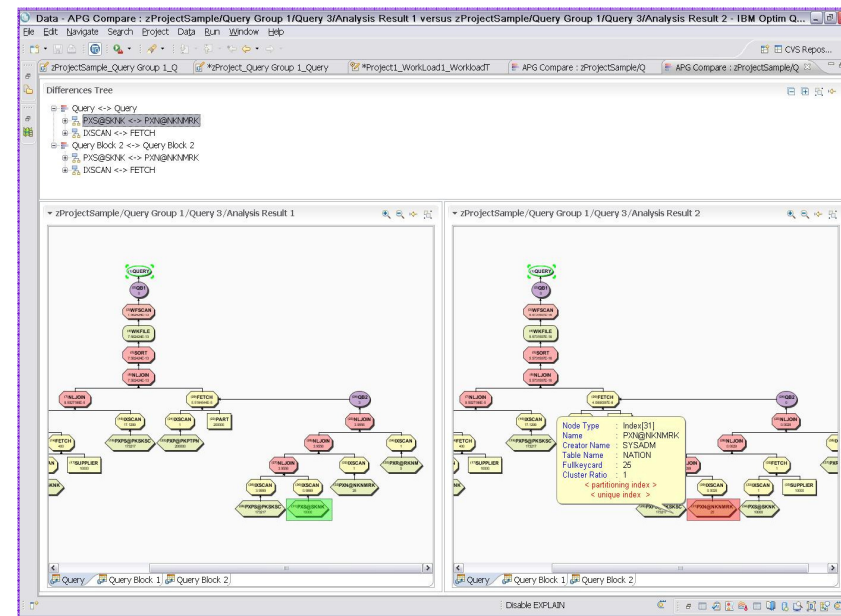
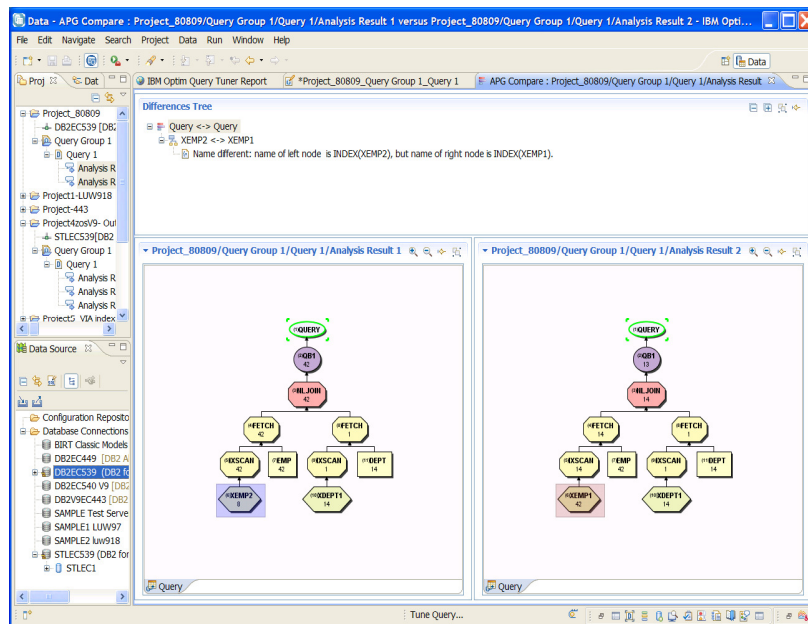
Existing indexes

Feature Details	Object Name	Columns
<input checked="" type="checkbox"/> ORDER		
Index	PXO@OKODCKS	O_ORDERKEY(ASC) ,O_...

Recommended Indexes

Access Path Graph Comparison

- ❑ Single query APG Comparison of 2 SQL Tuning analysis results.
- ❑ Can be from the same project or different project
- ❑ Can be from same server or different server. For example: Tuning analysis APG comparison from DB2 z/OS and LUW



Access Path Graph Comparison

Differences Tree

- Query <-> Query
 - WFSCAN <-> NLJOIN
 - WFSCAN <-> IXSCAN
 - UXO@CKOKODSP <-> SXL@PKSKOKEPDSQN
 - PXL@OKSDRFSKEPDC <-> UXO#CLOKOD**
 - QB3 <-> No right related node
- Query Block 1 <-> Query Block 1
- Query Block 2 <-> Query Block 2
- Query Block 3 <-> Query Block 3

List Differences in a tree. After clicking on it, related nodes are highlighted in below Access Plan Graphs

Query 1 Access Plan Graph:

- QB2 (1)
 - NLJOIN (1)
 - IXSCAN (380.0481)
 - UXO@CKOKODSP (25)
 - IXSCAN (400)
 - PXL@OKSDRFSKEPDC (25)

Query 2 Access Plan Graph:

- QB2 (1)
 - NLJOIN (1)
 - IXSCAN (10000)
 - UXO#CLOKOD (25)
 - IXSCAN (1)
 - SXL@PKSKOKEPDSQN (0)
 - QB3 (1)

Visual Plan Hint

- A example Query with Join seq. change (emp->dept to dept-> emp)

The screenshot displays the IBM Optim Query Tuner Client interface. The main window is titled "Visual Plan Hint" and shows a "Join Graph - based on the existing access plan". The graph includes three tables: (2) DEPT, (1) EMP, and (3) EPROJ. The join sequence is defined by the following predicates: A.WORKDEPT=B.DEPTNO, B.DEPTNO=C.DEPTNO, and A.EMPNO IN ((SELECT DSN8910.DEPT.M...)).

The "Join Sequence Definition Editor" on the right shows a hierarchical view of the join sequence. It starts with a root "NLJOIN" node, which branches into two "NLJOIN" nodes. The left "NLJOIN" node branches into (2) DEPT (IXSCAN) and (1) EMP (IXSCAN). The right "NLJOIN" node branches into (3) EPROJ (TBSCAN).

Below the graphs is a "Summary for Hint Definition" section with a table titled "All of Table Access Related Hint Customization".

QBLOCKNO	TABLE_CR...	TABLE_NAME	CORRELAT...	TABNO	JOIN_MET...	ACCESS_T...	ACCESS_C...	ACCESS_N...	SORTN_JOIN	SORTC_JOIN
1	DSN8910	EMP	A	1	NLJOIN					

Workload Index Adviser - Recommendations

The screenshot displays the 'Workload Tuning Editor' window. At the top, it shows the title 'Data - WIA Workload Group 1_WIA - Eclipse SDK' and a menu bar with options like File, Edit, Navigate, Search, Project, Data, Diagram, Services, Samples, Run, Window, and Help. Below the menu is a toolbar with various icons. The main area is titled 'Workload Tuning Editor' and contains a section for 'Workload Index Advisor Recommendations'. This section includes a text block explaining that the information shows index recommendations for the workload and that there is an option to run index analysis again with recommendations. Below this text are two input fields: 'Estimated performance improvement: 38 %' and 'Disk space required(DASD space): 60.78 MB'. A red box highlights these two fields, and a red arrow points from the first field to the second. To the right of these fields, a larger red box contains the same two metrics: 'Estimated performance improvement: 38 %' and 'Disk space required(DASD space): 60.78 MB'. Below the metrics is a 'Recommendations' section with a table of recommendations. The table has four columns: 'Feature Details', 'Action', 'Object N...', and 'Columns'. The table lists several recommendations, including 'DSN_WIA_QBLOCK', 'DSN_DET_COST_TABLE', 'DSN_STATEMENT_TABLE', 'PLAN_TABLE', and 'SYSINDEXPART'. Each recommendation is expanded to show its details, including the action (Create), the object name, and the columns. To the right of the table are several buttons: 'Show DDL...', 'Show Related SQL...', 'What-If Analysis...', 'Run DDL...', 'Select All', and 'Deselect All'. At the bottom of the window, there are sections for 'Recommendation Parameters' and 'Existing indexes'. A blue callout box with the text 'Recommend indexes to improve workload performance' points to the 'Recommendations' table. The bottom status bar shows 'Define Explain Task...' and a toolbar with various icons.

Estimated performance improvement: 38 %
 Disk space required(DASD space): 60.78 MB

Feature Details	Action	Object N...	Columns
<input checked="" type="checkbox"/> DSN_WIA_QBLOCK			
<input checked="" type="checkbox"/> Index	Create	DSN_WIA...	STMT_ID(ASC)
<input checked="" type="checkbox"/> Index	Create	DSN_WIA...	SESSION_ID(ASC)
<input checked="" type="checkbox"/> DSN_DET_COST_TABLE			
<input checked="" type="checkbox"/> Index	Create	DSN_DET...	QUERYNO(ASC), EXPLAIN...
<input checked="" type="checkbox"/> DSN_STATEMENT_TABLE			
<input checked="" type="checkbox"/> Index	Create	DSN_STA...	QUERYNO(ASC), EXPLAIN...
<input checked="" type="checkbox"/> PLAN_TABLE			
<input checked="" type="checkbox"/> Index	Create	PLAN_TAB...	QUERYNO(ASC), BIND_TI...
<input checked="" type="checkbox"/> Index	Create	PLAN_TAB...	QUERYNO(ASC), BIND_TI...
<input checked="" type="checkbox"/> Index	Create	PLAN_TAB...	QUERYNO(ASC), BIND_TI...
<input checked="" type="checkbox"/> SYSINDEXPART			
<input checked="" type="checkbox"/> Index	Create	SYSINDEX...	PARTITION(ASC)

Recommend indexes to improve workload performance



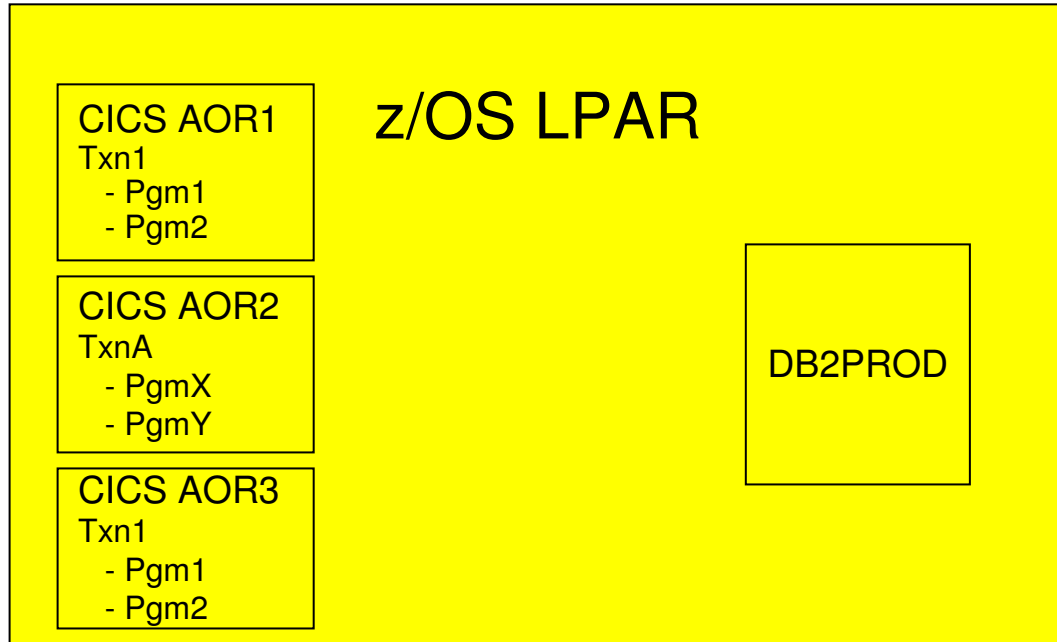
Optimizing Your Java Applications with Optim Tools

- Optim Development Studio, Optim pureQuery Runtime,
and Optim Query Tuner

Optim pureQuery Runtime – every Java application benefits!

