

S H A R E

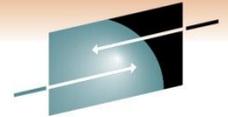
Technology • Connections • Results

Two for One: Optim Solutions Update and Optimizing DB2 for z/OS Query Performance

Bryan F. Smith bfsmith@us.ibm.com
IBM

Session: Xxx
Friday, March 4, 2011: 11:00 AM-12:00 PM
ACC, Room 201A



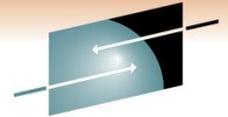


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Abstract

- **Optim Solutions Update:** Are you wondering how Optim Solutions relates to your z/OS DB2 Tools investment? Do you want to see what the lab is doing to help the z/OS DBA? Join one of our chief architects to hear how Optim solutions can extend administrative function for DB2 for z/OS, both today and in the future. The speaker will cover data design, performance and query monitoring, performance and query optimization, and key roadmap items.
- **Optimizing DB2 for z/OS Query Performance:** There are lots of factors that affect query performance and no silver bullets. Investigating performance issues includes looking at indexes, statistics, query design, cache size, execution mode, and the list goes on. Join the speaker as he digs into some of these areas in detail and at how Optim Solutions can help get resolutions faster and with more flexibility.

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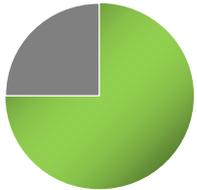
Agenda

- Introduction to Integrated Data Management (IDM)
- What can Data Studio be used for in DB2 for z/OS environments?
- How Java, .NET, and CLI applications can be managed like CICS/IMS applications
- What results can be realized by query tuning
- Data movement options
- What value is there to extending the DB2 backup and recovery utilities?
- Other DB2 for z/OS Tooling
- What's cooking back at the lab
 - Performance Management
 - Configuration Management
 - Maintenance Management
- Wrap-up

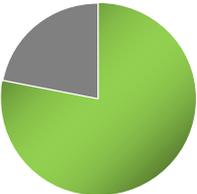
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Data Management Must Drive Competitive Advantage

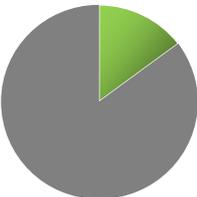
Survey: CIO's want to strengthen competitive advantage by better managing enterprise data



75% of CIO's believe they can strengthen their competitive advantage by better using and managing enterprise data.



78% of CIO's want to improve the way they use and manage their data.

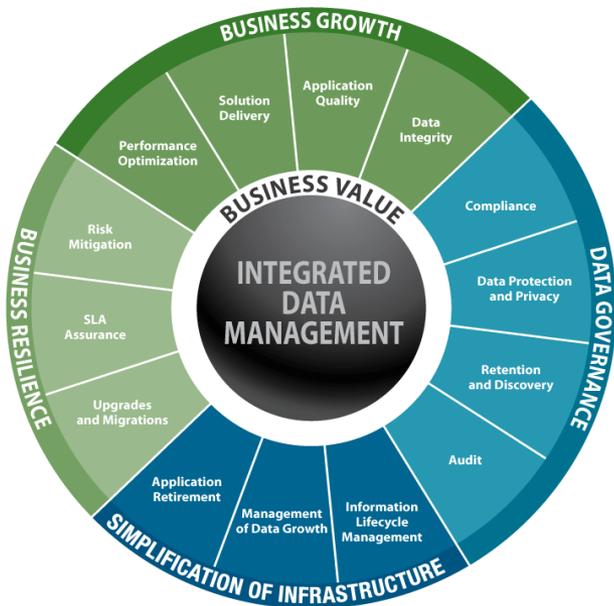


...but only 15% believe that their data is currently comprehensively well managed.

- ***Data management must drive competitive advantage***
 - Facilitate business alignment
 - Accelerate delivery of enterprise-ready, data-driven applications
 - Free up staff to drive business growth and optimization

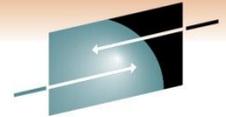
Introducing Integrated Data Management

An integrated, modular environment to manage enterprise application data, and optimize data-driven applications, from requirements to retirement

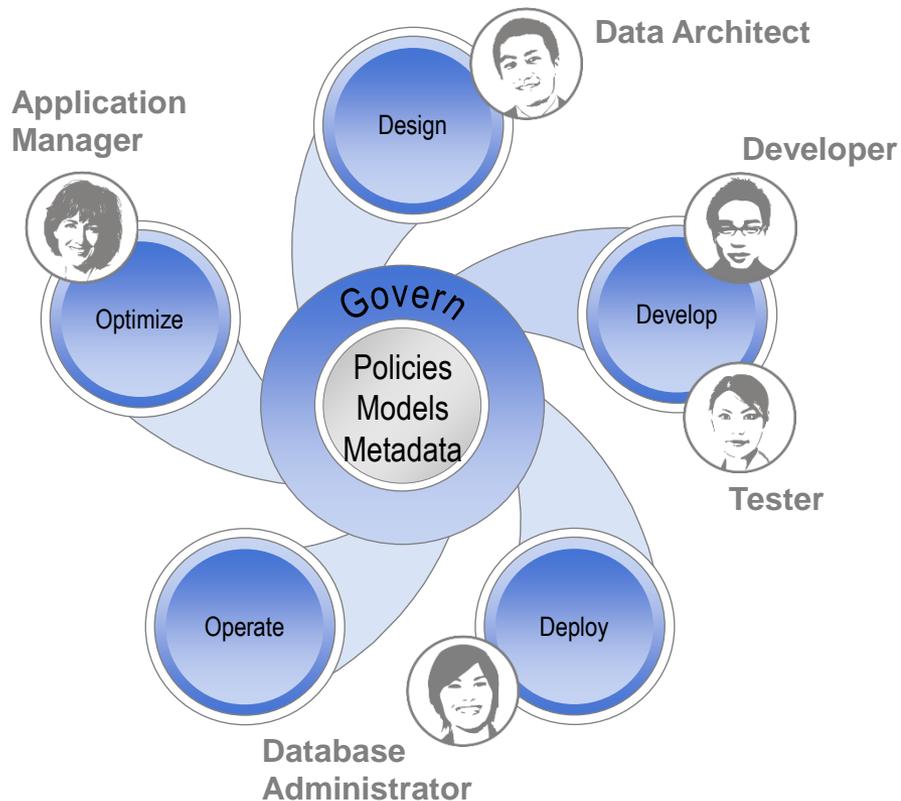


- ***Grow the business, without growing costs***
 - Develop and deploy business critical applications faster
 - Mitigate compliance risks with model-driven data governance
 - Prevent runaway infrastructure spending
 - Improve performance – of work teams, databases, applications, and business units

Integrated Data Management = Data Studio+Optim+DB2 for z/OS Tools



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*

Supporting Heterogeneous Environments

InfoSphere Data Architect

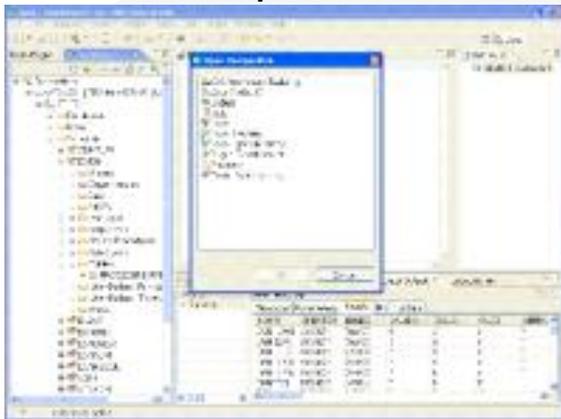


Integrated Data Management User Interface Directions

Data Studio and Optim

z/OS Tools

Eclipse UI



Develop and Deploy

- Design and Development
- Configuration
- Object Management
- Change Management
- Automation Planning
- Data Governance

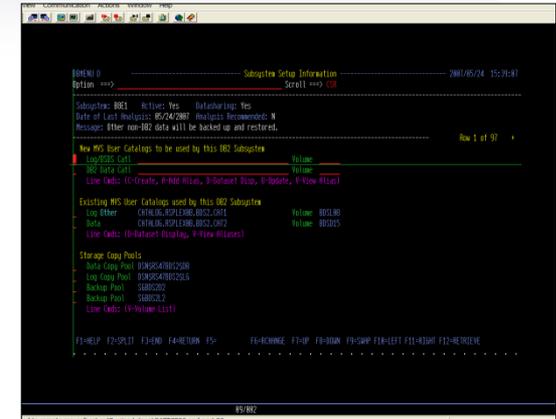
Web UI



Operate

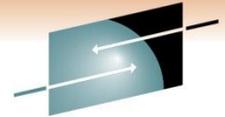
- Monitoring
- Automation Management
- Reporting
- Data Governance

3270



z/OS Database Administration

- Rich z/OS function
- Application Management
- Database Administration
- Performance Management
- Data Governance



DB2 for z/OS Tools Portfolio

Application Management

- InfoSphere Data Architect
- Optim Development Studio
- DB2 Path Checker
- DB2 Bind Manager
- DB2 SQL Performance Analyzer
- DB2 Table Editor
- Optim pureQuery Runtime

Utilities Management

- DB2 Utilities Suite
- DB2 Automation Tool
- DB2 Automation Toolkit SAP Edition
- DB2 Utilities Enhancement Tool
- DB2 High Performance Unload

Business Intelligence

- IBM DataQuant
- IBM QMF
- DB2 Web Query Tool

Database Administration

- DB2 Administration Tool
- DB2 Object Comparison Tool
- DB2 Administration Toolkit SAP Edition
- DB2 Storage Management Utility

Performance Management

- OMEGAMON XE DB2 Performance Expert
- OMEGAMON XE DB2 Performance Monitor
- DB2 Buffer Pool Analyzer
- Optim Query [Workload] Tuner
- DB2 Query Monitor
- DB2 Performance Toolkit SAP Edition

Information Integration

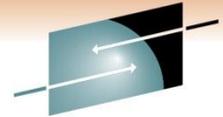
- WebSphere Classic Data Event Publisher
- WebSphere Classic Federation Server
- WebSphere Classic Replication Server
- WebSphere DataStage
- WebSphere Replication Server
- DataMirror

Backup and Recovery

- Application Recovery Tool for IMS and DB2 Databases
- DB2 Archive Log Accelerator
- DB2 Change Accumulation Tool
- DB2 Cloning Tool
- DB2 Log Analysis Tool
- DB2 Object Restore Tool
- DB2 Recovery Expert

Data Governance

- IBM Optim Data Growth
- IBM Optim Data Privacy
- IBM Optim Test Data Management
- DB2 Audit Management Expert
- IBM Database Encryption Expert
- Data Encryption for DB2 and IMS



DB2 Developer Workbench vs. Data Studio

before

now

IBM DB2 Developer Workbench V9.1

- SQL Query Editor
- SQLJ Editor
- SQL Builder
- XQuery Builder
- SQL Routine Debugger
- Java Routine Debugger
- XML Editor
- XML Schema Editor
- Data Management
- Visual Explain
- Project Management

***Data Studio is a full replacement of
DB2 Developer Workbench
plus much more***

- ***DB2 for Linux, Unix, Windows v8.x, v9.x***
- ***DB2 for z/OS v8, v9, v10***
- ***DB2 for i5/OS v5r2, v5r3, v5r4***
- ***Informix Dynamic Server (IDS) v9.x, v10.x, v11***

IBM Data Studio V2.2

- Integrated Query Editor – SQL + XQuery
- SQLJ Editor
- SQL Builder
- XQuery Builder
- SQL Routine Debugger
- Java Routine Debugger
- XML Editor
- XML Schema Editor
- Data Management
- Visual Explain
- Project Management
- ER Diagramming
- Data Distribution Viewer
- Object Management
- Browse & Update Statistics
- Query Tuning (stats advisor, query formatter, etc.)
- Security Access Control
- Connection Management integration with Kerberos and LDAP
- Data Web Services
- IDS Server Support

No-charge

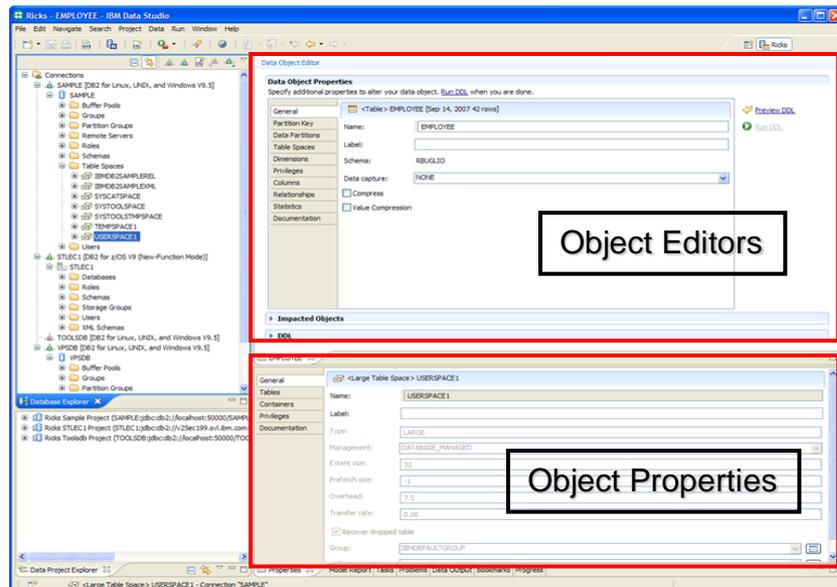
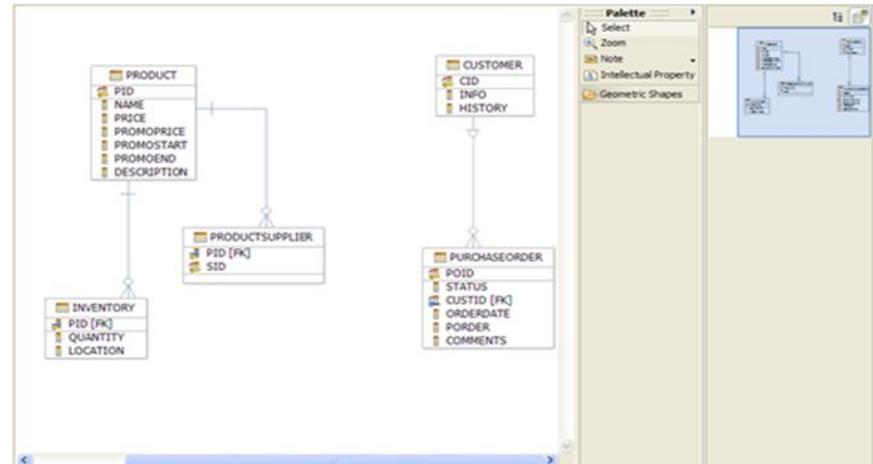
Data Studio is no longer used as a brand

Data Studio: Data Modeling / App & DB Dev

A Consistent & Productive work environment

Create, Alter, Drop, Browse and Filter database objects

ER Diagramming

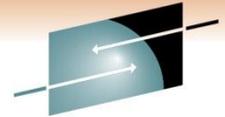


Integrated Query Editor

```

-- <ScriptOptions statementTerminator=";" />
XQUERY declare default element namespace "http://posample.org";
for $city in fn:distinct-values(db2-fn:xmlcolumn('CUSTOMER.INFO')/custo
return
<city name ='($city)')
(
  for $cust in db2-fn:xmlcolumn('CUSTOMER.INFO')/customerinfo[addr
  let $po := db2-fn:sqlquery("SELECT XMLELEMENT( NAME ""pos"",
    (XMLCONCAT( XMLELEMENT(NAME ""custid"", c.custid),
      XMLELEMENT(NAME ""order"", c.porder)))
    FROM purchaseorder AS c")
  let $id := $cust/@Cid,
    $order := $po/pos[custid=$id]/order
  return
  <customer id='($id)')
  
```

- Express yourself with optimal queries
 - Content assistance for database objects
 - Rapid interactive end-user feedback
 - Extensible templates
 - Multiple SQL statement testing
 - SQL assistance and XQuery assistance



Unleash SQL in your IDE

- SQL content assist

```
// Select GOSALEST.CUST by parameters
@Select(sql = "SELECT CUST_CODE, CUST_FRST_NAME, CUST_LAST_NAME, CUST_ADDR1,"
+ " CUST_ADDR2, CUST_CITY, CUST_POST_ZONE, CUST_CTRY_CODE, CUST_PHN_NBR,"
+ " CUST_INFO, CUST_EMAIL, CUST_GNDR_CODE, CUST_PROV_STATE"
+ " FROM GOSALEST.CUST"
+ " WHERE ")
Cust getCust(int cust_code
```

Press CTRL-SPACE
to invoke content
assist or auto complete

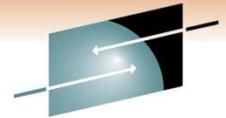
- CUST_ADDR1 - VARCHAR(128)
- CUST_ADDR2 - VARCHAR(128)
- CUST_CITY - VARCHAR(128)
- CUST_CODE - INTEGER
- CUST_CTRY_CODE - VARCHAR(128)
- CUST_EMAIL - VARCHAR(128)
- CUST_FRST_NAME - VARCHAR(128)
- CUST_GNDR_CODE - DECIMAL(3, 0)
- CUST_INFO - CLOB(32768)

Press 'Ctrl+Space' to show SQL Proposals

- SQL validation

```
// Select GOSALEST.CUST by parameters
@Select(sql = "SELECT CUST_CODE, CUST_FRST_NAME, CUST_LAST_NAME, CUST_ADDR1,"
+ " CUST_ADDR2, CUST_CITY, CUST_POST_ZONE, CUST_CTRY_CODE, CUST_PHN_NBR,"
+ " CUST_INFO, CUST_EMAIL, CUST_GNDR_CODE, CUST_PROV_STATE"
+ " FROM GOSALEST.CUST"
+ " WHERE CUST_CODE = ?")
Cust getCust(int cust_code
```

Table "CUST" does not contain column "CUST_COD".
Press 'F2' for focus.