- **JDBC – acceleration for any JDBC application**
 - Convert dynamic SQL to static SQL
 - Replace problem queries without changing the source
 - Remove literals from SQL to get better statement cache hit ratios
- **Hibernate/OpenJPA/iBatis – acceleration for persistence layers**
 - Improved SQL “batch” performance
 - Auto-tuning of Hibernate and OpenJPA persistence options
- **SQL-friendly APIs for OO access to relational**
 - Object to relational mapping
 - APIs that can be tailored to return XML, JSON, arrays, etc.
- **Improved management, monitoring, problem determination**
 - Tracks SQL back to the Java class file and line number
 - Enables performance monitors to report by application name
- **Provides the foundation for improved developer tooling**
 - Syntax assist, code generation, performance reporting, etc.

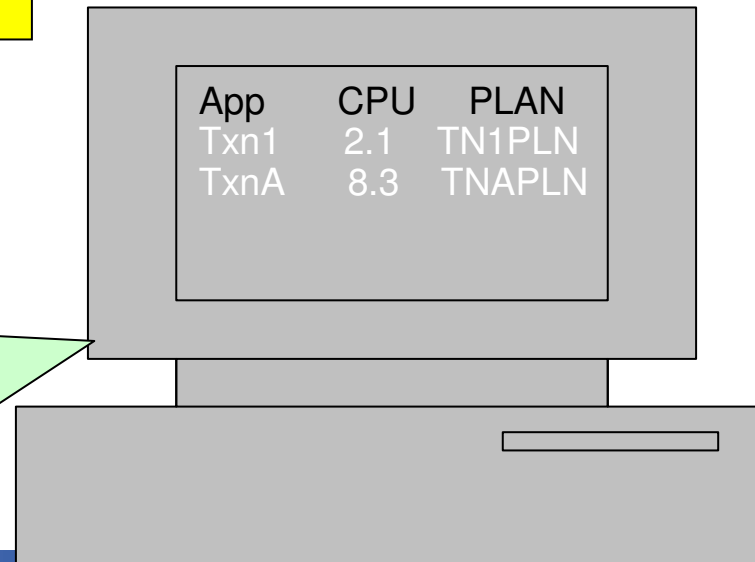
What's so Great About DB2 Accounting for CICS Apps?



DB2 Accounting for CICS apps allows you to study performance data from many perspectives:

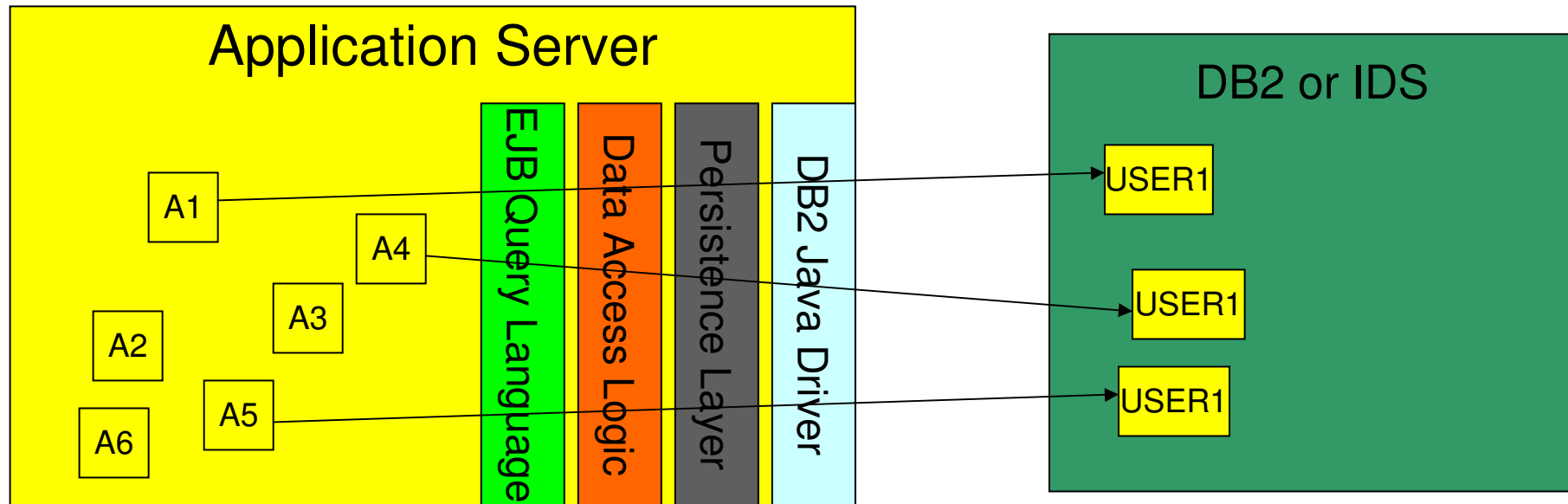
- By transaction (PLAN name)
- By program (package level accounting)
- By address space (AOR name)
- By end user ID (CICS thread reuse)

This flexibility makes it very easy to isolate performance problems, perform capacity planning exercises, analyze program changes for performance regression, compare one user's resource usage to another's, etc.



JDBC Performance Reporting and Problem Determination

– Before pureQuery



What is visible to the DBA?

- IP address of WAS app server
- Connection pooling userid for WAS
- app is running JDBC or CLI

What is not known by the DBA?

- which app is running?
- which developer wrote the app?
- what other SQL does this app issue?
- when was the app last changed?
- how has CPU changed over time?
- etc.

User	CPU	PACKAGE
USER1	2.1	JDBC
USER1	8.3	JDBC
USER1	22.0	JDBC

What's so Great About Optim pureQuery Accounting for WebSphere Applications?

z/OS LPAR

CICS AOR2
TxnA (PLANA)
- PgmX
- PgmY

Unix or Windows

WAS 21.22.3.4
TxnA (Set Client App=TxnA)
- ClassX
- ClassY

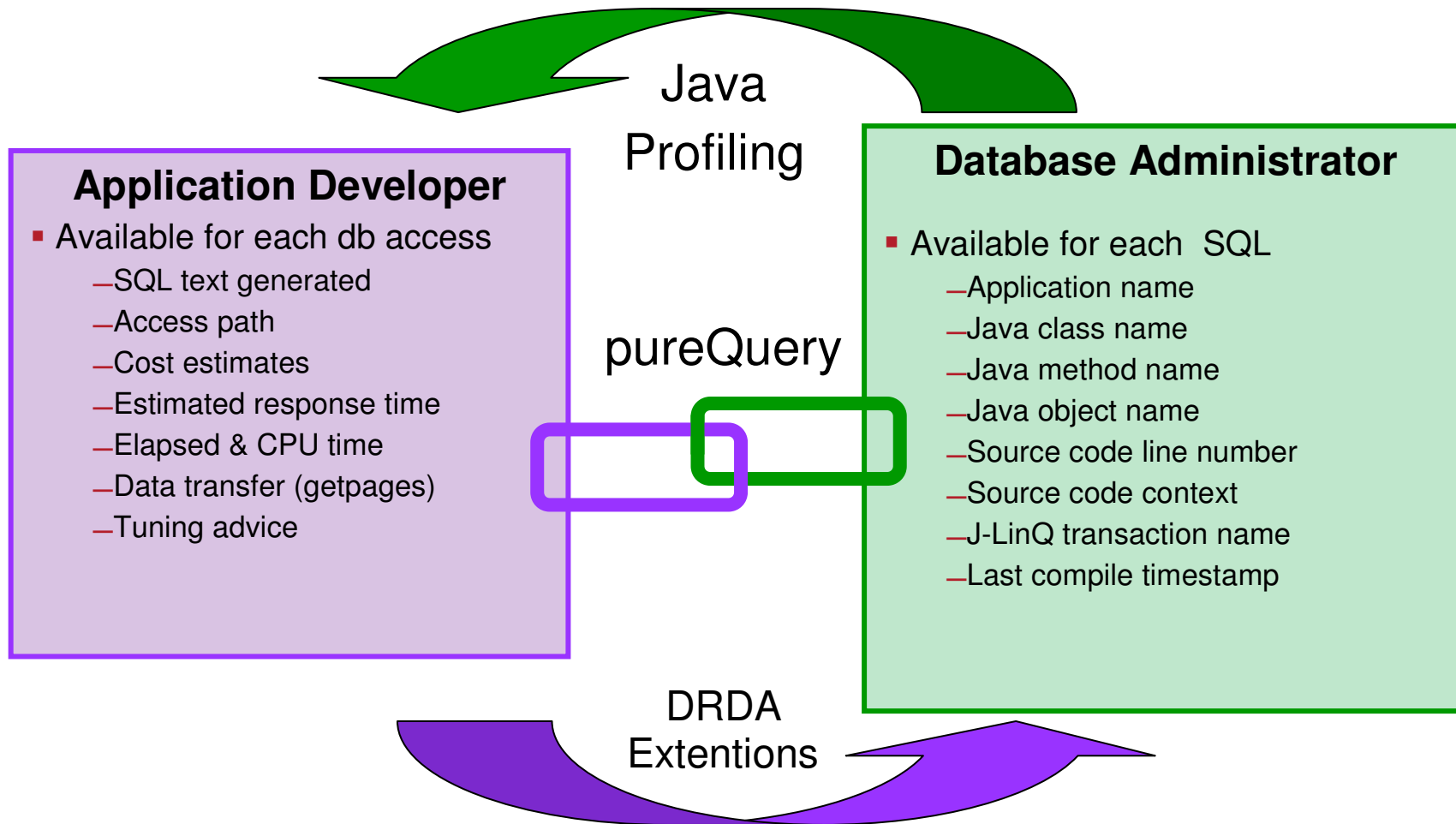
Optim pureQuery Accounting provides the same granularity for reporting WebSphere's DB2 resources that we have with CICS:

- By transaction (Set Client Application name)
- By class name (program - package level accounting)
- By address space (IP address)
- By end user ID (DB2 trusted context and DB2 Roles)

This flexibility makes it very easy to isolate performance problems, perform capacity planning exercises, analyze program changes for performance regression, compare one user's resource usage to another's, etc. just like CICS Accounting report

App	CPU
TxnA	2.1
TxnB	8.3

pureQuery API - Simplifying Problem Determination Scenario



Simpler Development

pureQuery API's:

```
Employee my_emp = db.queryFirst("SELECT Name, HomeAddress, HomePhone
FROM Employee WHERE Name=?", Employee.class, my_emp);
```

-or-

```
Employee my_emp = getEmployee(name);
```

XML file or Java annotation
SELECT * FROM EMPLOYEE
WHERE NAME=?1;

SQLJ:

```
#sql [con] { SELECT NAME, ADDRESS, PHONE_NUM INTO :name, :addr, :phone FROM EMP
WHERE NAME=:name };
```

```
new Employee my_emp;
my_emp.setName(name);
my_emp.setHomeAddress(addr);
my_emp.setHomePhone(phone);
```

JDBC:

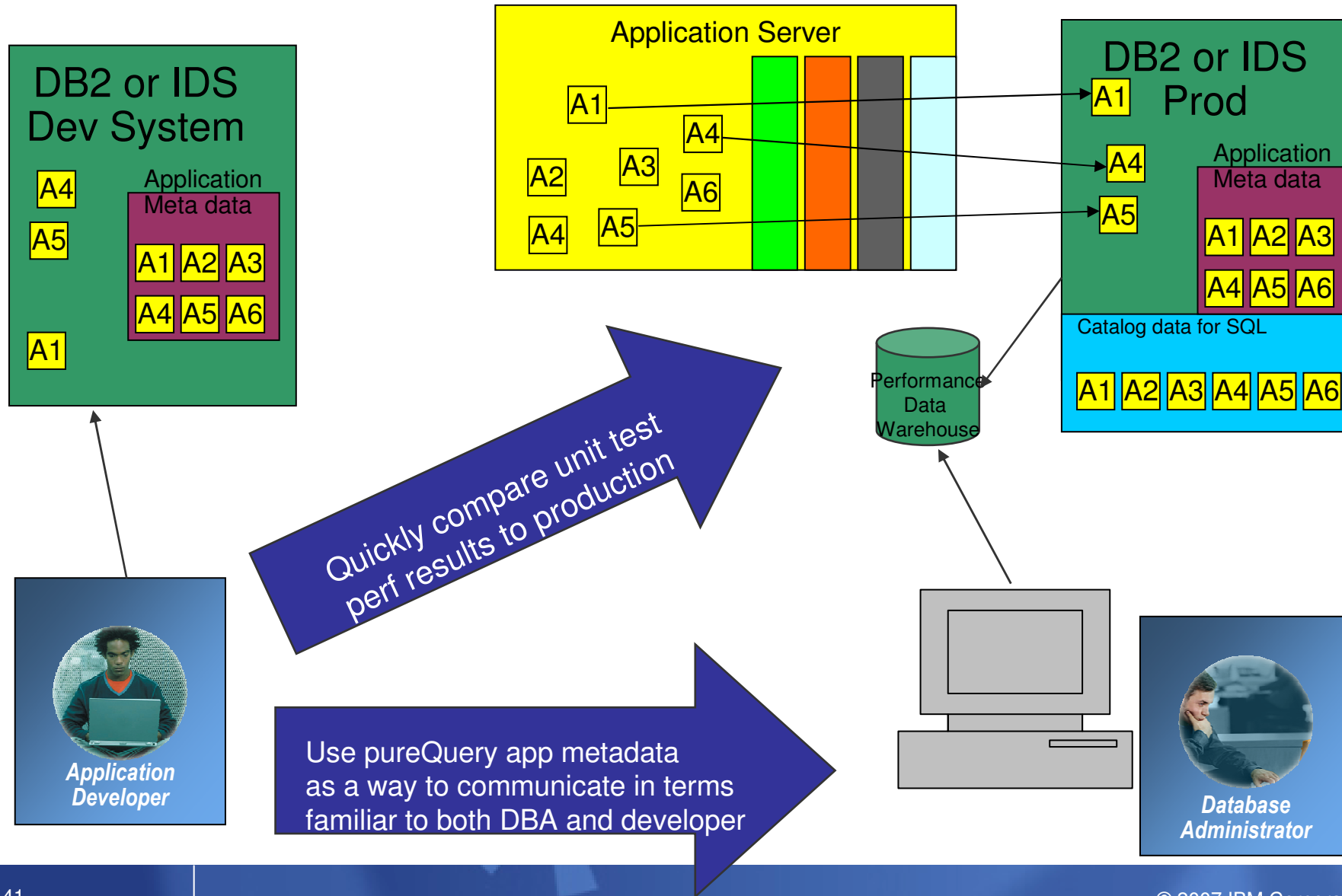
```
java.sql.PreparedStatement ps = con.prepareStatement(
"SELECT NAME, ADDRESS, PHONE_NUM FROM EMP
WHERE NAME=?");
```

```
ps.setString(1, name);
java.sql.ResultSet names = ps.executeQuery();
names.next();
new Employee my_emp;
my_emp.setName(names.getString(1));
my_emp.setHomeAddress(names.getString(2));
my_emp.setHomePhone(names.getString(3));
names.close();
```

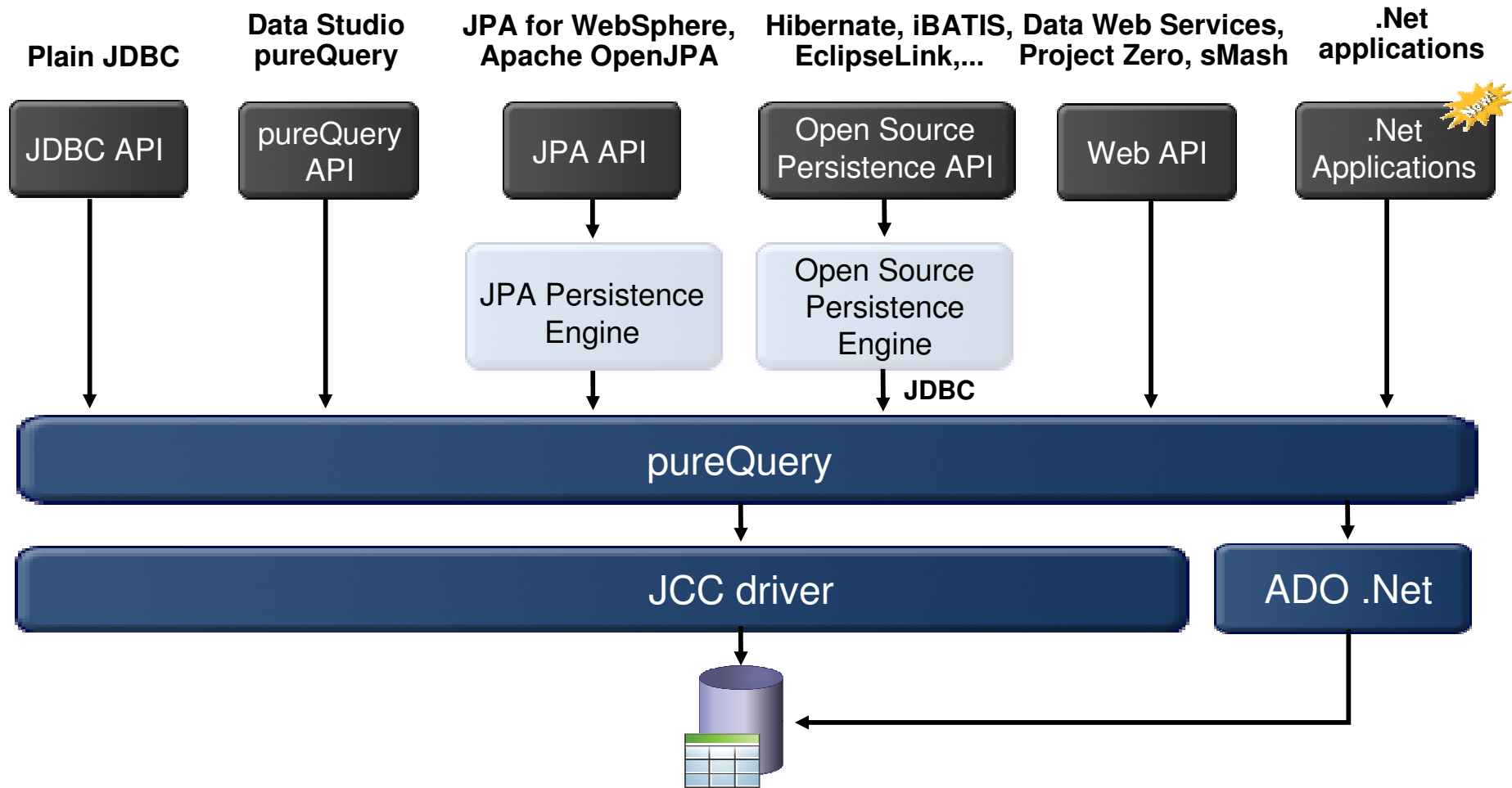
Table	Column	Type
EMP	NAME	CHAR(64)
EMP	ADDRESS	CHAR(128)
EMP	PHONE_NUM	CHAR(10)

```
class Employee
{ public String Name;
  public String HomeAddress;
  public String HomePhone;
  ...
}
```


Using pureQuery to Foster Collaboration and Produce Enterprise-ready Apps



On-ramps to pureQuery



DB2, Informix, and Oracle now...more coming



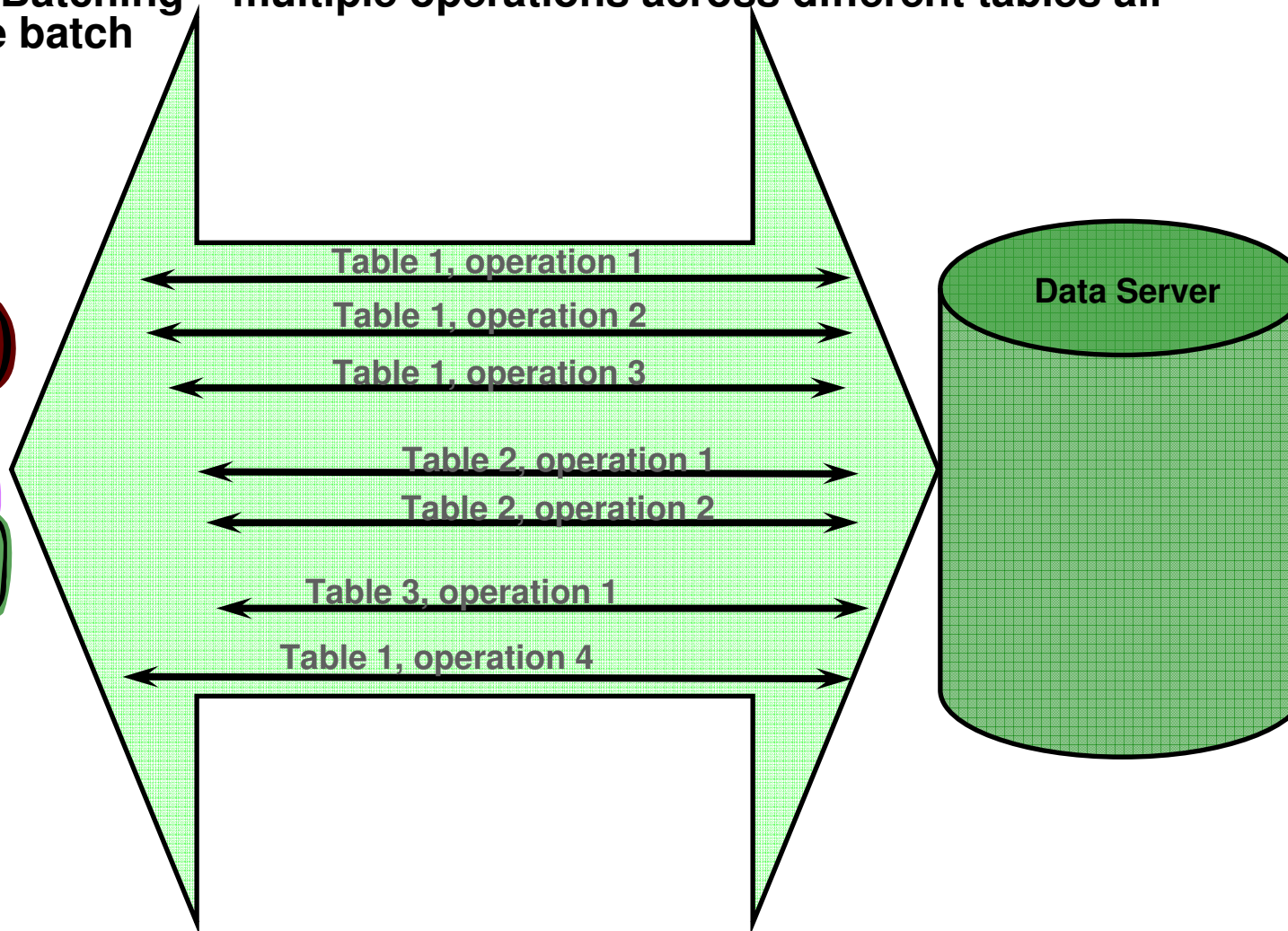
Client Optimization

Improve Java data access performance for DB2 – without changing a line of code

- Captures SQL for Java applications
 - Custom-developed, framework-based, or packaged applications
- Bind the SQL for static execution without changing a line of code
 - New bind tooling included
- Delivers *static SQL execution* value to existing DB2 applications
 - Making response time predictable and stable by locking in the SQL access path pre-execution, rather than re-computing at access time
 - Limiting user access to tables by granting execute privileges on the query packages rather than access privileges on the table
 - Aiding forecasting accuracy and capacity planning by capturing additional workload information based on package statistics
 - Drive down CPU cycles to increase overall capability
- Choose between dynamic or static execution at deployment time, rather than development time

What Is Heterogeneous Batching?