Unleash SQL in your IDE

- Run SQL at design time without the need to compile the program
- Launch Visual Explain

A screenshot of a SQL editor window. The SQL text is: `@Select(sql = "SELECT CUST_CODE, CUST_FRST_NAME, CUST_LAST_NAME, CUST_ADDR1," + " CUST_ADDR2," + " CUST_INFO," + " FROM GOSALESCUST," + " WHERE CUST_CODE = 100");`. A context menu is open over the text, showing options: Undo Typing (Ctrl+Z), Revert File, Save, Open Declaration (F3), and Create Stored Procedure...

A dialog box titled "Specify Host Variable Values". It contains a table for "Host Variable Values" with columns "Name", "Type", and "Value". The table has one row with a question mark in the "Name" column, "INTEGER" in the "Type" column, and "100" in the "Value" column. There are "Finish" and "Cancel" buttons at the bottom.

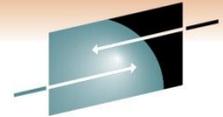
A screenshot of a menu item "Run SQL" with a play icon and the keyboard shortcut "Shift+F6". A mouse cursor is pointing at it.

A screenshot of a menu item "Launch Visual Explain" with a person icon. A mouse cursor is pointing at it.

A "Data Output" window showing the results of a query. It has tabs for "Messages", "Parameters", "Results", and "Profiling Data". The "Results" tab is active, showing a table with columns: CUST_CODE, CUST_FRST..., CUST_LAS..., CUST_ADD..., CUST_P. The data row is: 100, John, Smith, 77 Story R..., 95141.

A "Visual Explain" diagram showing the execution plan for the SQL query. The diagram is a tree structure of nodes. The root node is "RETURN(1) 7.58". Below it is "FETCH(4) 7.58". Below "FETCH" are two nodes: "IXSCAN(6) 0.02" and "GOSALESCUST.CUST". Below "IXSCAN" is a diamond-shaped node "CUST_PK". Below "CUST_PK" is another "GOSALESCUST.CUST" node. An "Overview" window is visible in the bottom right corner.

Stored Procedure Support SQL and Java Debugger



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Debug commands

variables

```
P1: BEGIN
-- Declare cursor
DECLARE cursor1 CURSOR WITH RETURN FOR
    SELECT PURCHASEORDER.POID, PURCHASEORDER.STATUS, PURCHASEORDER.ORDERDATE,
    PURCHASEORDER.PORDER, PURCHASEORDER.COMMENTS, CUSTOMER.CID,
    CUSTOMER.INFO, CUSTOMER.HISTORY
    FROM CUSTOMER JOIN PURCHASEORDER ON CUSTOMER.CID = PURCHASEORDER.CUSTID
    WHERE PURCHASEORDER.STATUS = V_STATUS;

-- Cursor left open for client application
OPEN cursor1;
```

source

Status	Action	Object Name
In progress	Debug	CHECK_ORDERS
Success	Run	CHECK_ORDERS
Success	Deploy	CHECK_ORDERS
Success	Run	s1.sql
Success	Run	s1.sql

GHUTCHIS.CHECK_ORDERS(IN V_STATUS VARCHAR(10))

Messages Parameters Results Profiling Data

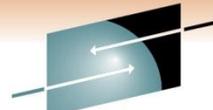
GHUTCHIS.CHECK_ORDERS - Run started.

Data returned in result sets is limited to the first 50 rows.

Data returned in result set columns is limited to the first 100 bytes or characters.

GHUTCHIS.CHECK_ORDERS - Calling the stored procedure.

Integrated editor and debugger for SQL PL and Java (JDBC or SQLJ)

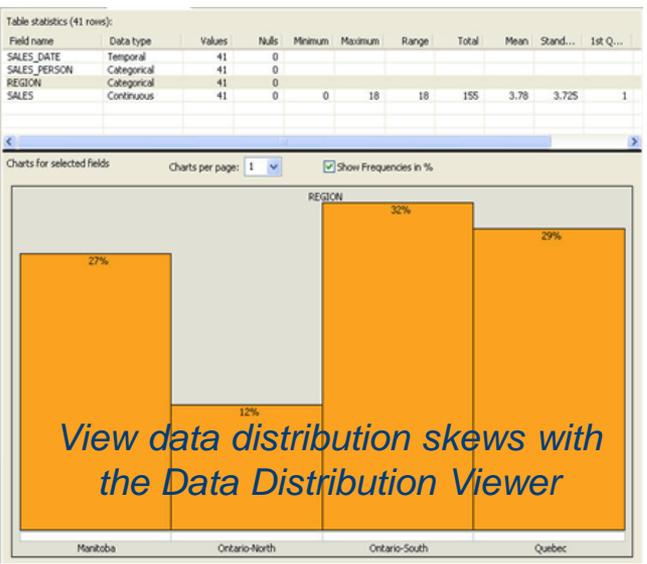


Edit Data

Data Management

EMPNO	CHAR(6)	FIRSTNAME	VARCHAR(12)	MIDINIT	CHAR(1)	LASTNAME	VARCHAR(15)	WORKDEPT	CHAR(3)	PHONE	CHAR(4)	HIREDATE	DATE	JOB
000020		CHRISTINE		I		MAAS		AOO		3978		1/1/95		PRES
000020		MICHAEL		L		THOMPSON		BO1		3476		10/10/03		MANU
000030		SALLY		A		KIVAN		CO1		4738		4/5/05		MANU
000050		JOHN		B		GEYER		EO1		6789		8/17/79		MANU
000060		IRVING		F		STERN		D11		6423		9/14/03		MANU
000070		EVA		D		PULASKI		O21		7831		9/30/05		MANU
000090		EELEEN		W		HENDERSON		E11		5498		8/15/00		MANU
000100		THEODORE		Q		SPENCER		E21		0972		6/19/00		MANU
000110		VINCENZO		A		LUCCHESI		AOO		3490		5/16/88		SALE
000120		SEAN		K		O'CONNELL		AOO		2167		12/5/93		CLER
000130		DELORES		M		QUINTANA		CO1		4579		7/28/01		ANAL
000140		HEATHER		A		NICHOLS		CO1		1793		12/15/06		ANAL
000150		BRUCE		A		ADAMSON		O11		4510		2/12/02		DESD
000160		ELIZABETH		R		PIANKA		O11		3782		10/11/06		DESD
000170		MASATOSHI		J		YOSHIMURA		O11		2890		9/15/99		DESD
000180		MARILYN		S		SCOUTTEN		O11		1682		7/7/03		DESD
000190		JAMES		H		WALKER		O11		2986		7/26/04		DESD
000200		DAVID		B		BROWN		O11		4501		3/3/02		DESD
000210		WILLIAM		T		JONES		O11		0942		4/1/98		DESD
000220		JEFFREY		K		LUFT		O11		0672		8/29/98		DESD
000230		JAMES		J		JEFFERSON		O21		2094		11/21/96		CLER
000240		SALVATORE		M		MARINO		O21		3780		12/5/04		CLER
000250		DANIEL		S		SMITH		O21		0961		10/30/99		CLER
000260		SYBIL		P		JOHNSON		O21		8953		9/11/05		CLER
000270		MARIA		L		PEREZ		O21		9001		9/30/06		CLER
000280		ETHEL		R		SCHNEIDER		E11		8997		3/24/97		OPEP
000290		JOHN		H		PARKER		E11		4502		5/30/06		OPEP
000300		PHILIP		X		SMITH		E11		2095		6/19/02		OPEP
000310		MAUDE		F		SETRUGHT		E11		3332		9/12/94		OPEP
000320		RAMBAL		V		MEHTA		E21		9990		7/7/95		FSBL
000330		WING		F		LEE		E21		2103		2/23/06		FSBL
000340		JACKSON		R		GOLDFOT		E21		5698		5/5/77		FSBL
000350		PITAN		T		HFNBSHGFGR		AOO		1078		1/1/64		SAI F

Data Distribution Editor



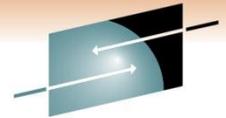
View data distribution skews with the Data Distribution Viewer

Roles, Users, Privileges

The screenshot shows the SQL Enterprise Manager interface. On the left, the 'Roles' folder is expanded, and a 'Role' is being managed. A box labeled 'Manage Roles' points to this area. On the right, the 'Data Object Properties' dialog is open, showing the 'Privileges' tab. A box labeled 'Privileges By User' points to the list of users and their privileges. Below that, the 'Privileges By Object' dialog is open, showing a table of privileges for a specific object.

Grantee	Grantee Type	Privilege	Grantor	WITH GRANT OPTION
RBUGLID	User	ALTER	SYSDBM	
RBUGLID	User	CONTROL	SYSDBM	
RBUGLID	User	DELETE	SYSDBM	
RBUGLID	User	INDEX	SYSDBM	
RBUGLID	User	INSERT	SYSDBM	
RBUGLID	User	REFERENCES	SYSDBM	
RBUGLID	User	SELECT	SYSDBM	
RBUGLID	User	UPDATE	SYSDBM	

IBM Data Studio



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- Training and certification
- Events
- Support

Communities:

- IBM Business Partners
- ISVs
- Developers

IBM Data Studio (stand-alone)

No-charge

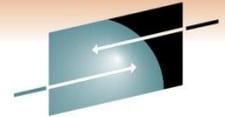
Downloads

To properly configure your download, please review the information below. Select the appropriate offering. When you are done, press the "Continue" button at the bottom.

Offering	Platform	Format
<input type="radio"/> IBM Data Studio Version 2.2 Languages: English	Red Hat Linux SUSE Linux Enterprise Desktop(SLED) SUSE Linux Enterprise Server (SLES)	download
<input type="radio"/> IBM Data Studio Version 2.2 Languages: English	Windows Vista Business Windows Vista Enterprise Windows Vista Ultimate Windows XP Professional	download

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IBM Optim Development Studio

An integrated database development environment that speeds application design, development, and deployment while increasing data access performance and manageability.

DB2.

Informix.

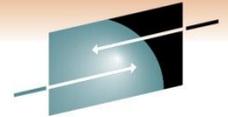
ORACLE

- Enhance developer productivity
 - Drag and drop creation of Web services
 - Provide a seamless SQL/Java experience
 - Generate a data access layer using Java objects, JSON, or, XML
 - Enhance problem isolation and impact analysis, even when using frameworks that generate the SQL
- Provide expert-equivalent performance
 - Facilitate use of JDBC and SQL data access best practices
 - Improve DB2 performance, predictability, and manageability by enabling transparent activation of static SQL (i.e. no change to the application) for Java and .NET
 - Facilitate DBA collaboration and optimization
- Enhance security
 - Eliminate SQL injection risk



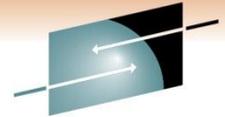
“Development Studio enables us to bridge the gap between object-oriented design and relational database technology. As a result, we can speed the development of high quality applications and improve developer productivity by between 25 and 50 percent”

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pureQuery

- How Java, .NET, and CLI applications can be managed like CICS/IMS/COBOL applications
 - What problems do these application platforms present to the DBA?
 - ORM frameworks obscure the SQL generated
 - Dynamic SQL
 - Capturing SQL for review/tune/revisement
 - Converting to static SQL and the benefits of doing so



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Frequently Cited Concerns



I have more and more Java workload coming into my data server driving up costs, but the budget is not keeping pace.

I don't even want to allow framework-generated SQL on my database. If I can't see it, I don't know how it will impact me.

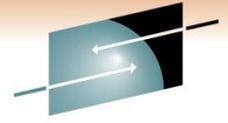


Java, .NET, and CLI performance problems are a real pain to resolve because I can't even tell what application issued the SQL.