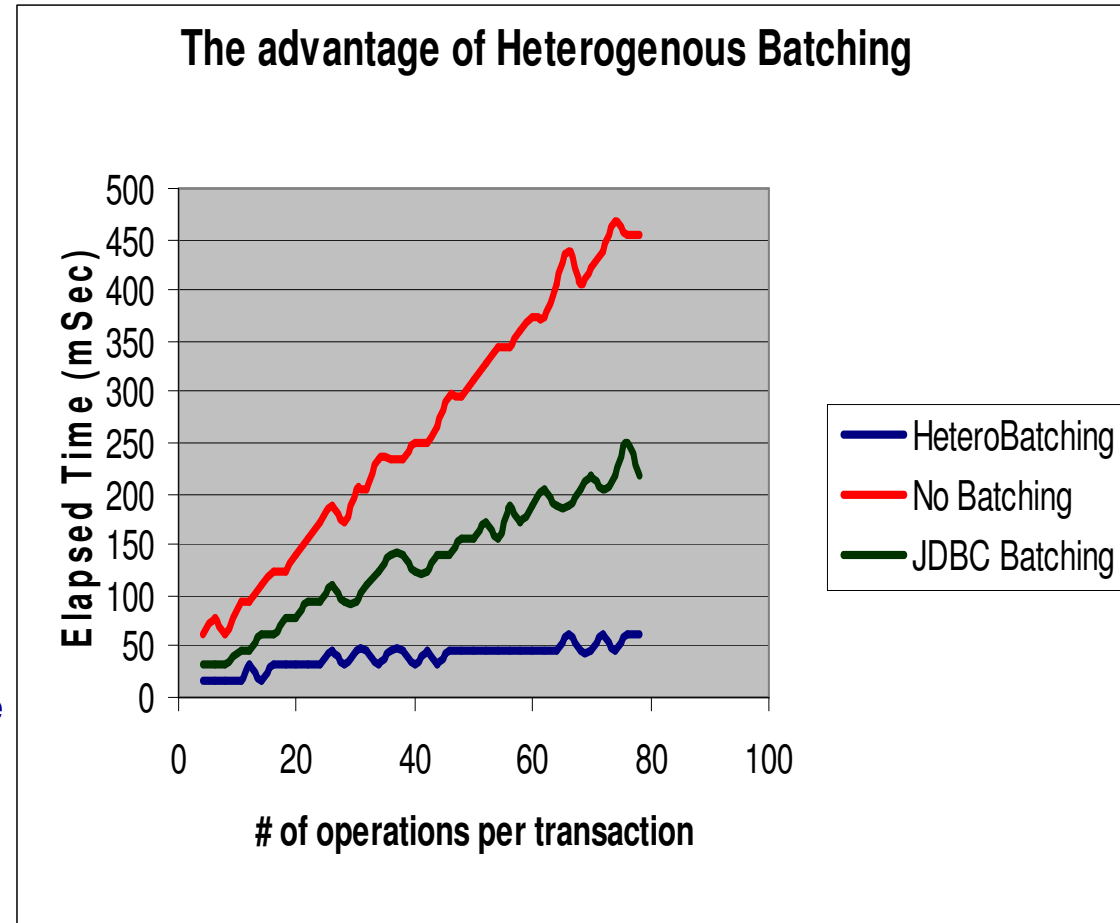
Heterogeneous Batching – multiple operations across different tables all execute as one batch



JDBC Batching v/s pureQuery Heterogeneous Batching

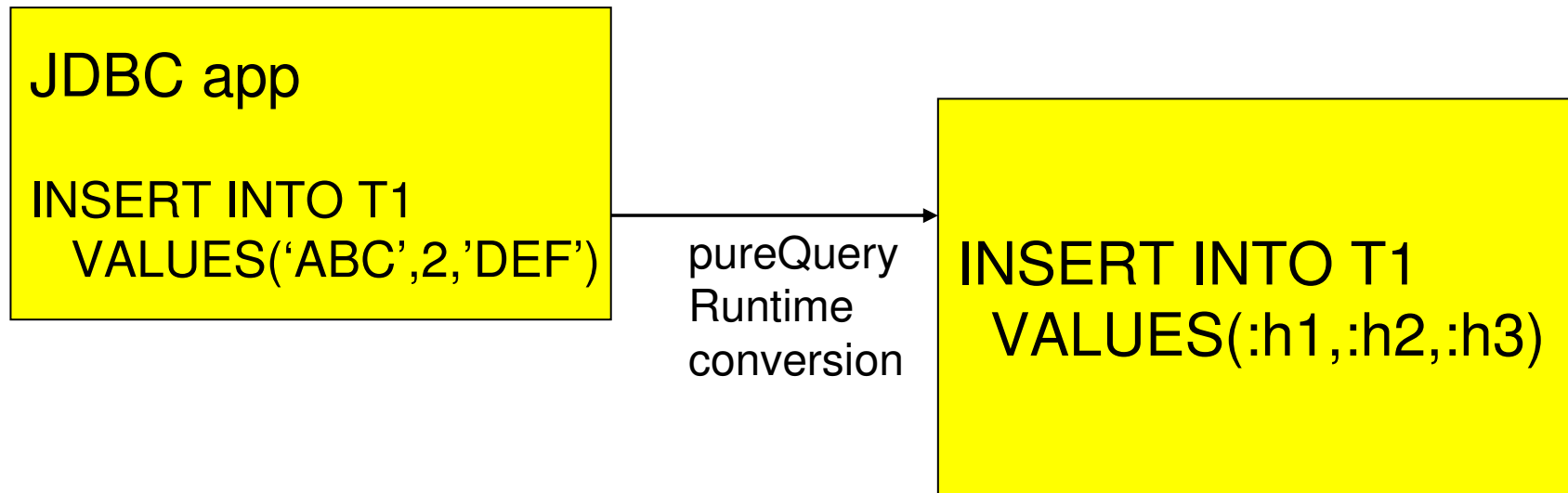
- JDBC batching used by Hibernate Batchter is currently limited
 - Cannot batch entities that map to multiple tables
 - Primary and Secondary tables.
 - Inheritance Join and Table per class strategies
 - Cannot batch different operations against same table
 - Field level updates
 - Insert, update
 - Cannot batch different entities
 - Each batch is a message to the database

- pureQuery heterogeneous batching plug-in for Hibernate on the other hand
 - Can batch entities that map to multiple tables
 - Can batch different operations against the same table
 - Can batch different entities into a single batch
 - Combines insert, deletes, updates into single batch



* Preliminary findings based on validation with a test designed to demonstrate heterogeneous batching differences. This is not intended to be a formal benchmark.

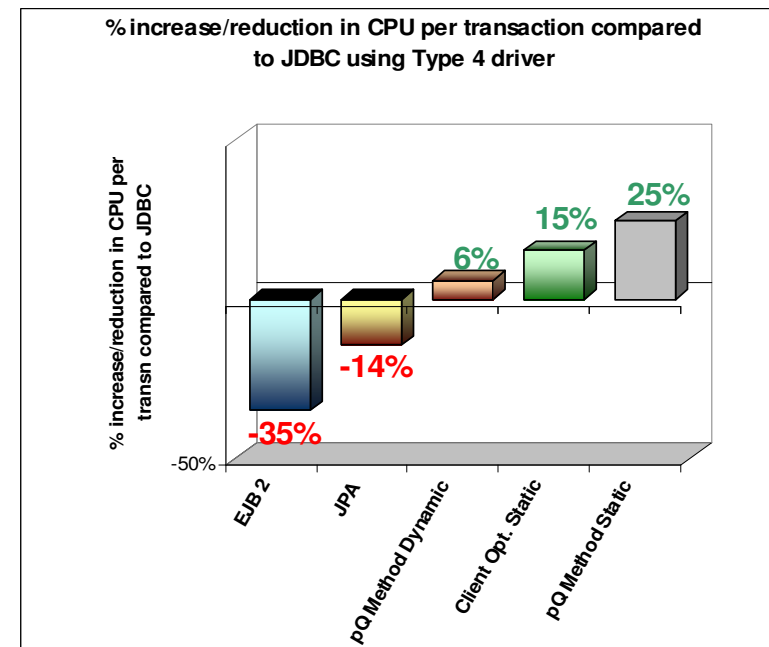
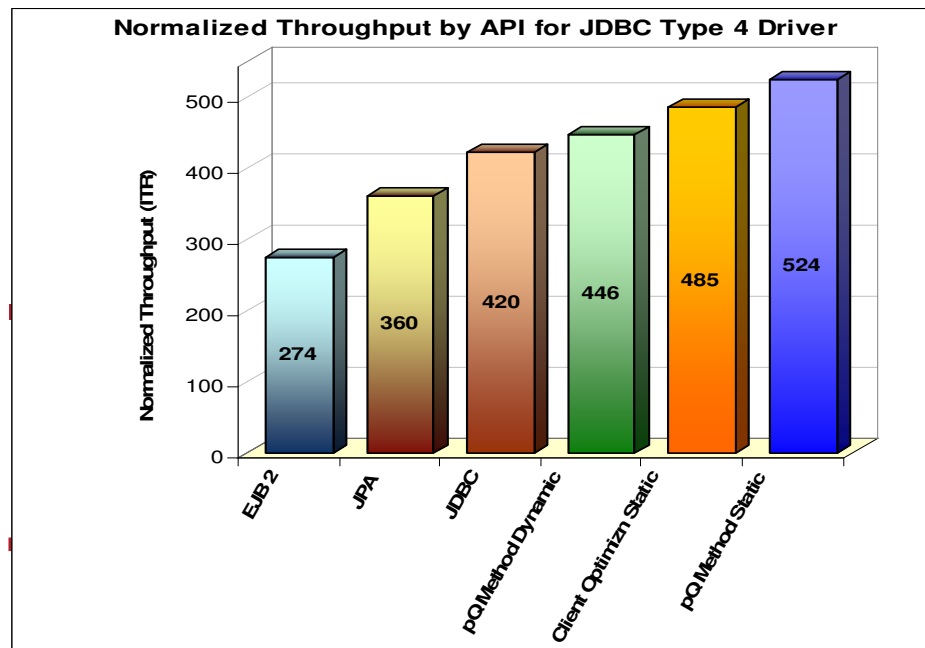
pureQuery – Stripping Literals from SQL



- pureQuery can identify statements that use no parameter markers, and strip the literals out at runtime
- significant performance gains:
 - less CPU cost at PREPARE
 - better use of dynamic statement cache