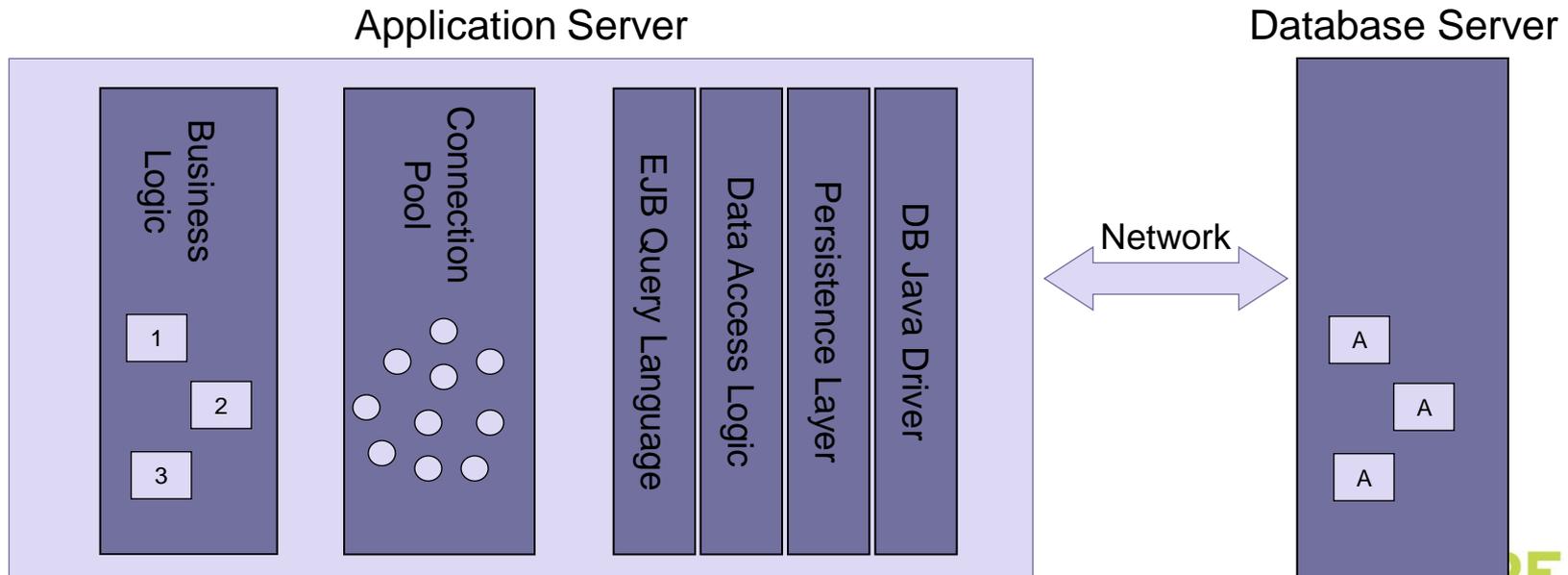
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Contemporary Application Stack Challenges

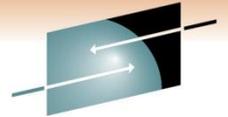


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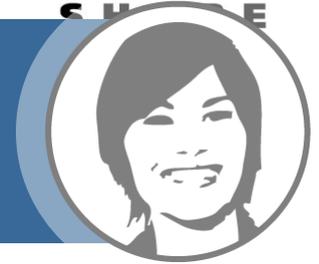
- Simplify development, but ...
 - Challenge problem resolution
 - Impact performance
 - Obscure impact analysis
 - Impede capacity planning



Introducing pureQuery



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A high-performance, data access platform to simplify developing, managing, securing, and optimizing data access for new and existing applications.

pureQuery Components:

- Optim Development Studio
 - Integrated development environment with Java and SQL support
 - Improve problem isolation and impact analysis
- Simple and intuitive API
 - Enables SQL access to databases or in-memory Java objects
 - Facilitates best practices
- Optim pureQuery Runtime
 - Flexible static SQL deployment for DB2



and



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pureQuery Improves Performance, Security, and Manageability for DB2, Informix, and Oracle...*Without Changing a Line of Code*



Three steps

1. Capture the SQL

- Use pureQuery API, generate from WebSphere JPA, or capture while executing
- Use with custom-developed, framework-based, or packaged applications
- Translation of literals to host variables (new in 2.2)

2. Bind SQL to DB2 (Client Optimization)

- Use tooling in Data Studio Developer, WAS console or command line

3. Choose execution mode

- Dynamic or static
- Choose at deployment time instead of development time

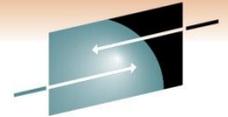
Static SQL value

- Make response time predictable
 - Lock in the SQL access path pre-execution
- Limit user access and reduce SQL injection
 - Grant execute privileges on the query packages rather than access privileges on the table
- Accelerate problem resolution
 - Trace SQL execution to a specific package and the originating source
- Improve impact analysis and capacity planning
 - Visualize application SQL and correlation metadata
- Increase system capacity
 - Drive down DB cycles



"The ability to use static SQL with pureQuery is huge. Recently, I worked with a client who could reduce CPU usage by 7 percent thanks to this one feature."

— David Beulke, Pragmatic Solutions Inc.



Dynamic vs. Static Execution

Dynamic SQL Full Prepare

Check auth for package / plan

Parse SQL Statement

Check Table / View Auth

Calculate access path

Store access path in a temporary package

Execute SQL statement

Dynamic SQL Short Prepare

Check auth for package / plan

Copy skeleton from cache to local DB2 thread storage

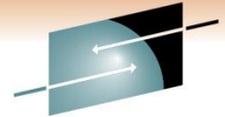
Execute SQL statements

Static SQL

Check auth for package / plan

Extract access path from
SYSIBM.PACKAGES and
STATEMENTS

Execute SQL statements



Static Execution Advantages

Feature	Dynamic SQL (pureQuery, JDBC)	Static SQL (pureQuery, SQLJ)
Performance	Can approach static SQL performance with help from dynamic SQL cache. Cache misses are costly	All SQL parsing, catalog access, done at BIND time. Fully optimized during execution.
Access path reliability	Unpredictable – Any prepare can get a new access path as statistics or host variables change	Guaranteed – locked in at BIND time All SQL available ahead of time for analysis by EXPLAIN.
Authorization	Privileges handled at object level. All users or groups must have direct table privileges – Security exposure, and administrative burden	Privileges are package based. Only administrator needs table access. Users/Groups have execute authority. Prevent non-authorized SQL execution.
Monitoring, Problem determination	Database View is of the JDBC or CLI package – No easy distinction of where any SQL statement came from.	Package View of applications makes it simple to track back to the SQL statement location in the application
Capacity planning, Forecasting	Difficult to summarize performance data at program level.	Package Level Accounting gives program view of workload to aid accurate forecasting.
Tracking dependent objects	No record of which objects are referenced by a compiled SQL statement	Object dependencies registered in database catalog

Improving Throughput with pureQuery, a z/OS Example

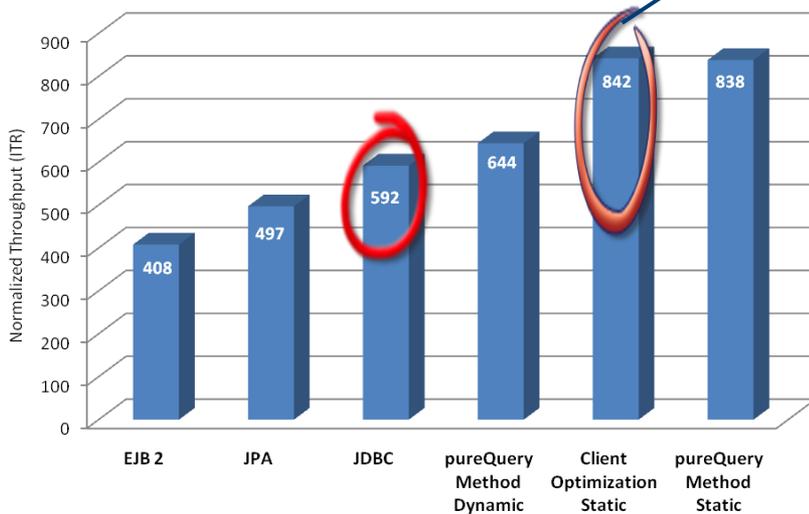


- In-house testing shows **over 40% reduction** in CPU costs over dynamic JDBC using pureQuery and DB2 for z/OS (type-2)
 - Read [IBM Optim pureQuery Runtime for z/OS Performance](#)
 - IRWW – an OLTP workload, cache hit ratio between 70 and 85%

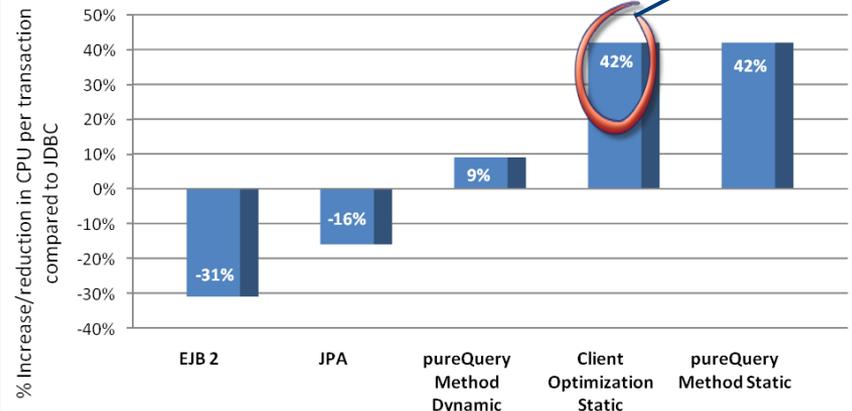
Preset application path never varies at runtime

Reduced CPU per transaction means more growth on existing resources

Normalized Throughput by API for JDBC Type 2 Driver

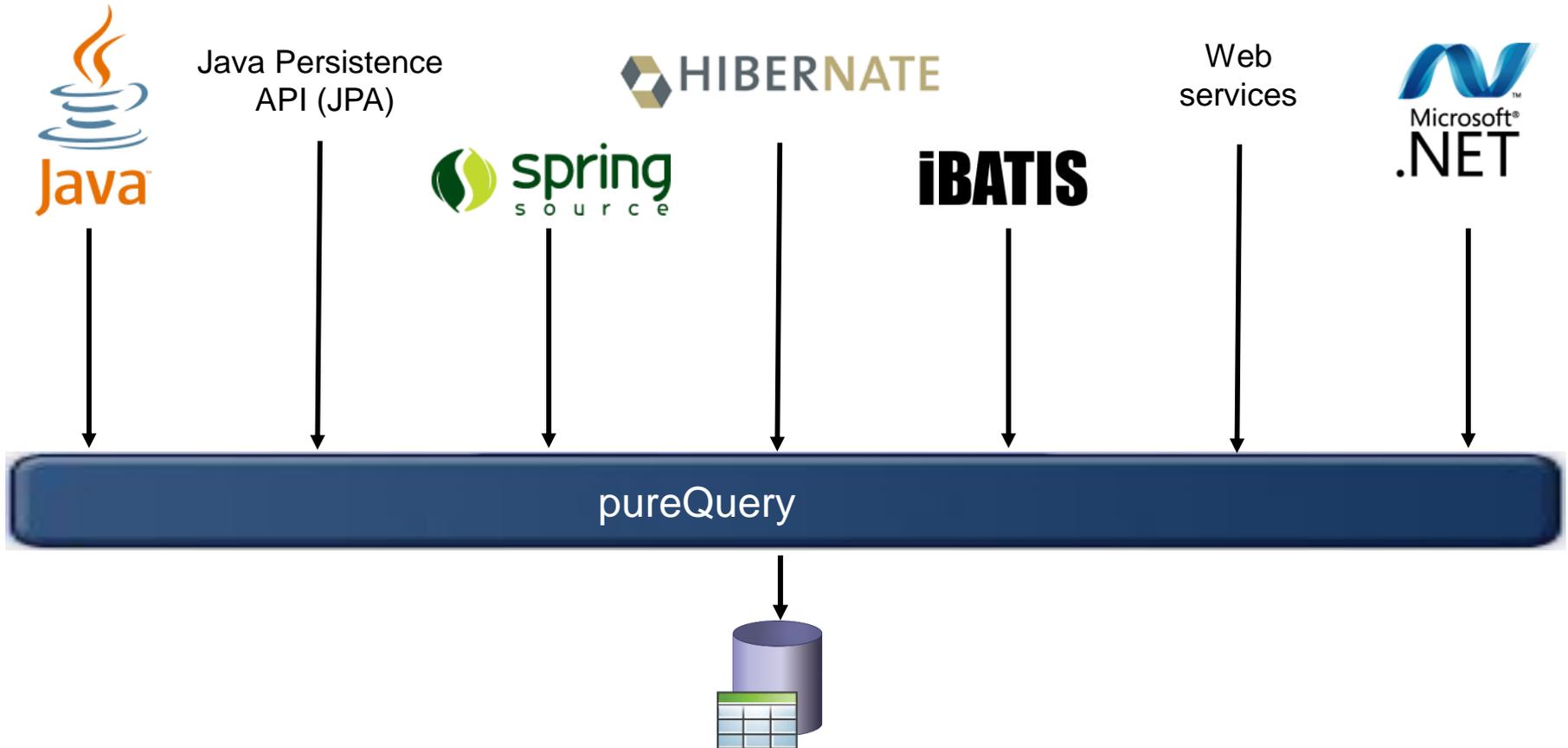


% Increase/Reduction in CPU per Transaction Compared to JDBC Type 2 Driver

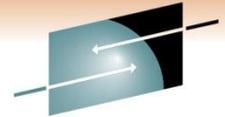


Java Database Access and pureQuery

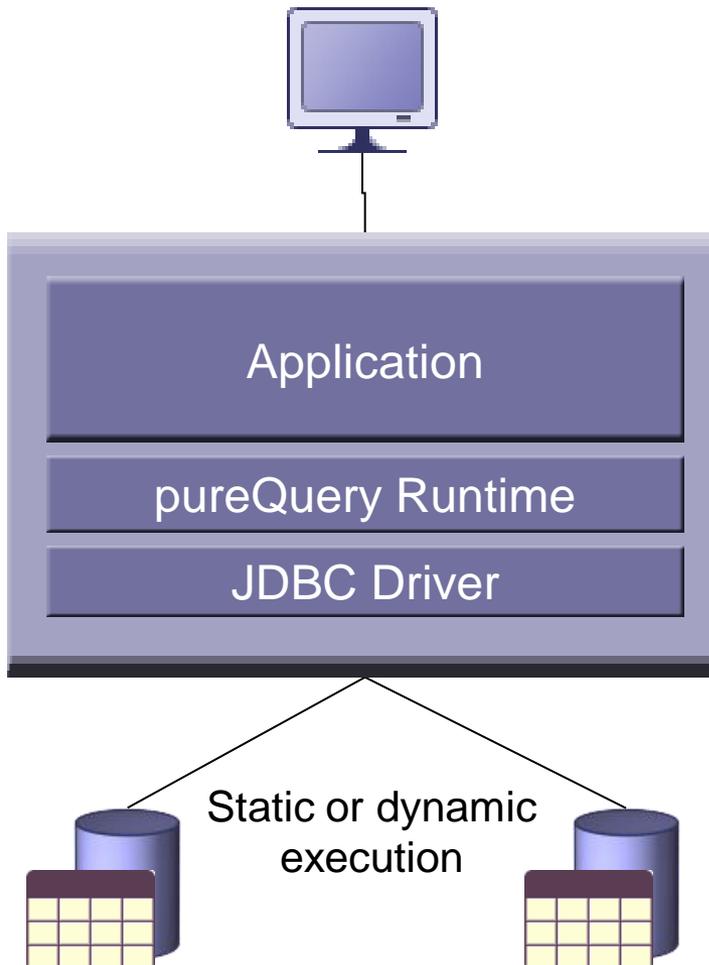
Many on-ramps for new and existing applications



DB2 (z/OS, i & LUW), Informix, and Oracle now
More coming



Deploying with pureQuery Runtime



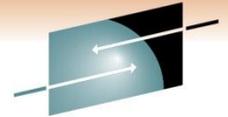
Application tier:

- z/OS, Linux, UNIX, Windows

Database tier:

- DB2 for z/OS
- DB2 for i
- DB2 for Linux, UNIX, and Windows
- Informix Dynamic Server
- Oracle

Unique Package Names Improves PD on DB2 for z/OS



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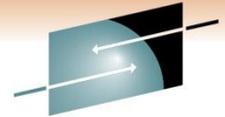
- Most dynamic Java applications use packages SYSLN00 making it hard to identify specific programs
- Unique package names link SQL to Java Beans, similar to CICS transaction names to programs.

Static
pureQuery
Java SQL

Dynamic
Java SQL

```
ZALLU      VTM      02      V410./C DB1S 09/12/08 11:29:22  2
> Help PF1      Back PF3      Up PF7      Down PF8      Sort PF10      Zoom PF11
> T.A          OMEGAVIEW PA2
>          THREAD ACTIVITY:  Enter a selection letter on the top line.
> *-ALL      B-TSO      C-CICS      D-IMS      E-BACKGROUND  F-DIST ALLIED
> G-DIST DBAC  H-UTIL      I-INACT      J-FILTER      K-FUNCTIONS  L-STORED PROC
> M-TRIGGERS  N-SYSPLEX  O-ENCLAVES  P-WORKSTA
=====
>          ALL THREADS CONNECTED TO DB2
PTHDA                                           FLTR ON
+
+ *
+ Elapsed      Package      CPU      Status      GetPg      Update      Commit      CORRID
+ -----
+ 00:00:13.6    PAW_OR_0     00.0%    IN-DB2      25         0         0    db2jcc_appli
+ 00:02:27.3    SYSLN200     00.0%    IN-DB2      897        0         0    db2jcc_appli
+ 00:02:52.3    SYSLN200     00.0%    IN-DB2     1025        0         0    db2jcc_appli
+ 00:03:05.8    SYSLN200     00.0%    IN-DB2     1324        0         0    db2jcc_appli
+ 00:02:32.7    SYSLN200     00.0%    IN-DB2      961        0         0    db2jcc_appli
+ 00:02:59.2    SYSLN200     00.0%    IN-DB2     1046        0         0    db2jcc_appli
=====
```

Static SQL for security – Administering table privileges



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- Dynamic SQL
 - Table privileges granted directly to users(groups)/secondary authids
 - Security exposure and administrative burden

PAYROLL

**GRANT SELECT
ON TABLE PAYROLL
TO DEPT_D47**



NAME	POSITION	SALARY	...

- Static SQL (pureQuery)
 - Users get no table privileges

**GRANT SELECT
ON PAYROLL
TO BIND_ADMIN**

**GRANT EXECUTE
ON PACKAGE
POSITION_REPORT
TO DEPT_D47 PACKAGE**



BIND

PAYROLL

**SELECT NAME,
POSITION FROM
PAYROLL...**

NAME	POSITION	SALARY	...

Reduce Costs with zIIP and zAAP

- Using COBOL or SQL/PL stored procedures instead of executing SQL directly
 - Separation of application development from data access
 - DBAs retain better control over SQL including static execution
 - If not written in DB2 9 for z/OS's Native SQL/PL, **the stored procedure must use general purpose processors**
- pureQuery introduces alternatives
 - Create Java stored procedures to run on zAAP using the pureQuery runtime
 - DBAs retain control, Data Studio helps with development, pureQuery executes statically
 - Execute SQL directly from Java application or method to run on zIIP
 - Developers use Data Studio Developer to generate access layer with pureQuery, content assist helps with best practices and SQL validation, packages SQL for easy collaboration with DBA, pureQuery executes statically

More Visibility and Control of Application SQL



- Capture SQL
- Share, review, and optimize SQL
- Revise and validate equivalency
- Bind for static execution or run dynamically
- Restrict SQL to eliminate SQL injection

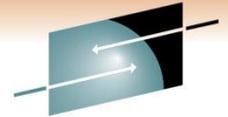


IT PRO has been watching and charting the progress of what is one of the biggest and most high profile web security threats of this year - the SQL injection.

By Asavin Wattanajutra, 4 Aug 2008 at 11:55



Capture Application SQL: At Development or Later

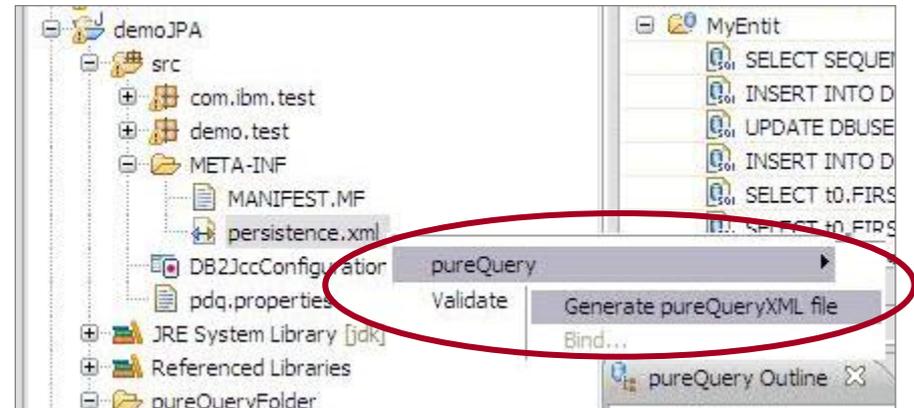


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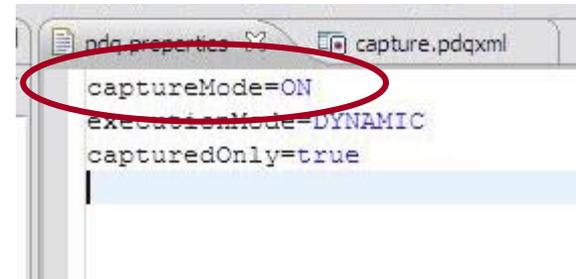


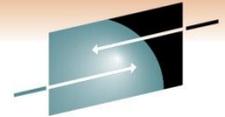
Three methods

1. Use pureQuery API
2. Use JPA and generate the pureQuery file
3. Set captureMode=ON and execute the program



IBM Optim
Development
Studio





Visualize Application and SQL Metadata



- Review the captured SQL
- View metrics about execution frequency and duration
- Share captured SQL with DBA

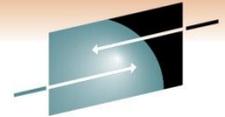
IBM Optim Development Studio

The screenshot shows the IBM Optim Development Studio interface. On the left, a 'Package' tree shows a 'testCO' package with several SQL statements. The main area displays a 'pureQuery Outline' for a specific SQL statement. Below this, a table shows performance metrics for various SQL lines. An arrow points from the 'pureQuery Outline' tab to the table.

	Execution Count	Max Time	Average	Min
ClientOptimizerDemo				
database				
DepartmentJDBCSample.java				
Line# 116: SELECT DEPTNO, DEPTNAME, MGRNO, LOCATION	49	12625627	5366204.755102041	41
Line# 123: getSql()	0	0	0.0	
Line# 108: SELECT DEPTNO, DEPTNAME, MGRNO, ADMRDEP	54	214289805	9491409.166666666	41
Line# 100: SELECT DEPTNO FROM DEPARTMENT	32	17681018	5702409.53125	41
Line# 124: SELECT DEPTNAME FROM DEPARTMENT	0	0	0.0	
ClientOptimizerDemo2				

SQL Outline

Speed up problem isolation for developers – even when using frameworks



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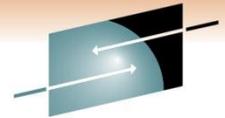
- Capture application-SQL-data object correlation (with or without the source code)
- Trace SQL statements to using code for faster problem isolation
- Enhance impact analysis identifying application code impacted due to database changes
- Answer “Where used” questions like “Where is this table used 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 shows the IBM Optim Development Studio interface. The top pane displays a Java method named `deleteEntities()`. A red line highlights the line `int deleted_entities = deleteQuery.executeUpdate();` in the code. Below the code editor, the 'pureQuery Outline' view is visible, showing a tree structure of database objects. A red line also highlights the corresponding SQL statement in the outline: `DELETE FROM DBUSER1.MYENTITY TO WHERE (t0.FIRSTN = ?)`. A context menu is open over the SQL statement, showing options like 'Show in Source', 'Run SQL', 'Show in SQL Editor...', 'Export SQL to File...', 'Launch Visual Explain', and 'Generate pureQuery code...'. An arrow points from the bottom-left text area towards the SQL Outline view.

IBM Optim
Development Studio

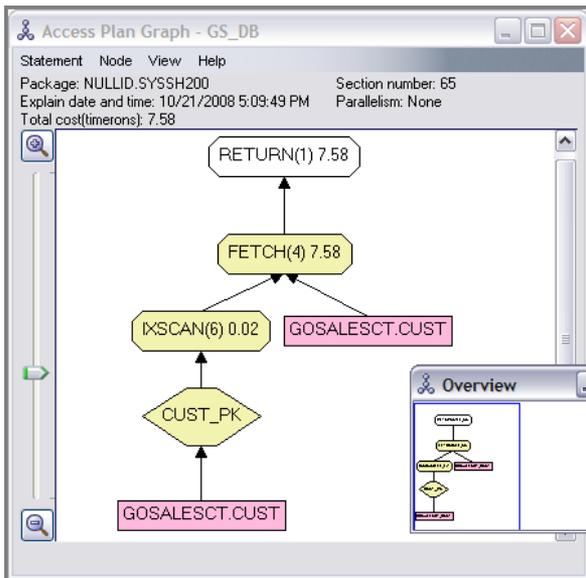
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Optimize SQL



- Launch Visual Explain



- Copy SQL to Optim Query Workload Tuner

Index Advisor Recommendations

Customized and Recommended Indexes

Add Index Edit Index Remove Index

Feature Details	Creator	Object Name	Columns	Estimated Disk Space
<input checked="" type="checkbox"/> LINEITEM <input checked="" type="checkbox"/> Index	DB2OE	LINEITEM_VIRT_IDX_1181...	L_RETURNFLAG(ASC) L_S...	717.08203125 M

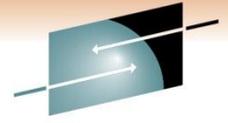
Existing indexes

Feature Details	Object Name	Columns
<input checked="" type="checkbox"/> LINEITEM Index	PXL@OKSORFSKEPOC	L_ORDERKEY(ASC) L_SHIPDATE(ASC) L_RETURNFLAG(ASC) L_SUPPK...
<input checked="" type="checkbox"/> ORDER Index	SXL@PKSKOKEPDSQN	L_PARTKEY(ASC) L_SUPPKEY(ASC) L_ORDERKEY(ASC) L_EXTENDED...

DDL Details

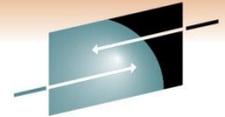
```
CREATE INDEX 'DB2OE'.LINEITEM_VIRT_IDX_1181023618203' ON 'SYSADM'.LINEITEM (
  L_RETURNFLAG ASC, L_SUPPKEY ASC, L_RECEIPTDATE ASC, L_SHIPDATE ASC,
  L_SHIPMODE ASC, L_ORDERKEY ASC, L_PARTKEY ASC, L_LINENUMBER ASC,
  L_QUANTITY ASC, L_EXTENDEDPRICE ASC, L_DISCOUNT ASC, L_TAX ASC,
  L_LINESTATUS ASC, L_COMMITDATE ASC, L_SHIPINSTRUCT ASC, L_COMMENT ASC)
NOT PADDED FREEPAGE 0 PCTFREE 10;
```

Query Tuning



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Introduction to query tuning

Query performance causes application outage

- Customer example
 - Application service drops from 3 seconds to 5 minutes
 - Limited performance management expertise
 - Took 3 days to identify the problem query
 - 5 day application outage
 - Loss of confidence in IT team
 - Time and money in analysts
- Expert analysis revealed
 - Relevant statistics were not being collected
 - Wasted CPU resources due to default statistics collection
 - Index design was very poor
 - Rapid development practices drove untuned queries into production

Poor data

Poor design

Wasted resources

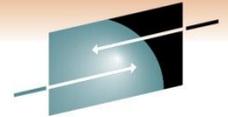
Poor process
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Introduction to query tuning

Why is query tuning such a pain?

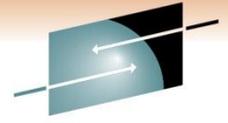


- Development
 - Lack of query tuning skills
 - Use of frameworks that generate SQL
 - Inadequate testing environments to drive the workload and data scale
 - Disconnect between application and data groups
- Production
 - Performance problems appear without warning
 - Aggregate information from multiple places
 - Complexity of analysis requires specialized skills
 - Need to consider entire workloads, not just single queries



Introduction to query tuning

- Why do we have to perform query and system tuning? Isn't this why I have DB2?
 - DB2 is powerful, but it's not all-knowing
 - DB2 doesn't know what queries are going to be submitted
 - DB2 doesn't know object sizes or cardinality unless statistics are gathered
 - DB2 doesn't know about cross-table correlation
 - DB2 doesn't know how many rows will be fetched, unless told
 - The biggest reason for a non-optimal access path is because the desired statistics are not collected
- Defining the task "query tuning" -- Developer versus DBA tasks
 - Developer tasks
 - Follow shop standards
 - Avoid Stage 2 (and Stage 3) predicates
 - DBA tasks
 - Design indexing scheme
 - Collect and maintain needed statistics
 - Analyze access paths and influence them when needed



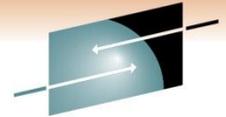
Introduction to query tuning

- Techniques used
 - Rules-based analysis of SQL statement text
 - Invoking EXPLAIN to understand the access path and cost of the query blocks
 - Invoking EXPLAIN to understand what statistics are interesting to DB2
 - Simulation of index schemes
- Other issues
 - Sometimes the SQL is generated and cannot be reviewed

IBM Tooling that is available to assist with this



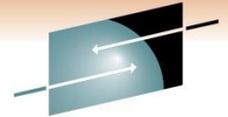
- IBM Tooling that is available to assist with this
 - DB2 SQL Performance Analyzer (SQL PA)
 - Optim Query Workload Tuner



SQL Performance Analyzer

- ISPF and batch
- Enhanced Explain
 - Compare access paths
 - What if
 - Retro explain
 - Migrate DB2 Statistics
- Provides advice on each SQL statement (helps users write better SQL)
 - Warnings, alerts, guidelines and recommendations
 - Performance notes
- Forecasts SQL performance (response/wait times, CPU, I/O counts)
- Forecasts the cost of the query, in terms of
 - Charge back (monetary, in national currency)
 - QUNITS (query service units)
- Acts as a governor for Static or Dynamic SQL
 - in QMF, as a preemptive exit
 - in DRDA and IMS or CICS, via a Stored Procedure call

Suitable for SQL Develop, Tuning and Control



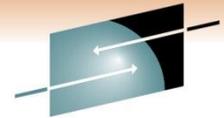
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Query Workload Tuner

- Eclipse-based interface
- Gathers SQL from various sources (catalog, statement cache, captured file)
- Visualize queries and costs (query annotation and visual explain)
- View DB2 Optimizer's query transformations
- Analyze one query or a whole workload
 - Access path
 - Statistics
 - Index
- Validate changes

Suitable for SQL Tuning, Statistics Collection and Index Design by DBAs

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Streamlined Analysis

Define or select workload

Select a workload and then click an item in the Open menu to view information about the workload.

New Workload Open Refresh Remove Tools

- Wizard...
- Statement Cache...
- Catalog...
- QMF...
- QMF HPO...
- File...
- Category...
- Other Workloads...
- Import...
- Export...

Summary Status	Owner
ENABLED/STARTED	SYSADM
ENABLED/STARTED	SYSADM
ANALYZING	B3OSC07
ANALYZING	B3OSC12
ANALYZING	B3OSC12

Execute advisors

Workload Statements

Immediately capture statements or multiple sources to this workload, launch workload advisors, use tools for capture, consolidation, and analysis.

Capture Workload Tools Query Tools Schedule History

Filter name: DEF

- Run All Advisors
- Run Workload Statistics Advisor
- Run Workload Index Advisor
- Run Workload Query Advisor
- Generate Workload
- Workload Report
- Workload Environment Capture

Execution Count	Average Elapsed Time (sec)	Accumulated Elapsed Time (sec)
5	21.151768	0.0694
5	23.351143	2.2789
5	18.033714	10.322
5	5.907151	0.0459
5	20.778751	5.5212

Drill into advice

Advisor Recommendation Overview

These recommendations are part of a sample project. [Learn More](#)

Advisor	Priority	Description
Recommendations		
Statistics Advisor	HIGH	Repair statistics problems for this workload.
Query Advisor	MEDIUM	Consider adding join predicates between tables.
Query Advisor	MEDIUM	Consider adding the following predicate to the query.
Access Path Advisor	LOW	The DSN8910.EMP table is accessed by the query.
Index Advisor	LOW	Index recommendations found.
Statistics Advisor	MAINTENANCE	Gather and recollect all of relevant statistics.

Context

Query 1 Initial Analysis

Validate improvement

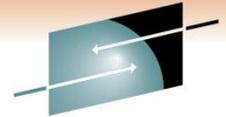
Workloads List

Select a workload and then click an item in the Open menu to view information about the workload. To create a workload, click New Workload.