Optim pureQuery Runtime for z/OS

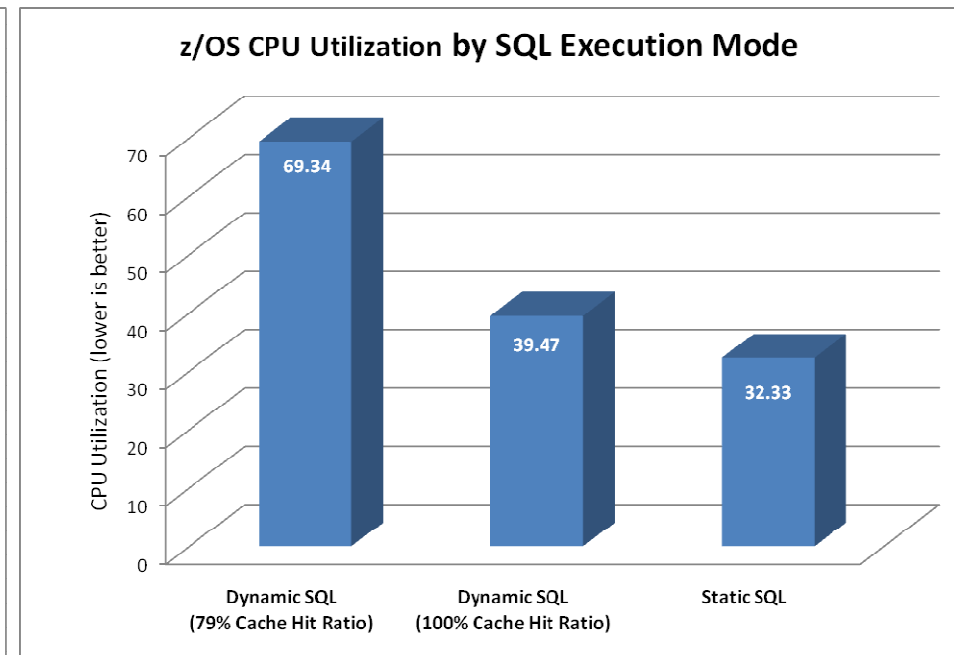
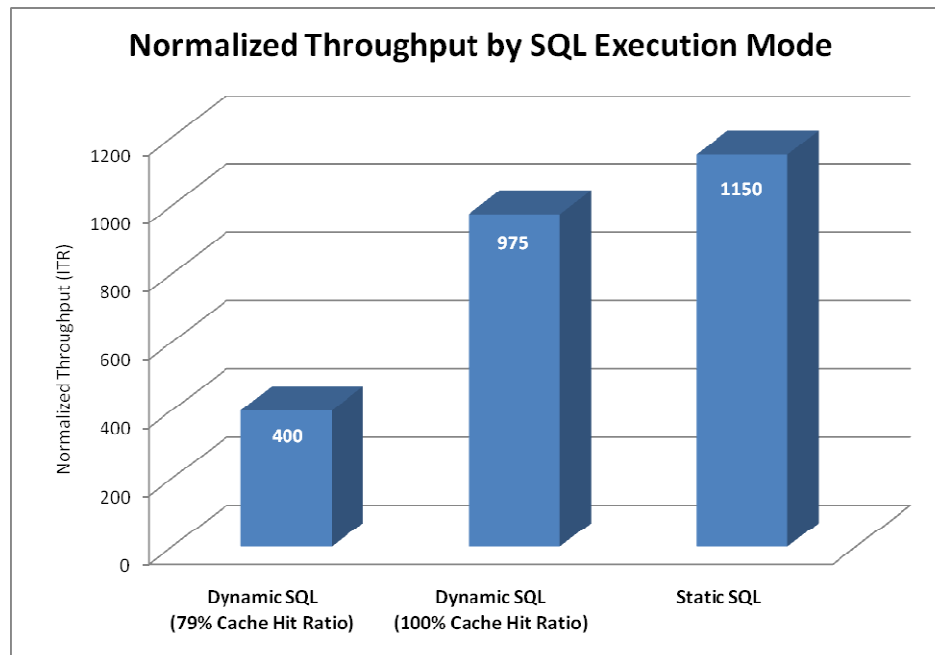
- In-house testing shows double-digit reduction in CPU costs over dynamic JDBC



- IRWW – an OLTP workload, **Type 4 driver**
- Cache hit ratio between 70 and 85%
- 15% - 25% reduction on CPU per txn** over dynamic JDBC

Throughput Increase with .NET

- Same IRWW OLTP application used for the Java tests but in .NET
- Application access DB2 for z/OS via Windows Application Server (IIS)
- Throughput during static execution **increased by 159%** over dynamic SQL execution assuming a 79% statement cache hit ratio



Optim Development Studio – SQL Outline



Speed up problem isolation for developers – even when using frameworks

- Capture application-SQL-data object correlation (with or without the source code)
- Trace SQL statements to using code for faster problem isolation
- Enhance impact analysis identifying application code impacted due to database changes
- Answer “Where used” questions like “Where is this column used within the application?”
- Use with modern Java frameworks e.g. Hibernate, Spring, iBatis, OpenJPA

```

private void deleteEntities() {
    String firstName = "John";
    em.getTransaction().begin();

    // simple JPQL query deletes all persisted entities whose first name is 'firstName'
    Query deleteQuery = em.createQuery("DELETE FROM MyEntity AS e WHERE e.firstName = ?1");
    deleteQuery.setParameter(1, firstName);

    int deleted_entities = deleteQuery.executeUpdate();

    System.out.println("Deleted " + deleted_entities + " instance(s) of " + firstName);

    em.getTransaction().commit();
}

```

The screenshot displays the Optim Development Studio interface. The top pane shows a Java code editor with a method named `deleteEntities()`. A red circle highlights the line `int deleted_entities = deleteQuery.executeUpdate();`. A red line connects this line to the SQL Outline view below. The SQL Outline view shows a tree of Java packages, including `org.apache.openjpa.jdbc.kernel`, `org.apache.openjpa.jdbc.sql`, `org.apache.openjpa.util`, `org.apache.openjpa.lib.rop`, `org.apache.openjpa.lib.jdbc`, `org.apache.openjpa.kernel`, and `com.ibm.test`. Under `SimpleJPAApp.java`, several SQL statements are listed, such as `Line#151: UPDATE DBUSER1.OPENJPA_SEQUENCE_TABLE SET SEQUENCE_VALUE = ? WHERE ID = ? AND SEQUENCE_VALUE = ?`. A context menu is open over the statement `Line#119: DELETE FROM DBUSER1.MYENTITY t0 WHERE (t0.FIRSTN = ?)`, showing options like `Show in Source`, `Run SQL`, `Show in SQL Editor...`, `Export SQL to File...`, `Launch Visual Explain`, and `Generate pureQuery code...`.

Java - ReportGenerator/src/com/jke/sales/report/ReportApplication.java - IBM Data Studio Developer

File Edit Source Refactor Navigate Search Project Run Window Help

Package Explorer Hierarchy

ReportGenerator

- src
 - com.jke.sales.report
 - DB2JccConfiguration.properties
 - pdq.properties
- JRE System Library [jdk]
- Referenced Libraries
- pureQueryFolder
 - analysis
 - exec
 - capture.pdqxml
 - capture.pdqxml.org
 - Default.bindProps
 - Default.genProps
 - pgProfiler.jar
- SOTCPADData
- SOTCPADDataCustomerDataEAR
- SOTCPADDataCustomerDataWeb
- TEST

```
statement.close();

if(customerList.size() > 0) {

    sql = "SELECT ORD_NBR AS ORDER_NUMBER, " +
        "ORD_NBR_OF_ITEMS AS NUMBER_OF_ITEMS, " +
        "ORD_NBR_OF_PRODS AS NUMBER_OF_PRODUCTS " +
        "FROM GOSALESC.T.CUST_ORD " +
        "WHERE CUST_CODE = ?";

    pStatement = connection.prepareStatement(sql);

    for(int i = 0; i < customerList.size(); i++) {
        pStatement.setInt(1, customerList.get(i).intValue());
        pStatement.execute();
        resultSet = pStatement.getRe
        while(resultSet.next()) {
            System.out.println(resul
                resul
                resul
            }
        }

        resultSet.close();
    }
}
```

Replace SQL without changing the application

Visualize application SQL

Visualize execution metrics

Position in Database Explorer

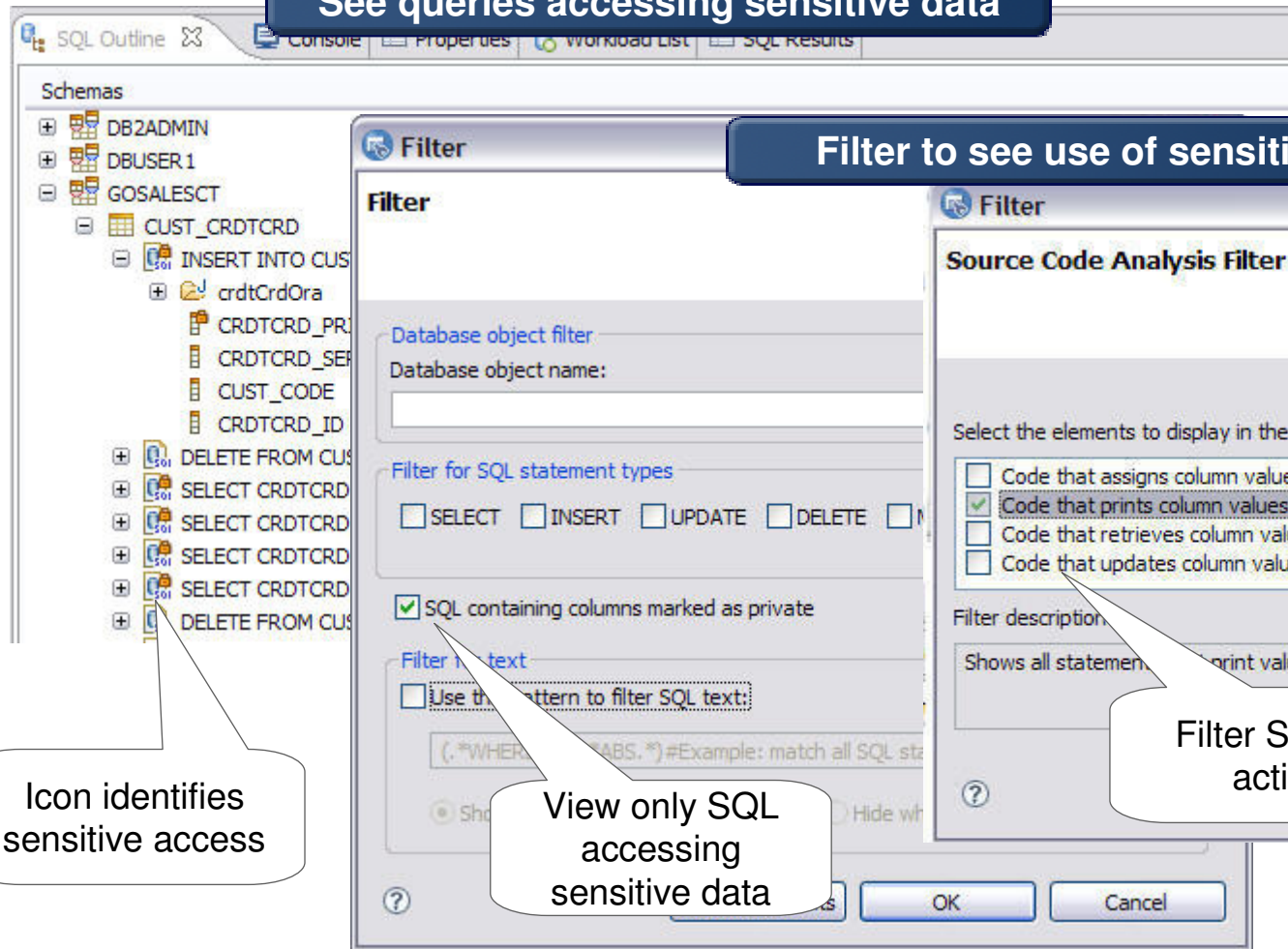
SQL	Number of Times Run	Total Time	Max Time	Average Time	Min Time
SELECT CUST_CODE FROM GOSALESC.T.CUST ORDER BY CUS	3	215.00	72.00	71.67	71.00
SELECT CUST_CODE FROM GOSALESC.T.CUST ORDER BY	3	215.00	72.00	71.67	71.00
SELECT ORD_NBR AS ORDER_NUMBER, ORD_NBR_OF_ITEMS AS NUMBER_OF_ITEMS, ORD_NBR_OF_PRODS AS NUMBER_OF_PRODUCTS FROM GOSALESC.T.CUST_ORD WHERE CUST_CODE = ?	234	16489.00	75.00	70.47	66.00
SELECT CUST_CODE, STDDEV(SUM(CUST_CODE)) FROM GOSALESC.T.CUST	4	287.00	73.00	71.75	71.00
SELECT CUST_CODE, AVG(CUST_CODE) FROM GOSALESC.T.CUST	4	294.00	74.00	73.50	73.00
SELECT CUST_CODE, CORRELATION(CUST_CODE, CUST_CODE) FROM GOSALESC.T.CUST	3	234.00	83.00	78.00	74.00
SELECT count(CUST_CODE) FROM GOSALESC.T.CUST	14	1236.00	344.00	88.29	68.00
SELECT CUST_CODE, SUM(CUST_CODE) FROM GOSALESC.T.CUST	3	222.00	73.00	73.00	73.00