New Workload Open Refresh Remove Tools

Name	Summary Status	Owner	Execution Time
WorkloadWithTypicalStats	ANALYZING	B3OSC12	CPU time: 97.32 (second...)
WorkloadTunedWithStatsAdvisor	ANALYZING	B3OSC12	CPU time: 53.19 (second...)
WorkloadTunedWithIndexAdvisor	ANALYZING	B3OSC07	CPU time: 40.67 (second...)
AbsoluteCPUTimeExceptionMonitor	ENABLED/STARTED	SYSADM	N/A
NormalMonitor	ENABLED/STARTED	SYSADM	N/A

Gather High Cost Queries and Workloads



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DB2

- Plan table
- Statement table
- Catalog plan or package
- Statement cache

Optim Development Studio

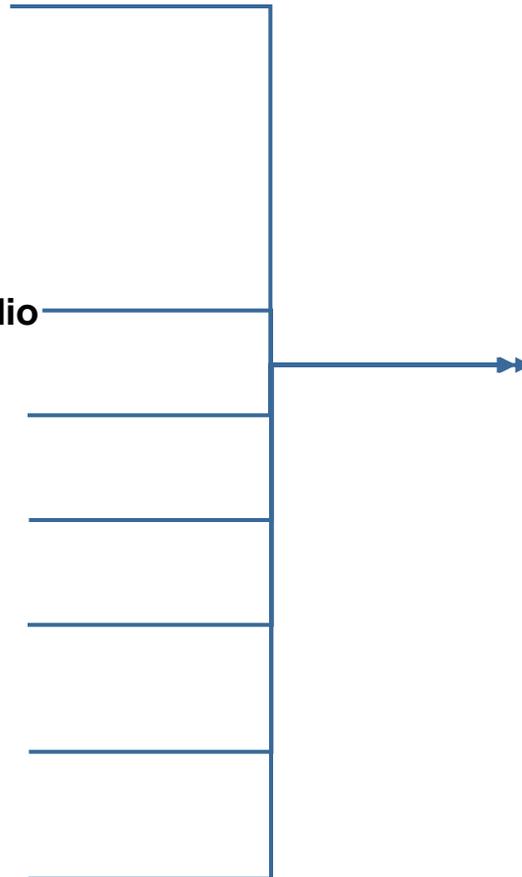
QMF and QMF HPO

DB2 Query Monitor

OMEGAMON XE for DB2

File, text, or exported workload

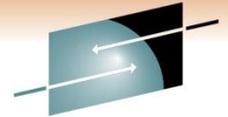
User defined category



Define or select workload

Summary Status	Owner
NABLED/STARTED	SYSADM
NABLED/STARTED	SYSADM
NALYZING	B3OSC07
NALYZING	B3OSC12
NALYZING	B3OSC12

Visualize Queries and Costs to Speed Analysis



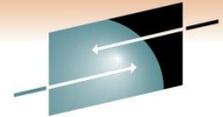
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Formatted Query	Annotation	Additional Information
<pre> SELECT A.EMPNO , A.FIRSTNME , A.LASTNAME , A.JOB , A.SALARY , A.BONUS , A.COMM , B.LOCATION , C.PROJNAME FROM DSN8910.DEPT AS B , DSN8910.EMP AS A , DSN8910.EPROJ AS C WHERE (A.EMPNO IN (SELECT DSN8910.DEPT.MGRNO FROM DSN8910.DEPT WHERE DSN8910.DEPT.MGRNO IS NOT NULL) AND A.WORKDEPT = B.DEPTNO AND B.DEPTNO = C.DEPTNO) ORDER BY A.EMPNO ASC , A.FIRSTNME ASC , A.LASTNAME ASC </pre>	<pre> CARDF=14 QUALIFIED_ROWS= CARDF=42 QUALIFIED_ROWS= CARDF=(missing) QUALIFIED_ROWS COLCARDF=42 MAX_FREQ=(r CARDF=14 QUALIFIED_ROWS= COLCARDF=9 MAX_FREQ=42 COLCARDF=8/14 MAX_FREQ=: COLCARDF=14/(missing) MAX_FREQ </pre>	<p>DSN8910.DEPT.MGRNO contain(s) skewed data</p> <p>DSN8910.EMP.WORKDEPT contain(s) skewed data</p>

Easily see tables, sections, join predicates, etc.

Examine table statistics and additional information

- Accelerate analysis, reduce downtime
 - Spot human errors
 - Identify where filtering should occur



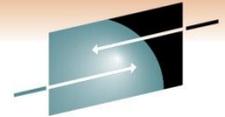
View Optimizer Transformations

```
Original Transformed
Annotation to display: All
Expand All Collapse All Customize Save Print
Formatted Query
SELECT A.EMPNO
      , A.FIRSTNAME
      , A.LASTNAME
      , A.JOB
      , A.SALARY
      , A.BONUS
      , A.COMM
      , B.LOCATION
      , C.PROJNAME
FROM DSN8910.DEPT AS B
      , DSN8910.EMP AS A
      , DSN8910.EPROJ AS C
WHERE ( A.EMPNO IN ( SELECT DSN8910.DEPT.MGRNO
                    FROM DSN8910.DEPT
                    WHERE DSN8910.DEPT.MGRNO IS NOT NULL
                  )
      AND A.WORKDEPT = B.DEPTNO
      AND B.DEPTNO = C.DEPTNO
)
ORDER BY A.EMPNO ASC
      , A.FIRSTNAME ASC
      , A.LASTNAME ASC
```



```
Original Transformed
Annotation to display: All
Expand All Collapse All Customize Save Print Clear Highlights
Formatted Query
SELECT A.EMPNO
      FROM DSN8910.DEPT AS B
      , DSN8910.EMP AS A
      , DSN8910.EPROJ AS C
WHERE ( A.WORKDEPT = B.DEPTNO
      AND A.WORKDEPT = C.DEPTNO
      AND B.DEPTNO = C.DEPTNO
      AND A.EMPNO = SYSADM."DSNWFQB(02)".MGRNO
      DB2 creates a virtual table, SYSADM.DSNWFQB(02), to process the following correlated subquery
          SELECT DSN8910.DEPT.MGRNO
          FROM DSN8910.DEPT
          WHERE ( DSN8910.DEPT.MGRNO IS NOT NULL
                AND A.EMPNO = DSN8910.DEPT.MGRNO
              )
      End of the subquery for the SYSADM.DSNWFQB(02) virtual table.
)
ORDER BY A.EMPNO ASC
      , A.FIRSTNAME ASC
      , A.LASTNAME ASC
```

- Accelerate analysis, reduce downtime
- Spot transformations which will occur



Execute Advisors

Workload Statements

Immediately capture statements or multiple sources to this workload, launch workload advisors, use tools capture, consolidation, and analysis.

Capture Workload Tools Query Tools Schedule History

Filter name: DEF

< Previous

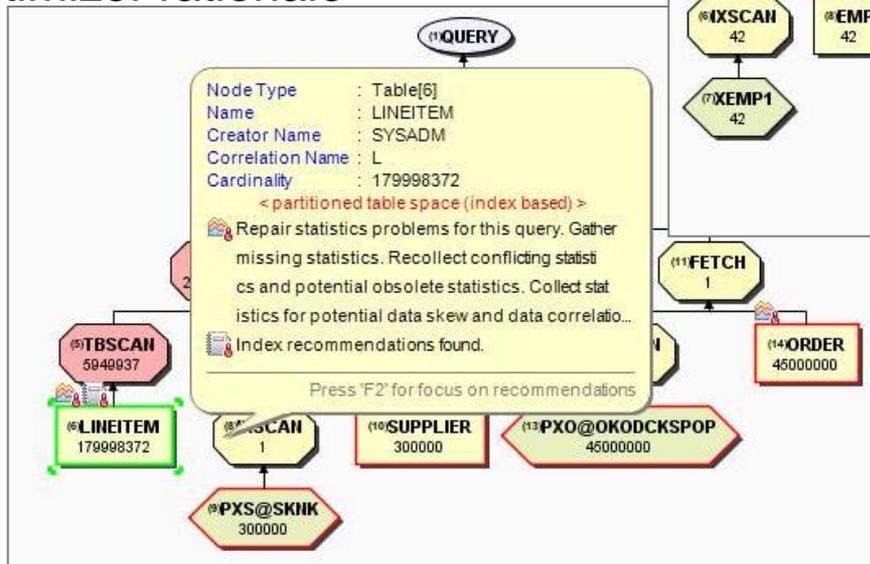
- Run All Advisors
- Run Workload Statistics Advisor
- Run Workload Index Advisor
- Run Workload Query Advisor
- Generate Workload
- Workload Report
- Workload Environment Capture

Execution Count	Cache	Average Elapsed Time (sec)	Accum
5		21.151768	0.0696
5		23.351143	2.2789
5	CACHE	18.033714	10.322
5	CACHE	5.907151	0.0459
5	CACHE	20.778751	5.5212
5	CACHE	99.665344	0.5974
5	CACHE	13.440651	2.4417
9	CACHE	9.309578	0.3156
9	CACHE	18.914537	0.1205
11	CACHE	17.629927	14.428
11	CACHE	22.592033	5.0555
11	CACHE	18.943417	0.1524
11	CACHE	18.937361	0.0849
11	CACHE	3.410327	2.4663
11	CACHE	18.706799	0.0596
13	CACHE	18.79925	1.2846
13	CACHE	27.179655	6.4435
16	CACHE	5.250328	0.0872
16	CACHE	0.970876	0.3689

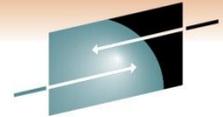
- Statistics
 - Get recommendations on the best statistics to capture to influence access path selection
- Query
 - Get recommendations regarding how to rewrite the query for better efficiency
- Index
 - Get recommendations on additional indexes that can reduce database scans

Analyze Access Plans

- Visualize access path
 - See flow of query processing
 - See indexes and operations
 - See optimizer rationale



- Assess access path stability to reduce risk of performance regression
 - Is the optimizer able to apply the filtering early?
 - Are there indexes that support an efficient path?
 - Do statistics allow distinction between the choices?



Improve Statistics Quality and Collection

- Provides advice on
 - Missing statistics
 - Conflicting statistics
 - Out-of-date statistics
- Results
 - Accurate estimated costs
 - Better query performance
 - Less CPU consumption
 - Improved maintenance window throughput

“Half of access path PMRs could be resolved by statistics advisor before calling IBM support.”
– IBM Support

Statistics Recommendation Detail

Recommendations

RUNSTATS Control Statements

```
RUNSTATS INDEX(SYSADM.PXS@SKNK FREQVAL NUMCOLS 1 COUNT 15)
SHRLEVEL CHANGE REPORT YES UPDATE ALL HISTORY NONE

RUNSTATS TABLESPACE DB4LINEI.TSLINEI
TABLE(SYSADM.LINEITEM) SAMPLE 40
COLUMN(L_SHIPMODE)
COLGROUP(L_SHIPDATE) HISTOGRAM NUMQUANTILES 25
COLGROUP(L_RECEIPTDATE) FREQVAL COUNT 15 HISTOGRAM NUMQUANTILES 25
COLGROUP(L_SHIPMODE) FREQVAL COUNT 15
COLGROUP(L_RETURNFLAG) FREQVAL COUNT 15
SORTDEVT SYSDA SORTNUM 4
INDEX(SYSADM.SXL@PKSKOKEPDSQN KEYCARD,
```

Table, index, column, and column group details

O_ORDERKEY

Cardinality: 4,5E7
Uniform statistics collection time: 0001-01-01 00:00:00.0
Uniform statistics status: conflicting
Frequency statistics collection time: 2001-10-04 13:01:28.076475
Frequency statistics status: conflicting
Histogram statistics collection time: null
Histogram statistics status: missing
Possibly point skewed: No
Possibly range skewed: No

O_ORDERPRIORITY

Cardinality: 5,0
Uniform statistics collection time: 0001-01-01 00:00:00.0
Uniform statistics status: OK
Frequency statistics collection time: null
Frequency statistics status: missing
Histogram statistics collection time: null
Histogram statistics status: missing
Possibly point skewed: Yes
Possibly range skewed: No

Conflicts detail

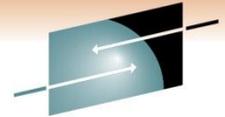
TABLE SYSADM.LINEITEM
One of the frequency records (-1.0) of the L_ORDERKEY column group is out of range [0,1]
Tolerance: 0.0010

The maximum frequency of the column group or column (L_ORDERKEY), (0,0), is less than the average frequency, or 1 divided by the greater than the average unless only least-frequently occurring values are being collected.
Tolerance: 0.0010

Generates RUNSTATS control statements

Indicates conflicting and missing statistics

Conflicting statistics explanation



Improve Query Design

Guard against errors and oversights:
Further constrain query, increase index utilization, and reduce data reads

Workload Query Advisor Recommendations Summary

The following is a summary of the queries analyzed in the workload. Use this criteria to filter the view for specific statements.

Statements Sorted by	Number
Statements Analyzed Successfully	22
Statements with Warnings	4
Number of High Severity Warnings	0
Number of Medium Severity Warnings	0
Number of Low Severity Warnings	7
Statements with High Severity Warnings	0
Statements with Medium Severity Warnings	0
Statements with Low Severity Warnings	0

View statements that meet the following criteria:

Degree of warning severity: High severity
 Medium severity
 Low severity
 Show statements that do not contain warnings

Restore Defaults Save as Defaults

Statements | Index Advisor | Query Advisor Summary | Advisors

View analysis summary

Filter recommendations by severity

Query Advisor checks for

- Missing join predicate for referential constraint
- Predicates that can be rewritten as indexable
- Stage 2 predicates that can be rewritten as stage 1 predicates

Query Recommendation Detail

SQL Text

```
SELECT A.EMPNO  
      , A.FIRSTNAME  
      , A.LASTNAME  
      , A.JOB  
      , A.SALARY  
      , A.BONUS  
      , A.COMM  
      , B.LOCATION  
      , C.PROJNAME  
FROM DSN8910.DEPT AS B  
     DSN8910.EMP AS A  
     DSN8910.EPROJ AS C  
WHERE ( A.EMPNO IN ( SELECT DSN8910.DEPT.MGRNO  
                    FROM DSN8910.DEPT  
                    WHERE DSN8910.DEPT.MGRNO IS NOT NULL
```

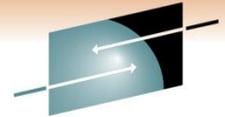
Selected Recommendation:

Description
Consider adding join predicates between columns EMPNO in table DSN8910.EMP and columns MGRNO in table DSN8910.DEPT which use the referential constraints between table DSN8910.EMP and table DSN8910.DEPT to avoid a potentially costly Cartesian join. Check the explanation for this warning for more details about possible impact and examples.
If a referential constraint is defined between corresponding join predicates that map exact RI1 is defined between table T1 and T2, in which that an SQL statement joins the two tables as follows: SELECT T1.C2, T2.C2 FROM T1, T2 WHERE T1.C2 = :charHV3 AND T2.C2 = :charHV4 As written, the SQL statement does not include a join predicate between the two tables. The result is likely to be incorrect. As written, the SQL statement does not include a join predicate between the two tables. The result is likely to be incorrect. Rewriting the SQL statement as follows: SELECT T1.C2, T2.C2 FROM T1, T2 WHERE T1.C2 = :charHV3

Highlights relevant components of the query

Recommendation and rationale

Indexing Advice to Improve Query Efficiency



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- Improve query efficiency
 - Indexing foreign keys in queries that do not have indexes defined
 - Identifying index filtering and screening
 - Support for index only access
 - Indexing to avoid sorts
- Simplify use
 - Consolidate indexes and provide a single recommendation
 - Enables what-if analysis
 - Provides DDL to create indexes
 - Run immediately or save
- Test before deployment
 - Utilize virtual index capabilities built into the DB2 engine

Data - Project6_WorkLoad1_WorkloadTunedWithStatsAdvisor - IBM Optim Query Tuner Client

File Edit Navigate Search Project Data Run Window Help

Project5_Query Group1_Query Before Tuning *WorkloadINDEX_WorkLoad1_WorkloadTunedWith *Project6_WorkLoad1_Wo

Workload Tuning Editor

Recommendations

Recommendation

Feature Details	Action	Object N...	Columns
<input checked="" type="checkbox"/> PART			
<input checked="" type="checkbox"/> Index	Create	PART_VIR...	P_PARTKEY(ASC), P_NAM...
<input checked="" type="checkbox"/> PARTSUPP			
<input checked="" type="checkbox"/> Index	Create	PARTSUP...	PS_SUPPKEY(ASC)
<input checked="" type="checkbox"/> Index	Create	PARTSUP...	PS_SUPPLYCOST(ASC), PS...
<input checked="" type="checkbox"/> LINEITEM			
<input checked="" type="checkbox"/> Index	Create	LINEITEM...	L_SHIPMODE(ASC), L_OR...
<input checked="" type="checkbox"/> Index	Create	LINEITEM...	L_QUANTITY(ASC), L_EXT...
<input checked="" type="checkbox"/> Index	Create	LINEITEM...	L_RETURNFLAG(ASC), L_L...
<input checked="" type="checkbox"/> Index	Create	LINEITEM...	L_SUPPKEY(ASC), L_EXTE...
<input checked="" type="checkbox"/> ORDER			
<input checked="" type="checkbox"/> Index	Create	ORDER_V...	O_CUSTKEY(ASC), O_ORD...
<input checked="" type="checkbox"/> Index	Create	ORDER_V...	O_ORDERKEY(ASC), O_O...