Execute, tune query, share, trace, explore SQL

Optim Development Studio

- Analyze Use of Sensitive Data in Applications

See queries accessing sensitive data



Filter to see use of sensitive data

Icon identifies sensitive access

View only SQL accessing sensitive data

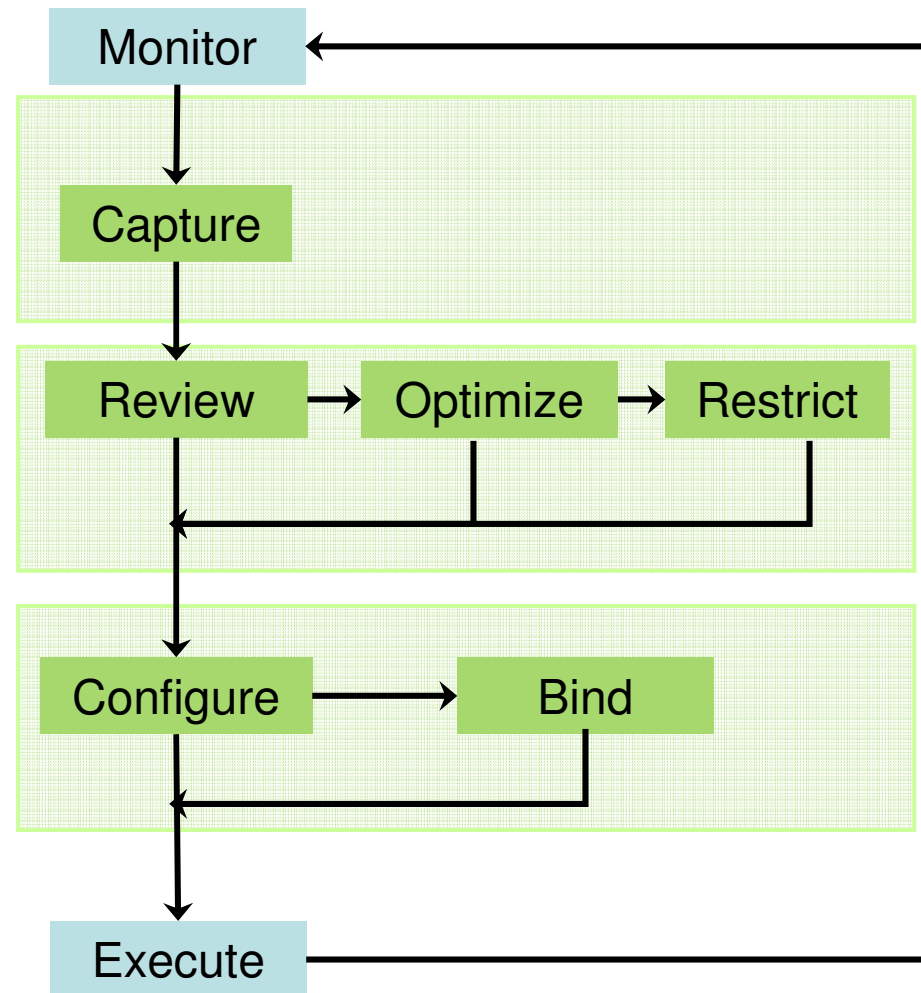
Filter SQL by action

More Visibility, Productivity, and Control of Application SQL

- Capture SQL with pureQuery
 - Capture performance and application metadata, works with:

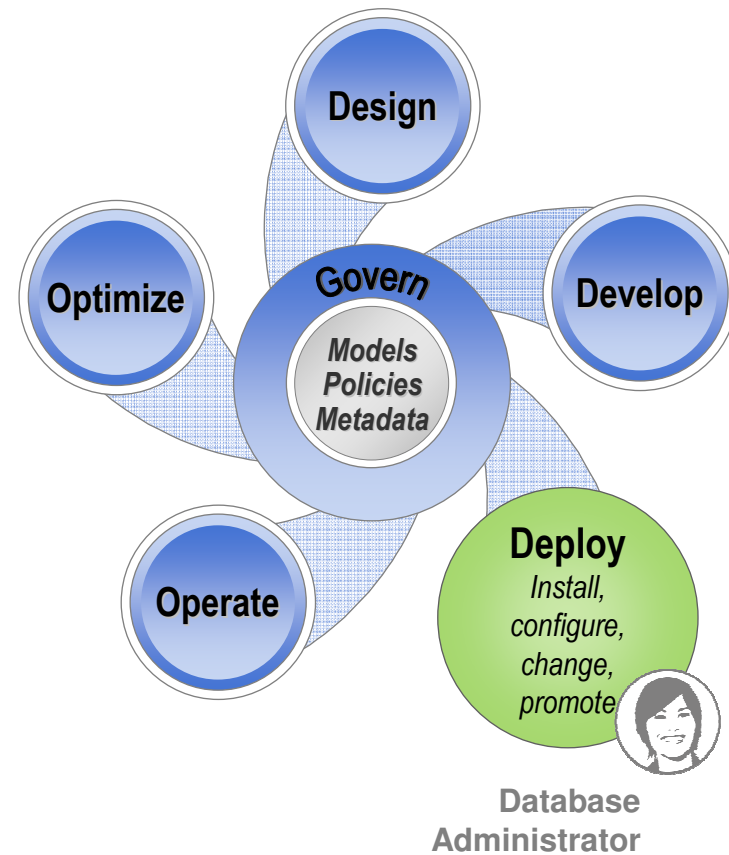


- Optimize
 - Review and share SQL
 - Visualize hotspots
 - Analyze impacts from schema changes
 - Trace SQL to originating source
 - Optimize and replace SQL
 - *using [Optim Query Tuner to get advice](#)*
 - Create approved SQL list
- Deploy
 - Configure execution properties
 - Optionally bind for static execution



Optim Database Administrator

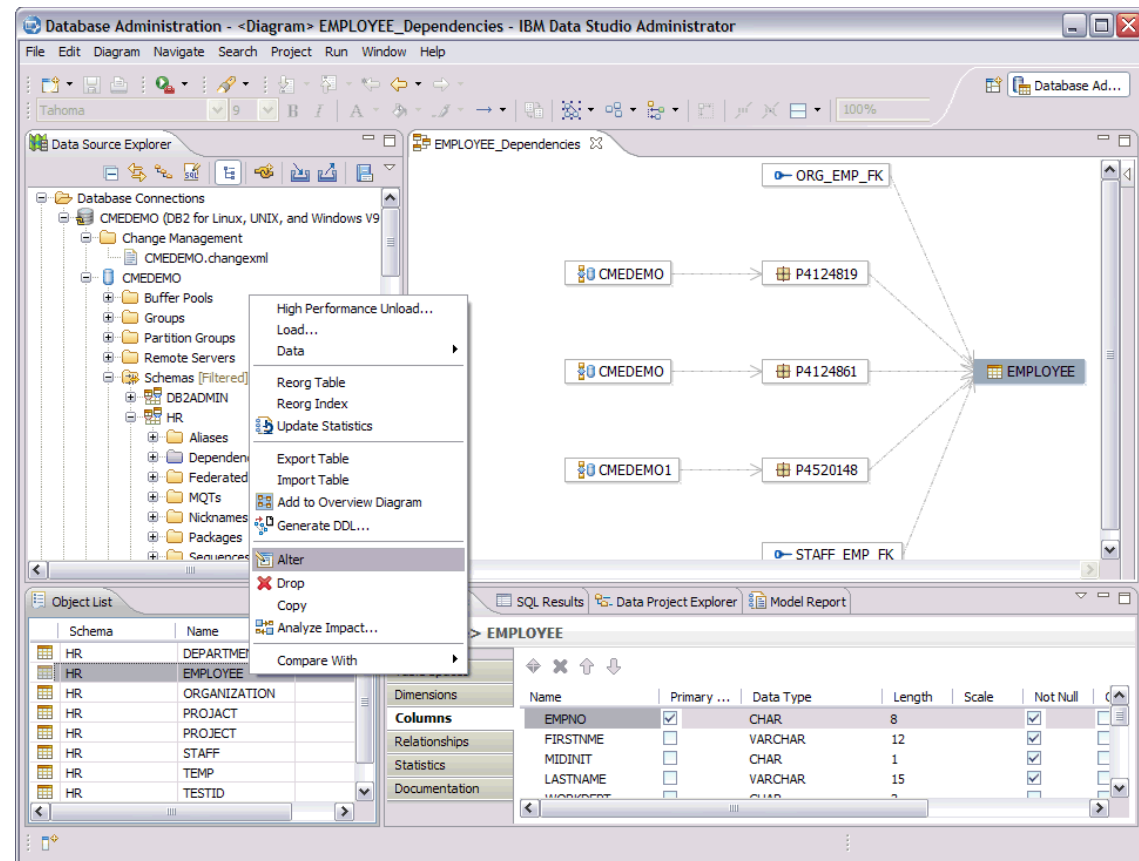
–Deploy without Disruption



Optim Database Administrator...

Improves DBA productivity and reduces application outages by automating and simplifying complex DB2 structural changes including change-in-place as well as database migration scenarios.

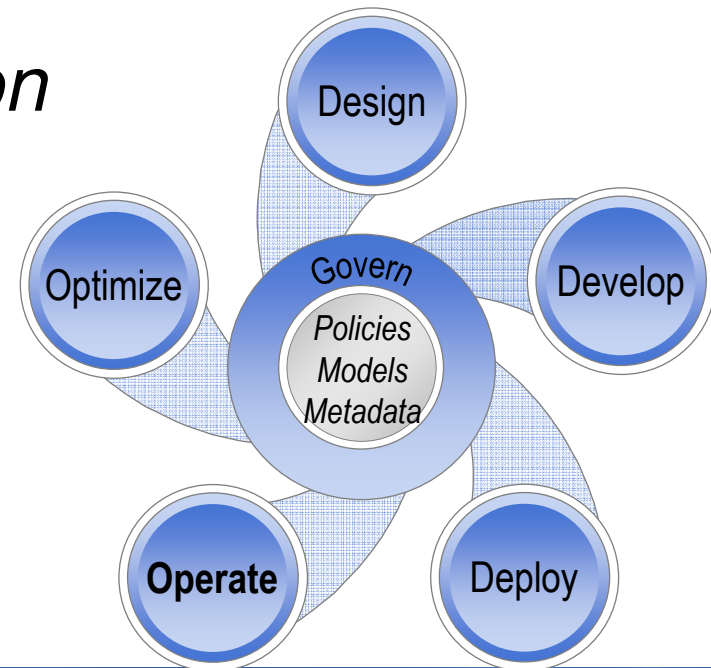
- Models, automates and deploys complex schema changes
- Identifies dependencies and analyzes impact to mitigate deployment risk
- Preserves data, dependent objects, privileges, and application binding
- Synchronizes, copies, clones, or merges database schema definitions from the source to the target
- Documents changes for collaboration and audit
- Enables undo or restart -- if