Show DDL...
Show Related SQL...
What-If Analysis...
Run DDL...
Select All
Deselect All

DDL Details

Save

```
CREATE INDEX
DB2OE.LINEITEM_VIRT_IDX_115953554645 ON
SYSADM.LINEITEM (L_SHIPMODE ASC, L_ORDERKEY
ASC) FREEPAGE 0 PCTFREE 10;

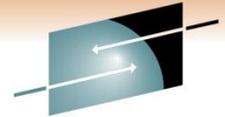
CREATE INDEX
DB2OE.LINEITEM_VIRT_IDX_115953563807 ON
SYSADM.LINEITEM (L_QUANTITY ASC,
L_EXTENDEDPRICE ASC, L_TAX ASC) FREEPAGE 0
```

OK

Columns	Used
JUSTKEYC_NATIONKEY...	Y
ORDERKEYO_ORDERDA...	Y
ATIONKEYN_NAMEN_...	Y

Advisor | Query Advisor Summary

Get Workload List



Visual Plan Hints for Experienced DBAs

- Why hints?
 - Version to version migration
 - Assumptions made by optimizer when SQL contains parameter markers or host variables
- Reduce errors
 - Hint editor
 - Hint validation
 - Hint deployment

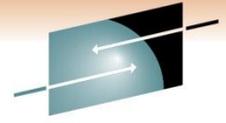
The screenshot displays the IBM DB2 Optimization Expert interface. The main window shows a query plan for 'Query block 1' with tables ORDER, LINEITEM, and SUPPLIER. A secondary plan view shows a join tree structure. Below the main window, a 'Hint Customization Rule' dialog is open, showing a list of hints and their values for a specific query.

Hint Name	Value
CREATOR	ADMF001
TNAME	SUPPLIER
CORRELATION_NAME	NULL
ACCESSTYPE	INDEX
ACCESSCREATOR	ADMF001
ACCESSNAME	SUPP01
PREFETCH	S
PAGE_RANGE	
METHOD	SMJ
SORTN_JOIN	N
SORTC_JOIN	Y
PARALLELISM_MODE	NULL
ACCESS_DEGREE	NULL
JOIN_DEGREE	NULL
PRIMARY_ACCESTYPE	
WHEN_OPTIMIZE	

Leading table

Buttons: OK, Cancel

Query tuning tools for z/OS – Unique benefits



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Optim Query Workload Tuner

- Better support for modern dev environment and dynamic SQL
- Eclipse-based, GUI and stored procedure-driven
- Integrates with OM/PE and QM GUI interfaces, Data Studio, Optim
- Provides virtual index capability for single queries and across workloads
- Recommends rewriting queries only when improvements result
- Has limited support to create statistics in Query Environment Capture and Workload Environment Capture service support
- Strategic investment spans databases

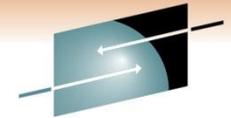
DB2 SQL Performance Analyzer

- Better support for classic z/OS env, DBRMs, batch analysis, and z/OS libraries
- ISPF-based, Command and JCL- driven
- Integrates with OM/PE VTAM and QM 3270 interfaces
- Creates real indexes for “WHAT-IF” scenarios for single queries
- Offers a best practices Query Advisor with approx. 150 rules
- Has full support for cloning statistics
- Continued z/OS-specific investment

Optimization Service Center (the fate of)

- Current OSC remains supported through DB2 9
- OSC functionality will be split among the following offerings:
 - Data Studio (no charge)
 - Query Tuner (single query tuning capabilities already overlap with Q[W]T today)
 - Base function in DB2 for z/OS customers
 - SQL environment capture
 - ~~Profile monitoring~~

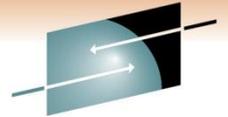
Contents of Eclipse-based Query Tuning offerings



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	Data Studio	Optim Query Tuner for z/OS	Optim Query Workload Tuner for z/OS
Queries from all sources	✓	✓	✓
Reports	✓	✓	✓
Query Formatter	✓	✓	✓
Access Plan Graph	✓	✓	✓
Query Statistics Advisor	✓	✓	✓
Query Annotation		✓	✓
Visual Plan Hint		✓	✓
Query Index Advisor		✓	✓
Query Advisor		✓	✓
Access Path Advisor		✓	✓
Workload Statistics Advisor			✓
Workload Index Advisor			✓
Workload Query Advisor			✓

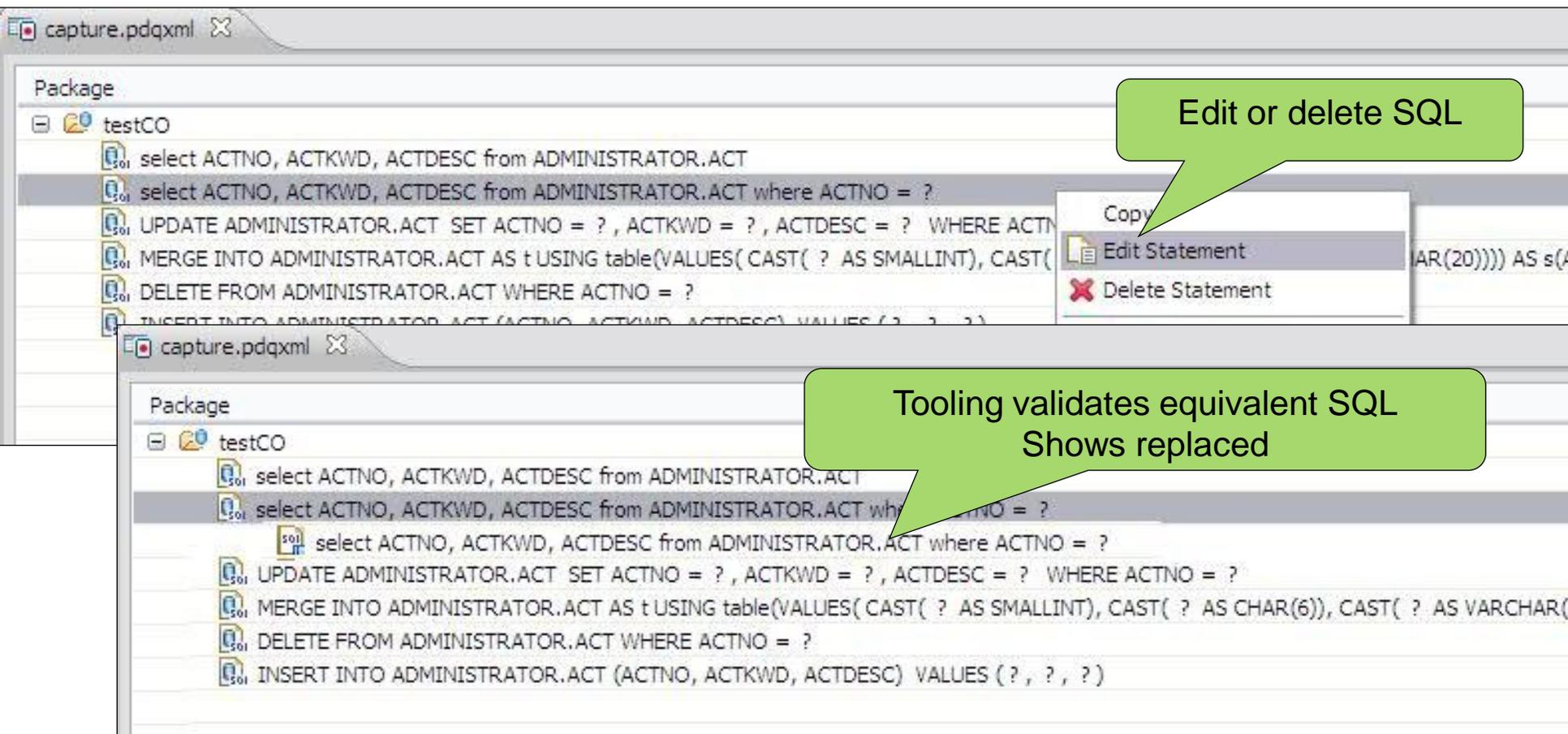
End of query tuning



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2011

Revise SQL Without Modifying the Application

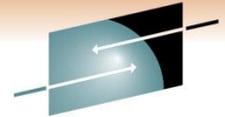


The screenshot shows a software interface with a list of SQL statements under a 'Package' named 'testCO'. The statements include:

- select ACTNO, ACTKWD, ACTDESC from ADMINISTRATOR.ACT
- select ACTNO, ACTKWD, ACTDESC from ADMINISTRATOR.ACT where ACTNO = ?
- UPDATE ADMINISTRATOR.ACT SET ACTNO = ? , ACTKWD = ? , ACTDESC = ? WHERE ACTNO = ?
- MERGE INTO ADMINISTRATOR.ACT AS t USING table(VALUEs(CAST(? AS SMALLINT), CAST(? AS VARCHAR(20)))) AS s(ACTNO, ACTKWD, ACTDESC) VALUES (? , ? , ?)
- DELETE FROM ADMINISTRATOR.ACT WHERE ACTNO = ?
- INSERT INTO ADMINISTRATOR.ACT (ACTNO, ACTKWD, ACTDESC) VALUES (? , ? , ?)

A context menu is open over the second statement, showing options: Copy, Edit Statement, and Delete Statement. A green callout bubble points to the menu with the text "Edit or delete SQL".

Below the first screenshot, the same interface is shown again, but the second statement is highlighted with a green background. A green callout bubble points to it with the text "Tooling validates equivalent SQL Shows replaced".



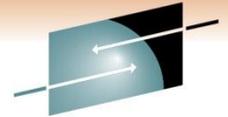
Eliminate SQL Injection



- Restrict SQL execution to only those statements captured
- Set capturedOnly=true in pdq.properties
- pureQuery Runtime looks for it in the classpath

```
captureMode=ON
executionMode=DYNAMIC
capturedOnly=true
```

Optimize for WebSphere and DB2 with pureQuery



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Capture metadata from existing applications

- Capture from JPA without executing
- Derive performance, costs, security and manageability value

Jump start application design

- Generate SQL and Code from Database Objects
- Setup basic DAO Pattern

Enhance development productivity

- Code generation, content assist
- Database aware, Java SQL Editor

Simplify impact analysis

- Categorize by Java, SQL, Database, Packages, track back to line of code

Focus tuning efforts

- Find and sort by query elapsed time from Java

Enhance performance

- Leverage best practices, automatically for JPA
- Use static execution, automatically for JPA
- Lock in access plans for consistent performance

Reduce HW and SW costs

- Up to 42% lower CPU/Trans
- Move workload to zIIP and zAAP

Replace SQL without changing the source

- Editor validates equivalency

Speed up problem resolution

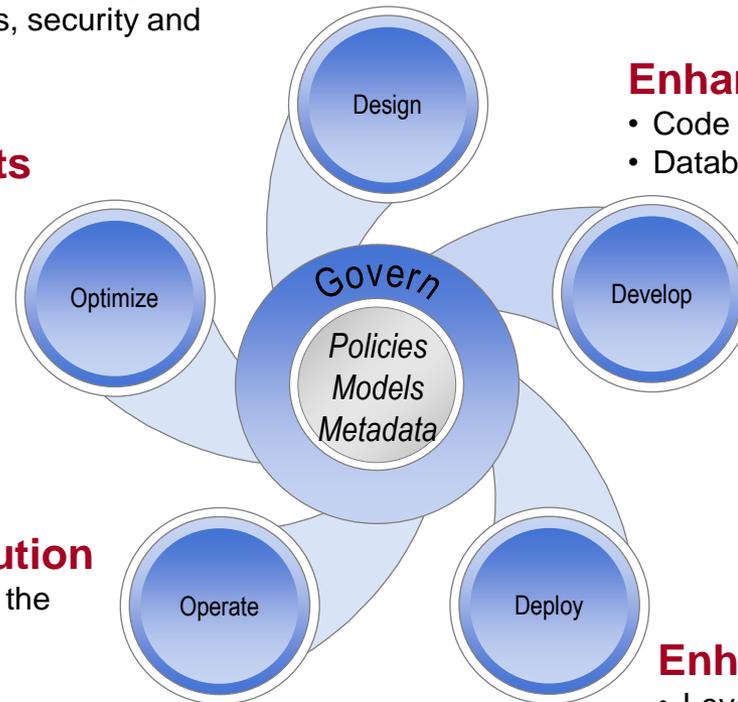
- Trace SQL back to line of code in the application

Prevent SQL Injection

- Lock down SQL for dynamic or static execution

Reduce security exposure

- Grant access to queries, not tables



Optim Development Studio and pureQuery Runtime



IBM
Country/region [select]

Home Solutions ▾ Services ▾ Products ▾ Support & downloads ▾ My IBM ▾

developerWorks

AIX and UNIX

Information Mgmt

- New to Information Mgmt
- Products
- How to buy
- Downloads

Technical library

- Training
- Support
- Services
- Forums & community
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Lotus

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Linux

Open source

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Web development

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Trial: IBM Optim Development Studio and Optim pureQuery Runtime

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Buy
Support

Download Optim Development Studio

Download Optim Development Studio, which provides an integrated database development environment for Oracle, DB2, and Informix. Optim Development Studio improves development productivity up to 50% for developing and testing SQL and XQuery queries, stored procedures, Web services, and Java data access layers.

Trial download

The evaluation period for this trial is 30 days. All of the product's features are enabled.

A trial version of Optim pureQuery Runtime V2.2 is available within the Optim Development Studio V2.2 trial package for use on the same Windows or Linux machine. To try the pureQuery Runtime on another platform, contact your IBM sales representative or IBM Business Partner.

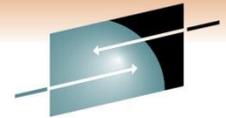
➔ [System requirements](#)

The estimated download time using Download Director over a 1.5Mbps connection is 1 hour and 24 minutes; 43 minutes using Installation Manager.

Choose one of these options to download the trial. A Web install downloads and installs the product from a Web based repository. A local Install downloads and installs the product to your local hard drive.

Operating system	Version	Size	Download method
Web install using IBM Installation Manager (recommended) Windows, Linux	V2.2	480MB	
Web install if you already have IBM Installation Manager installed Windows	V2.2	372MB	

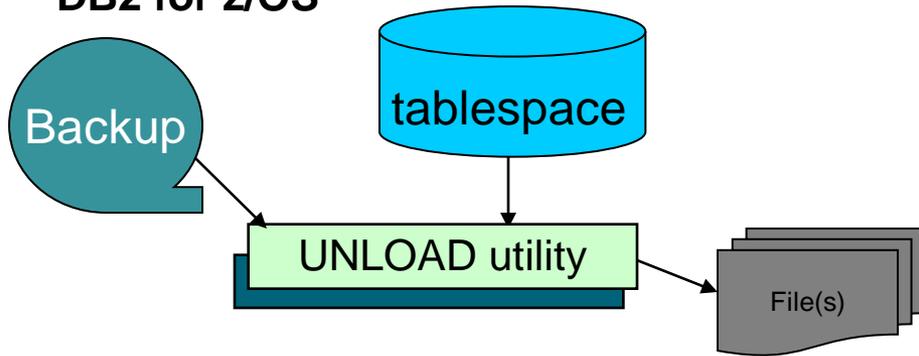
Download it today!



Data movement options

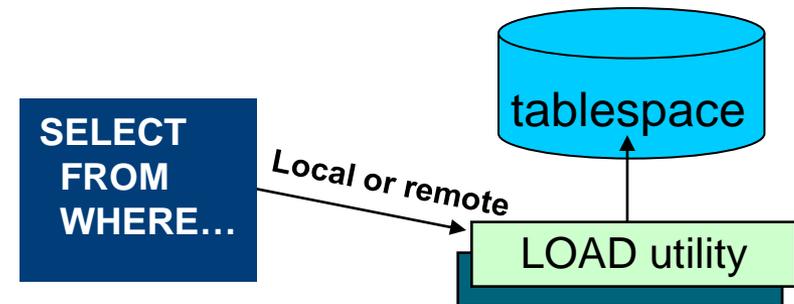
UNLOAD Utility

- Designed for loading back into DB2 for z/OS



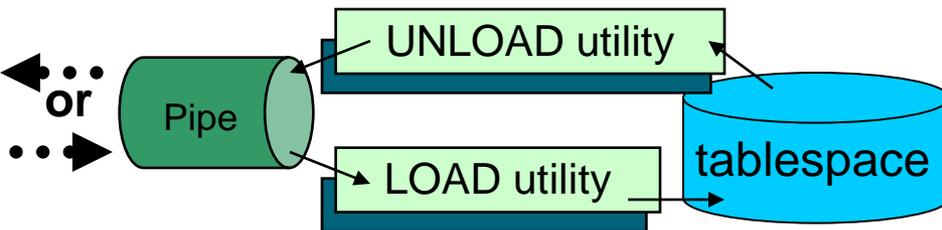
Crossloader (LOAD from INCURSOR DD)

- Ultra fast loading of data when the source is in a relational table – even remote



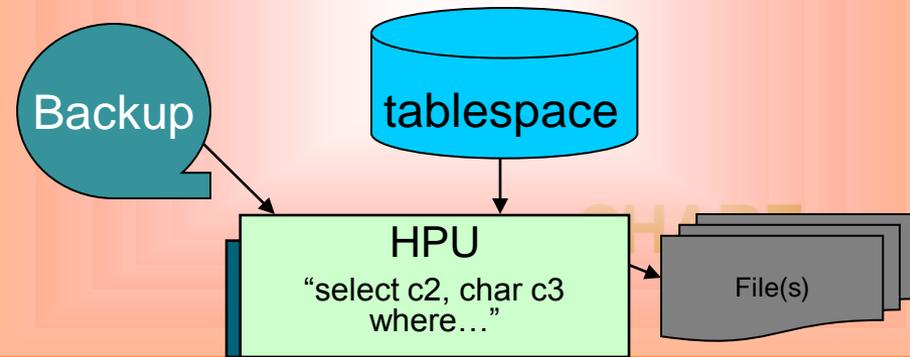
LOAD/UNLOAD via pipes

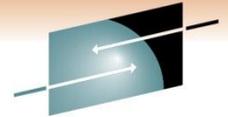
- Perfect for remote loading/unloading



High Performance Unload (z/OS and LUW)

- Ideal data moving to another platform
- SQL interface enables developer usage
- Low CPU consumption

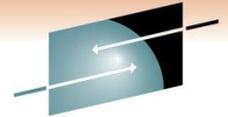




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Recovery Tooling

- What value is there to extending the DB2 backup and recovery utilities?
 - Safety net for a complex task
 - Ability to view and make surgical changes using the DB2 recovery log
 - Allows you to use DB2 9 function on a DB2 Version 8 system

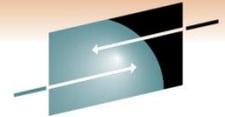


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Recovery management

- DB2 Change Accumulation Tool
- DB2 Log Analysis Tool
- DB2 Object Restore Tool
- DB2 Recovery Expert

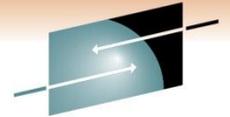
- DB2 Cloning Tool



DB2 Recovery Expert for z/OS

- Wizard driven
 - Object selection (Database, Table space, Table,..... Multiple objects supported)
 - Point in time selection (Time, Quiesce point, Backup point, Log point)
 - Recovery Paths / alternate recovery resources
- Analyzes all possible recovery paths for a version and attaches a relative cost to each
- Recommends the least cost recovery path while allowing other paths to be chosen
- Recovery paths include
 - Traditional restore and log apply (forward recovery)
 - Generating undo operations (backward recovery)
- Recommend set of objects to recover
 - Prompts the user to show related objects (next slide)
 - Assists in including these objects in the recovery process
- Manage recovery via policies: Recovery Policy – Insure that I can recover an application (set of DBMS objects) within twenty minutes to any point in time in the last week. {Supersedes the need for a backup policy}

ACTION	ROW STATUS	EMPNO	FIRSTNAME	MIDINIT	LASTNAME	WORKDEPT	PHONENO	HIREDAT
INSERT	POST-CHAN...	001100	Bryan	F	Smith	Z99	3474	2002-09-
	PRE-CHANGE	-	-	-	-	-	-	-
INSERT	POST-CHAN...	001200	Dan		Wardman	Z99	4574	2002-09-
	PRE-CHANGE	-	-	-	-	-	-	-
UPDATE	POST-CHAN...	000010	CHRISTINE	I	HAAS	A01	3978	1965-01-
	PRE-CHANGE	000010	CHRISTINE	I	HAAS	A00	3978	1965-01-
UPDATE	POST-CHAN...	000110	VINCENZO	O	LUCCHESI	A01	3490	1958-05-

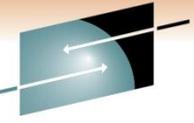


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Data Governance

- IBM Optim Data Growth
- IBM Optim Data Privacy
- IBM Optim Test Data Management
- DB2 Audit Management Expert
- IBM Database Encryption Expert
- Data Encryption for DB2 and IMS

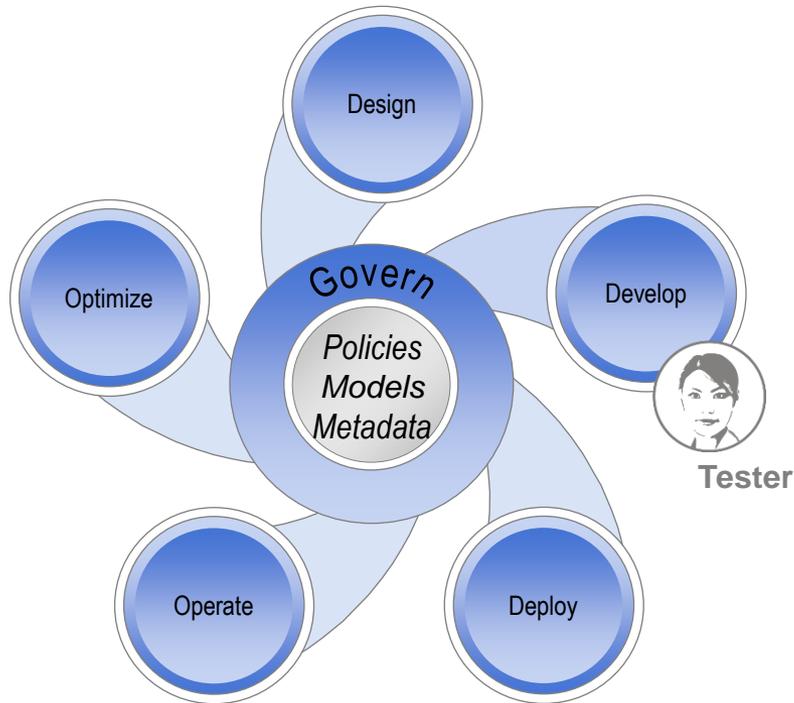
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Create Production-like, Privatized Databases

Optim Test Data Manager and Data Privacy Solutions

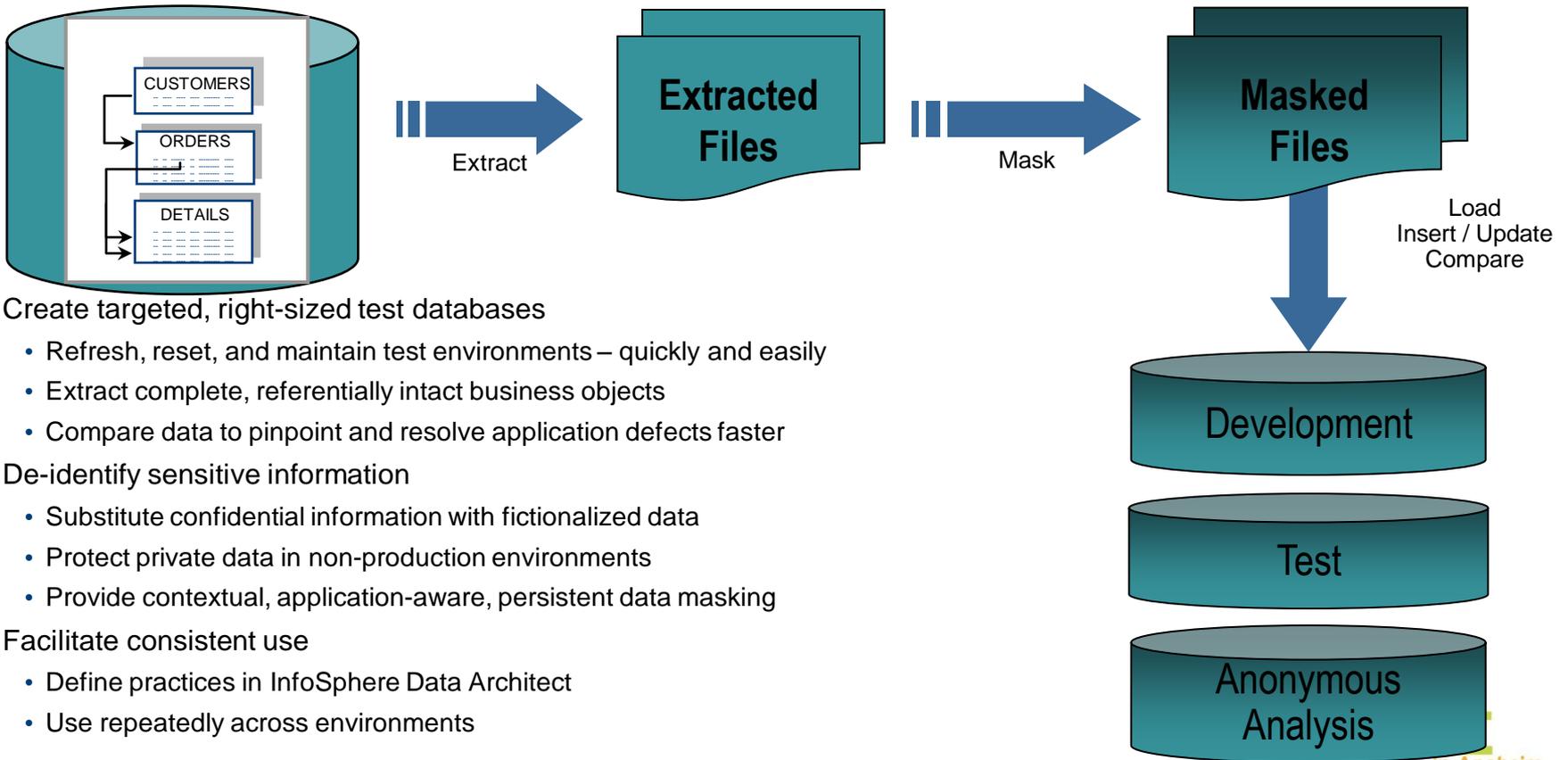
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High Quality Connections • Results



- Increase software quality
 - Use test data that accurately reflects production systems
- Accelerate release schedules
 - Comparison to expected results and fast refresh
- Comply with privacy regulations
 - De-identify personal information with realistic substitutions
- Protect confidential information
 - Mask sensitive data
- Facilitate consistent use

Optim Test Data Management and Data Privacy Solutions

Increase software quality and comply with regulatory requirements based on test data that accurately reflects production systems while protecting client privacy and sensitive information.

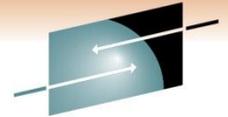


- Create targeted, right-sized test databases
 - Refresh, reset, and maintain test environments – quickly and easily
 - Extract complete, referentially intact business objects
 - Compare data to pinpoint and resolve application defects faster
- De-identify sensitive information
 - Substitute confidential information with fictionalized data
 - Protect private data in non-production environments
 - Provide contextual, application-aware, persistent data masking
- Facilitate consistent use
 - Define practices in InfoSphere Data Architect
 - Use repeatedly across environments

Supports non-relational on z/OS (Sequential, VSAM, and IMS)!

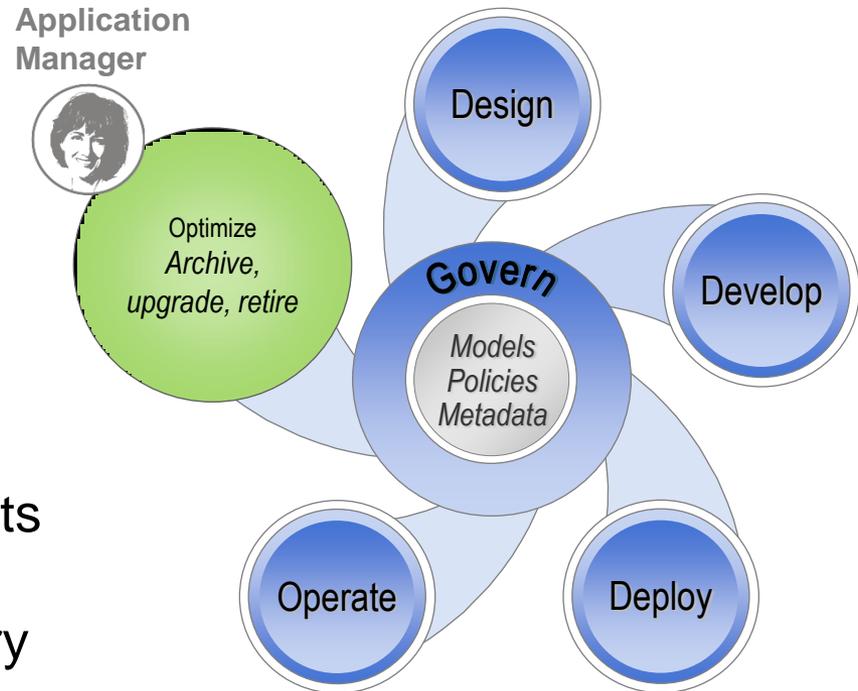
Optimize Systems for Growth

Optim Data Growth Solution

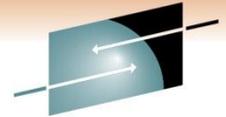


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Technology • Connections • Results

- Improve application performance
- Accelerate application upgrades
- Reduce the risk of application consolidation and retirement
- Comply with retention requirements
- Find information for legal discovery

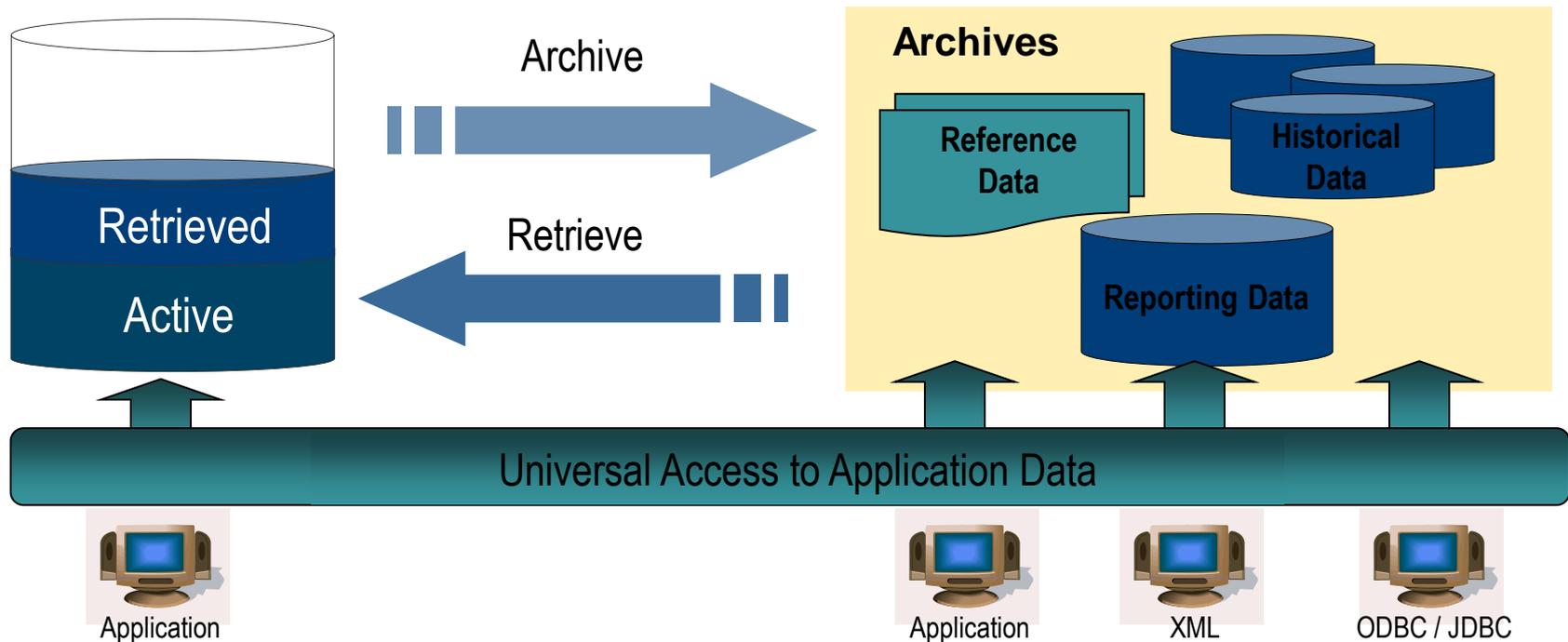


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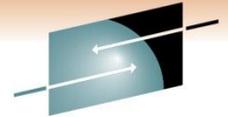


Optim Data Growth Solution

Facilitates application growth, application upgrades, application retirement, and retention management.