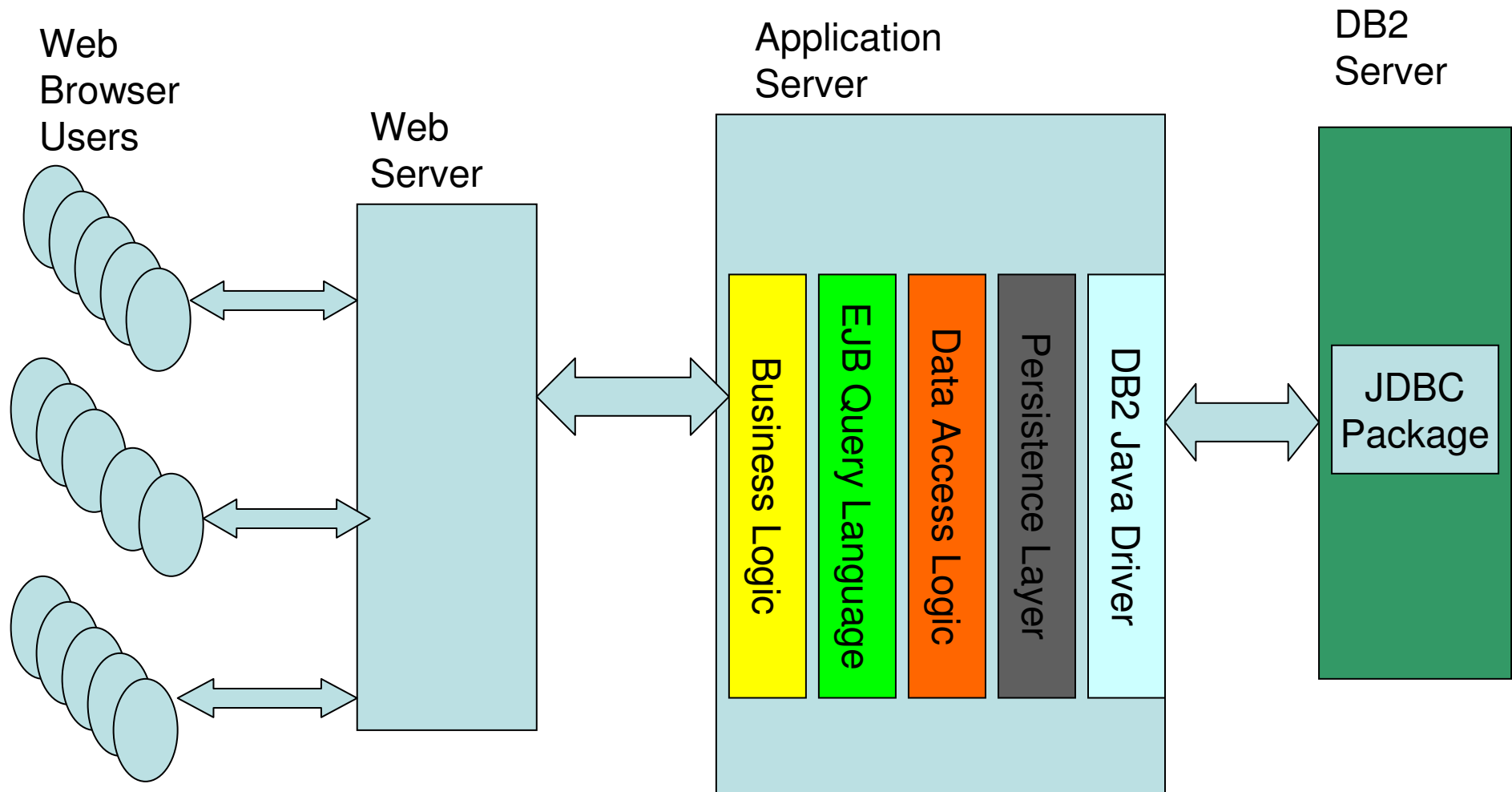
Get a Broader Perspective on Database performance

- DB2 Performance Expert and Extended Insight Solutions



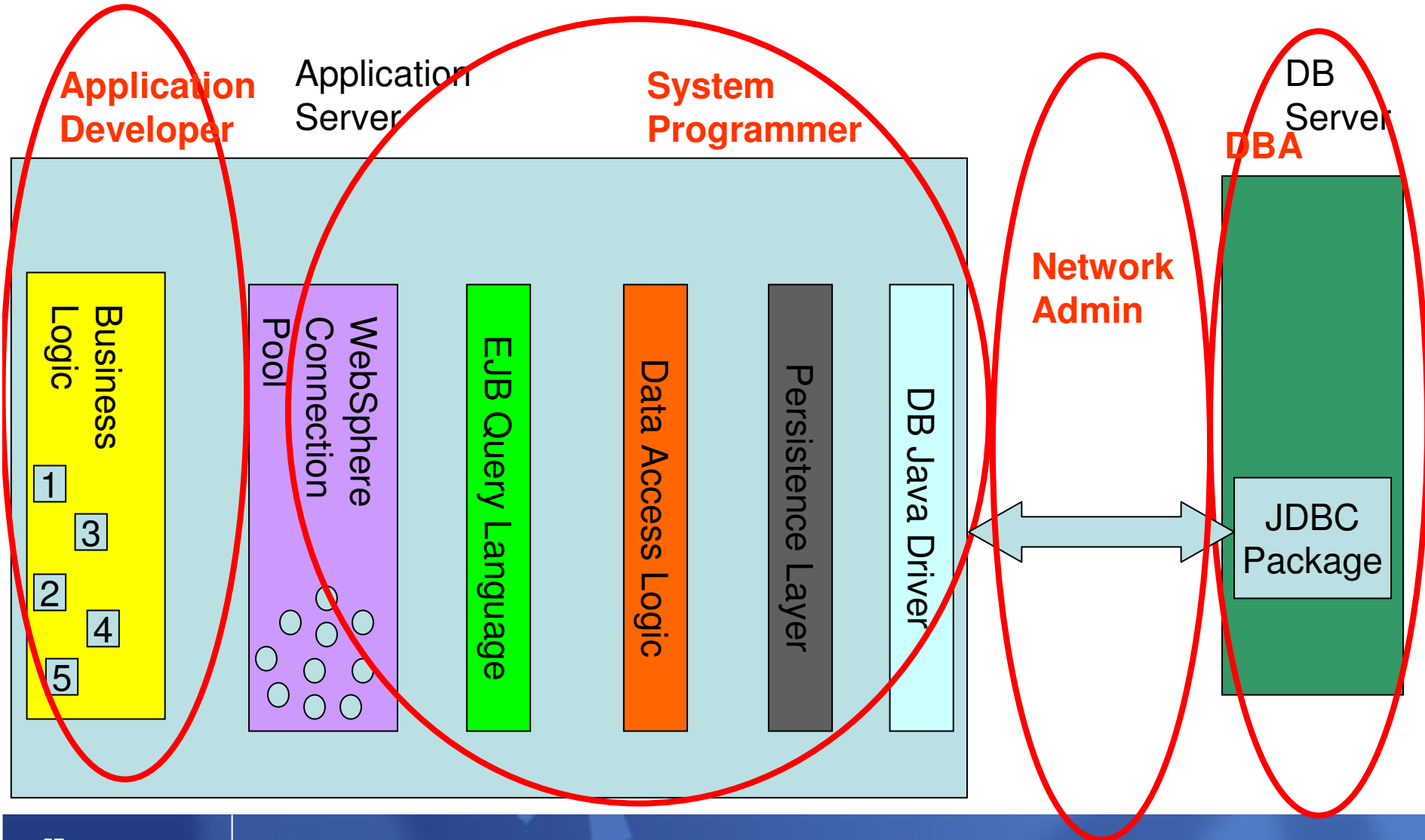
Get a Broader Perspective on DB Performance

- Toughest issue for Web applications
 - Problem diagnosis and resolution/Where is the time spent in application?



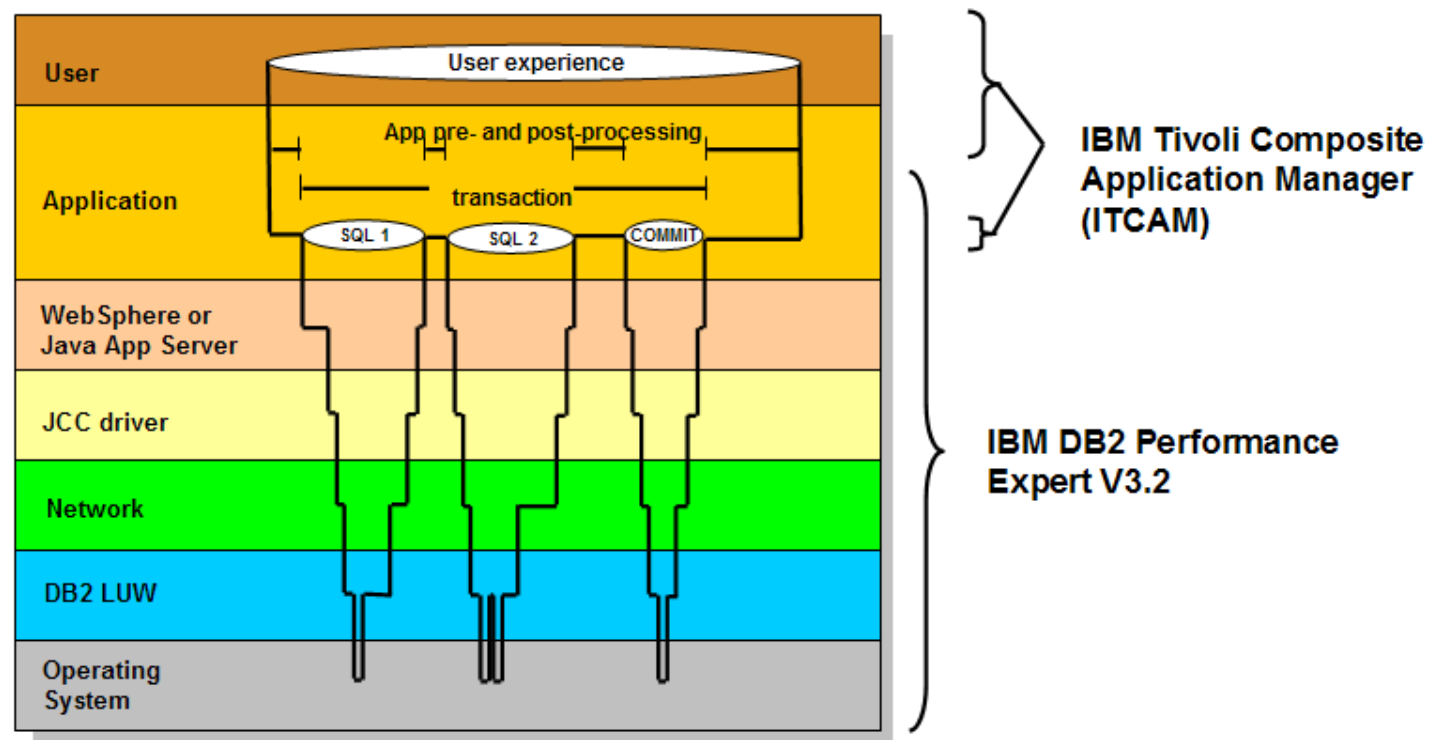
Where is my DB application spending its time?

- Customer Job Roles – A Barrier to a “Holistic View”



How do we plan to help?

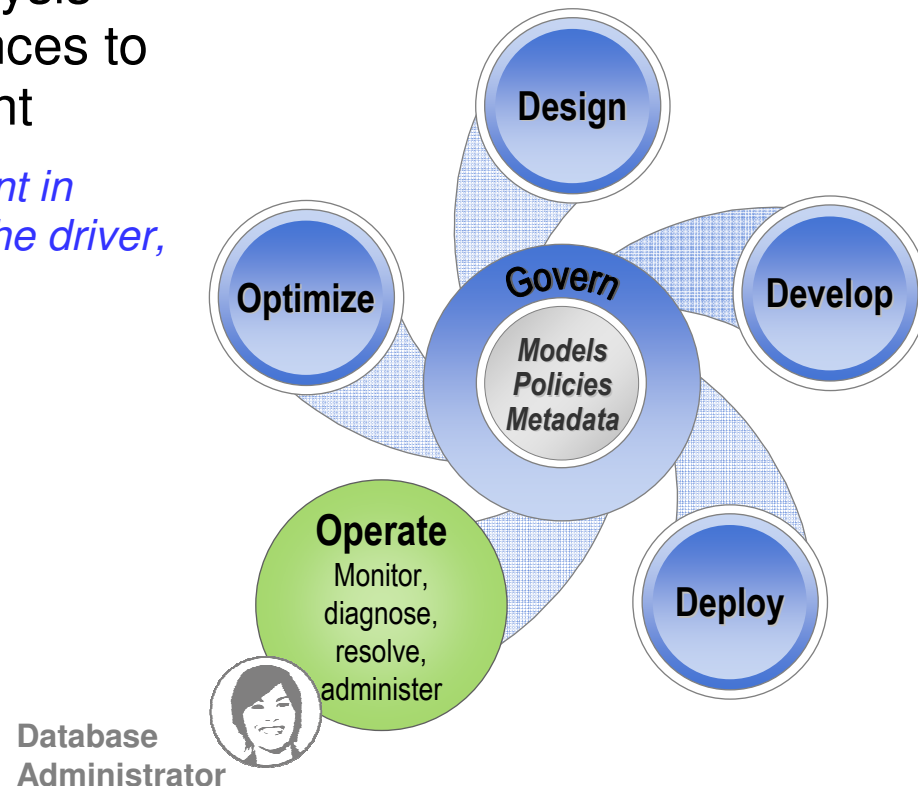
- Show me what my application is seeing
- Let me figure out where in the software/hardware stack my problem is
- Is it really my problem, or someone else's?
- Include database related information from WebSphere



Manage to Service Level Agreements

DB2 Performance Expert and Extended Insight Feature

- A single point for monitoring, analysis and control of multiple DB2 instances to improve service level management
 - *With monitor information like time spent in application, in connection pooling, in the driver, or in the network*
- Monitor DB2 for Linux, UNIX, and Windows servers
 - Application monitoring
 - WLM monitoring
 - Engine monitoring
 - OS monitoring
 - Partition analysis
 - Realtime and historical data
 - Dashboards and alerts



Diagnose overall application response time – a example of the end-to-end monitoring

DB2 Performance Expert - System Overview

Monitor Selected View Tools Window Help

Data: Recent Refresh: Off

Time Period: Last 30 min. 18:00:36 - 18:30:36

End-to-End KPIs Data Server KPIs Data Views Exceptions

Database: SALES

Workload Cluster	Transactions	Total End-to-End Time	Avg. End-to-End Time	Avg. Data Server Time	Avg. Network Time	Warnings	Problems
Database Total (SALES)	300,000	1,068,0...	3.350	0.345	0.318	-	-
Sales Portal Applications	100%	100%	3.350	0.345	0.318	3%	17%
Sales Portal Application Servers	100%	100%	3.350	0.345	0.318	3%	32%

End-to-end time: SALES Histogram: SALES

Sales Portal Applications

Workload Cluster	Transactions	Total End-to-End Time	Avg. End-to-End Time	Avg. Data Server Time	Avg. Network Time	Warnings	Problems
Total	300,000	1,068,0...	3.560	0.345	0.318	3%	17%
sales_shopping_cart	69%	94%	3.694	0.210	0.288	5%	21%
sales_view_items	9%	1%	3.321	0.312	0.301	2%	12%
sales_purchase	22%	5%	3.238	0.470	0.419	3%	15%

End-to-end time: sales_shop... Histogram: sales_shopping_cart

Sales Portal Application Server

Workload Cluster	Transactions	Total End-to-End Time	Avg. End-to-End Time	Avg. Data Server Time	Avg. Network Time	Warnings	Problems
Total	300,000	1,068,0...	3.560	0.345	0.318	2%	13%
sales_portal1.jk_enterprise.com	48%	49%	6.468	0.359	0.271	3%	12%
sales_portal2.jk_enterprise.com	52%	51%	0.876	0.331	0.365	0%	1%

End-to-end time: sales_po... Histogram: sales_portal1.jk_e...

It seems that the first application server has a problem. Double-click to drill-down.

In this situation, all applications are equally affected, and the problem seems not to be in the data server.

Diagnose Application Server

LIMETTE_59930_INSTANCE - End-to-End Details

End-to-End Details Selected View Tools Window Help

Data: History 05/28/2008 18:30:36 Since 05/28/2008 18:00:36

Aggregation: 1 minute Refresh: Manual

Main sales.portal1.jk-enterprise.com

sales.portal1.jk-enterprise.com

Legend

- Data server
- Sorting
- Network
- Driver processing
- Driver agent wait
- WS connection pool wait
- Application

Show data as

- Graphical View
- Text View

Distribution of end-to-end response time (s)

Transactions (x 1,000)

Physical reads (x 1,000,000)

Network bandwidth (Mbps)

Top SQL statements Show top 3 by Avg. end-to-end response

Statement text	Occurrences	End-to-end time
SELECT * FROM sales.customer AS cust, sales.order AS or...	51,000	2.344
SELECT a.schema, b.name FROM sysi...	37,000	2.308
DELETE FROM account WHERE aid = 3...	42,000	2.227

Top clients Show top 3 by Problems

Client	Problems
sales.portal1.jk-enterprise.com	32%

Buffer pool and sorting

Buffer pool hit ratio (%)	43.400
Buffer pool physical reads per min.	1,900,000
Rows read per selected row (avg.)	11.520
Sorts per minute	8.647
Sort overflows	0

Most of the time is spent for „WAS connection pool wait“ time.

Double-click to drill-down and display detail information.

Diagnose on connection Pool ...

LIMETTE_59930_INSTANCE - End-to-End Details

End-to-End Details Selected View Tools Window Help

Data: History 05/28/2008 18:30:36 Since 05/28/2008 18:00:36

Aggregation: 1 minute Refresh: Manual

Main sales.portal1.jk-enterprise.com Client Information - sales.portal1.jk-enterprise.com

Client Information

Problems (%) 32
 Warnings (%) 3
 Transactions per minute 300,000

Statement details

Host name sales.portal1.jk-enterprise.com
 IP address 9.152.344.081
 Authentication ID YGH6E
 Driver level 1.0.3
 Connection start time 10/10/2007 06:43:23
 JVM version 1.5.1
 Operating system Microsoft Windows XP Profes...

System utilization

CPU Usages (%) 56
 Memory usage (%) 81
 Pages swapped out per second 209
 Client up time 10/10/2007 06:40:52

Global transport pool

Max. allowed transport objects 20
 Transactions rejected (%) 0
 Transactions slowed down (%) 0
 Avg. transaction wait time (s) 0
 Idle global transport pool hit ratio (%) 84
 Idle global transport pool size 15

Distribution of time (s)

Top applications

Name	CPU Usage (%)	Memory Usage (%)
db2pb.exe	16.000	14.200
javaw.exe	15.000	8.100
ninotes.exe	11.000	2.500

Statement details

Application server name salesnode1
 Connection pool size (max.) 17
 Connection pool size high water m... 17
 Current free connections 0
 Current used connections 17
 Used connections (avg.) 15.7
 Max. connection pool wait time (s) 4.8

Comparison with other clients

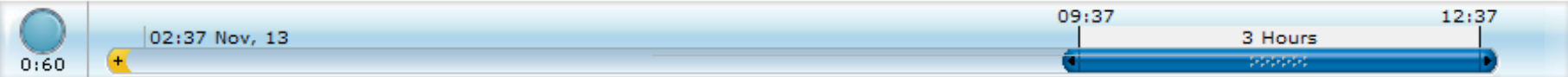
Name	Avg. Network Time (%)	CPU Usage (%)	Avg. Driver Wait Time	Avg. WAS Connection Pool Wait	Max. Allowed Connections	Max. Allowed Transport	Network Driver Level	Virtual Machine Version
sales.portal1.jk-enterprise.com	0.271	56.000	0.071	4.339	17.000	20.000	9.5.1	1.5.1.2
sales.portal2.jk-enterprise.com	0.365	62.000	0.082	0.723	20.000	20.000	9.5.1	1.5.1.2

5 second wait time indicates that the maximum number of allowed connections is not sufficient...

... which becomes also evident when comparing the parameters and metrics of this client with other clients.

Heat Chart Alerts Dashboard SLAs **In-flight analysis**

Database: Accounting



TOP 3 currently running SQL Statements DS Proc

Statement text	schema	E2E elapsed	occurrences	sort time	phys. I/O
SELECT TIME FROM UNIVERSE	SAP3	132.13	1323	123.32	1.303
SELECT SALARY FROM PAYMEN					
DELETE FROM ACCOUNT WHERE					

TOP by
 ● DS elapsed
 ● DS CPU time
 ● Physical I/O
 ● Time

Statement information X

Stmt text: SELECT TIME FROM UNIVERSE Analyze

Application	
DS user ID	KARN
Client IP addr / hostname	TPKARN.de.ibm.com
Client user ID	KARN
Client workstation name	TPKARN
Client application name	Jawaw.exe
Client accounting	N/A
application name	Online banking
application contact	hkarn@de.ibm.com
package	West.OLBank
class	Account
method	Transfer()
source line	314

Time distribution

Resource usage	
Query cost estimates	18.456
Buffer Pools	
Data – hit ratio (%)	43.4%
Data – physical reads / min	4323
Index – hit ratio (%)	54.2%
Index – physical reads / min	3214

Statement elapsed time	
Current	132.13 sec
last day	239.40 sec
last week	15.60 sec

Stop SQL Force application

Database Support by Product (as of today)

	DB2 for z/OS	DB2 for LUW	DB2 for i	IDS	Oracle	SQL Server	Sybase	MySQL
Data Studio	✓	✓	✓	✓				alphaworks derivative
Data Studio Administration Console	✓	✓		OpenAdmin Tool				
InfoSphere Data Architect	✓	✓	✓	✓	✓	✓	✓	✓
Optim Development Studio	✓	✓	✓	✓	✓			
Optim pureQuery Runtime	✓	✓	✓	✓	✓			
Optim Query Tuner	✓ + Workload	✓						
Optim Database Administrator	DB2 Admin Tool/Object Compare	✓						
Optim Test Data Management	✓	✓	✓	✓	✓	✓	✓	
Optim Data Privacy	✓	✓	✓	✓	✓	✓	✓	
Optim Data Growth	✓	✓	✓	✓	✓	✓	✓	
DB2 Performance Expert	Omegamon	✓						
DB2 PE Extended Insight		✓						
Database Encryption Expert	EE for DB2 and IMS	✓		✓	Vormetrics	Vormetrics	Vormetrics	

THANK
YOU

The image features the words "THANK YOU" in large, 3D, light blue letters. Each letter is filled with a different photograph of a person. The 'T' shows a man in a white shirt and orange tie. The 'H' shows a woman in a green top. The 'A' shows a man with a green face. The 'N' shows a woman with a blue patterned top. The 'K' shows a man with glasses. The 'Y' shows a man in a white shirt. The 'O' shows a man in an orange shirt. The 'U' shows a woman in a green top.

IBM Optim Solutions

- Optim Solutions Page:
 - <http://www.ibm.com/software/data/optim/>

- IBM Integrated Data Management (Optim and Data Studio):
 - <http://www.ibm.com/developerworks/spaces/optim>
 - Tutorials
 - Downloads
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 - Join the community!

- New demo: **Optim solutions for accelerating Java database access**
 - <https://www.ibm.com/developerworks/offers/lp/demos/summary/im-optimolutionsforjava.html>

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