- Complete business object provides historical reference snapshot of business activity
- Storage device independence enables storage cost optimization
- Immutable file format enables data retention compliance

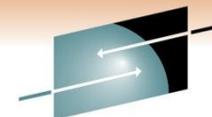


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What's cooking back at the lab?

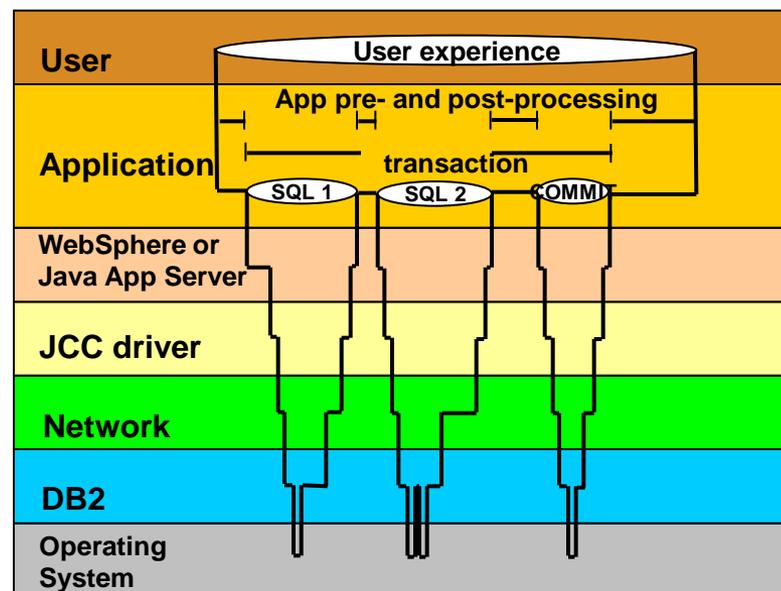
- Performance Management

Where is my DB2 application spending its time?



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- **OMEGAMON PE's Extended Insight** is an advanced way to monitor the database workload (SQL) of your applications and solutions
 - Get total response times and response time breakdown (appl, driver, network, data server) per defined workload/cluster (e.g. per system, application, user)
 - Compare workload from various servers / applications
 - Select a time period for analysis
 - Get top SQL statements per defined workload
 - Identify top clients contributing in the workload



How to start and navigate to the Extended Insight dashboard



- Seamless navigation depending on the usage/problem scenario ...
 1. Integration and navigation to Extended Analysis Dashboard as part of new OMEGAMON XE for DB2 PE on z/OS (OMPE) TEP workspace
 2. As a stand-alone web console session
 3. Integrated with ITCAM and navigation to Extended Analysis Dashboard

OMPE on z/OS TEP

Navigation to the Extended Insight Analysis Dashboard



End-to-End SQL Monitoring - IBM-590C1A11DE1 - SYSADMIN *ADMIN MODE*

File Edit View Help

Navigator View: Physical

- DB2plex
 - PMO1
 - DB2
 - D811:PMO1:DB2
 - D813:PMO1:DB2
 - D911:PMO1:DB2
 - DA11:PMO1:DB2
 - Thread Activity
 - Storage Consumption
 - System Status
 - Detailed Thread Exceptio
 - Lock Conflicts
 - Subsystem Management
 - Log Manager
 - Utility Jobs
 - EDM Pool
 - Buffer Pool Management
 - DB2 Messages
 - Volume Activity
 - CICS Connections
 - IMS Connections
 - DB2 Connect Server
 - DDF E2E Monitoring
- PMO2
- PMO3
- PMO4

- SZ11:PMO1:DB2

Physical

Thread Summary Navigation

All Threads Connected to DB2 CICS Threads Detailed Thread Exceptions Distributed Allied Threads

DBAT End-to-End SQL Monitoring Enclave Threads IMS Threads Lock Conflicts

Packages Plans Utility Jobs

Extended Insight Analysis Dashboard: DEMO@local

Workloads are listed in the grid. Click in the left column to show the chart for the workload. Use the second column to expand and collapse workload clusters in the grid. Double-click a row to view details. Click New to create a workload cluster group.

Open Details Activate... Deactivate... New... Edit... Copy... Reset Delete Transaction Topology Expand Collapse

Graph	Workload Cluster Group/Workload Cluster	Average End-to-End Response Time (sec)	Maximum Inflight Elapsed Time (sec)	Maximum End-to-End Response Time (sec)	Average Data...	Average Network Time...	Average Client Time (sec)	Warning (%)	Critical (%)	Transactions (/min)
Show	DEMO@local	0.088	01:11:04.328	1.063	0.079	0.009	0	N/P	N/P	710.097
Show	Cognos report packages	0.089	0.078	1.063	0.080	0.009	0	1.207	0.046	700.387
Show	growth	5.639	0	0	5.637	0	0.001	0	0	9.71
Show	profit	0.013	0.062	1.015	0.002	0.011	0	3.701	0.141	228.355
Hide	resultspergeo	0.012	0.078	1.031	0.001	0.011	0	N/P	N/P	228.871
Hide	earningspershare	0.007	0.062	1.063	0.001	0.006	0	N/P	N/P	233.452
Hide	Cognos users	0.089	0.078	1.063	0.080	0.009	0	1.971	1.17	700.387
Show	Cognos report servers	0.089	0.078	1.063	0.080	0.009	0	N/P	N/P	700.387
Show	Client user IDs	0.088	01:11:04.328	1.063	0.079	0.009	0	N/P	N/P	710.097

Charts for selected workload cluster groups

Cognos users [Show Maximum] [Alert History Off]

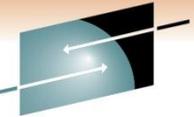
resultspergeo [Maximum Off] [Alert History On]

earningspershare [Show Maximum] [Alert History On]

Done

Hub Time: Tue, 07/13/2010 07:58 AM Server Available End-to-End SQL Monitoring - IBM-590C1A11DE1 - SYSADMIN *ADMIN MODE*

Optim Performance Manager Web Console with Health Summary and navigation to Extended Insight Dashboard



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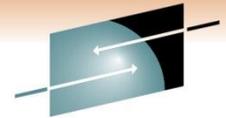


OMEGAMON XE for DB2 PE on z/OS reuses the Optim Performance Manager Extended Insight monitoring capability.. Health Summary and Extended Insight Dashboard are enabled for monitoring of SQL access DB2 for z/OS.

Data Source	Alerts			System										Database			Extended Insight			
	Critical	Warning	Data Server Status	Monitoring Status	Memory Usage	CPU Utilization (%)	Connections	Storage	Recovery	Workload	Logging	I/O	Sorting	Locking	Transactions (/min)	Physical Page I/O (/min)	Lock Wait Time (sec)	Longest Running SQL (sec)	Average End-to-End Response Time (sec)	Maximum End-to-End Response Time (sec)
OMPD911	1	0	●	●	0	0	●	●	●	●	●	●	●	●	0	0	0s	0s	1.120s	4.625s
OMPDA11	1	0	●	■	0	0	●	●	●	●	●	●	●	●	0	0	0s	0s	0s	0s
SN51	1	0	●	●	0	0	●	●	●	●	●	●	●	●	0	0	0s	0s	9.692s	26.281s

Navigate to Extended Insight Analysis Dashboard for E2E SQL monitoring =>

Extended Insight Analysis Dashboard



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The slider bar allows selection of the time period to be considered

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Task Manager | Manage Database Connections | Welcome - My Optim Central

Welcome - My Optim Central | Manage Database Connections | Health Summary | Workload | System | Overview | **Extended Insight Dashboard**

Recent: 03/17/10 16:00 | History: 34 sec | Aggregation level:1

Learn about the time controls. GMT +01:00 | End Time: 03/26/10 12:06 | Duration: 3 Hours

Extended Insight Analysis Dashboard: OMP1D911 OMP1D911 | Disconnect

Workloads are listed in the grid. Click in the left column to show the chart for the workload. Use the second column to expand and collapse workload clusters in the grid. Double-click a row to view details. Click New to create a workload cluster group.

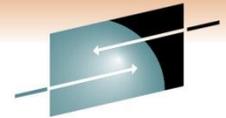
Open Details | Activate... | Deactivate... | New... | Edit... | Copy... | Reset | Delete | Transaction Topology Expand | Collapse

Graph	Workload Cluster Group/Workload Cluster	Average End-to-End Response Time (sec)	Maximum Inflight Elapsed Time (sec)	Maximum End-to-End Response Time (sec)	Average Data Server Time (sec)	Average Network Time...	Average Client Time (sec)	Warning (%)	Critical (%)	Transactions (/min)
Sh...	Host names/IP address	0.588	0	1.828	0.465	0.002	0.120	N/P	N/P	6
Sh...	9.152.205.30	0.588	0	1.828	0.465	0.002	0.120	N/P	N/P	6
Sh...	Application Types	0.588	0	1.828	0.465	0.002	0.120	N/P	N/P	6
Sh...	OTHER	0.588	0	1.828	0.465	0.002	0.120	N/P	N/P	6
Sh...	WebSphere Applicati	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P
Sh...	WebSphere applicati	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P

Charts for selected workload cluster groups

Overview and comparison of “Workload cluster groups” but also on details with the capability to select and further zoom in.

Extended Insight Analysis Dashboard



Optim Performance Manager

Task Manager | 0# Manage Database Connections | Welcome

Welcome - My Optim Central | 0# Manage Database Connections | Learn about...

Recent | History | 34 sec | 03/17/10 16:00 | Aggregation level:1

Extended Insight Analysis Dashboard: OMP1D91

Workloads are listed in the grid. Click in the left column to show the chart for the workload. Click New to create a workload cluster group.

Open Details | Activate... | Deactivate... | New... | Edit... | Copy

Graph	Workload Cluster Group/Workload Cluster	Average End-to-End Response Time (sec)	Maximum Inflight Elapsed Time (sec)
Sh...	Host names/IP address	0.588	0
Sh...	9.152.205.30	0.588	0
Sh...	Application Types	0.588	0
Sh...	OTHER	0.588	0
Sh...	WebSphere Application Servers	N/P	N/P
Sh...	WebSphere applications	N/P	N/P

Charts for selected workload cluster groups

Activate Workload Cluster Groups

Select the workload cluster groups to activate. Only activated workload cluster groups are monitored and shown on the performance monitoring dialogs.

| Edit...

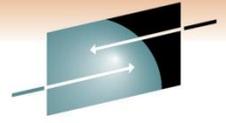
Workload Cluster Group	Description
<input type="checkbox"/> E2E_SAP_SAP_REPORT_ZOS_CL...	E2E_SAP_SAP_REPORT_ZOS_CL_GROUP_DESCRIPTION
<input type="checkbox"/> E2E_SAP_SAP_TRANSACTIONS_Z...	E2E_SAP_SAP_TRANSACTIONS_ZOS_CL_GROUP_DESCRIPTION
<input type="checkbox"/> SAP application servers	Contains a workload cluster for each SAP application server t...
<input type="checkbox"/> SAP users	Contains a workload cluster for each SAP end user that send...
<input type="checkbox"/> SQW application servers	Shows the response time of each InfoSphere Warehouse ap...
<input type="checkbox"/> SQW applications and flows	Shows the InfoSphere Warehouse applications and flows acc...
<input type="checkbox"/> DataStage jobs	Contains a workload cluster for each DataStage job that sen...
<input type="checkbox"/> DataStage servers	Contains a workload cluster for each DataStage server that ...
<input type="checkbox"/> Cognos users	Contains a workload cluster for each Cognos user that send...
<input type="checkbox"/> Cognos report packages	Contains a workload cluster for each Cognos report package...
<input type="checkbox"/> Cognos report servers	Contains a workload cluster for each Cognos report server t...
<input type="checkbox"/> WebSphere Application Servers	Contains a workload cluster for each WebSphere Application...
<input type="checkbox"/> WebSphere applications	Contains a workload cluster for each WebSphere application...
<input type="checkbox"/> Authentication IDs	Contains a workload cluster for each authorization ID that s...
<input type="checkbox"/> Client workstations	Contains a workload cluster for each workstation that sends ...

OK Cancel

Define your "Workload cluster groups" as you need

Extended Insight Analysis Dashboard

Expand to more details, e.g. expand user data and application data



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Task Manager Manage Database Connections Welcome - My Optim Central

Welcome - My Optim Central Manage Database Connections **Extended Insight Dashboard** Health Summary

Learn about the time controls. GMT +02:00
08/23/10 14:15 - 08/23/10 20:15
End Time:
08/23/10 20:15
Duration:
6 Hours

Recent 18 sec History Aggregation level:1

Extended Insight Analysis Dashboard: SN51 i SN51 Disconnect

Workloads are listed in the grid. Click in the left column to show the chart for the workload. Use the second column to expand and collapse workload clusters in the grid. Double-click a row to view details. Click New to create a workload cluster group.

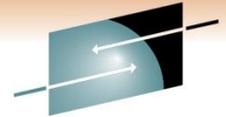
Open Details Activate... Deactivate... New... Edit... Copy... Reset Delete View All Known Clients Transaction Topology Expand Collapse

Graph	Workload Cluster Group/Workload Cluster	Average End-to-End Response Time (sec)	Maximum Inflight Elapsed Time (sec)	Maximum End-to-End Response Time (sec)	Average Data Server Time (sec)	Average Network Time (sec)	Average Client Time (sec)	Warning (%)	Critical (%)	Transactions (/min)	Statement Failure Rate...
Show	SN51	9.692	35.875	26.281	0.943	0.034	8.715	--	--	1.725	0
Show	Client application names	9.692	35.875	26.281	0.943	0.034	8.715	--	--	1.725	0
Show	testapplication_1 2	12.421	11.671	21.234	0.845	0.043	11.532	--	--	0.248	0
Show	testapplication_1 5	11.128	20.407	26.281	0.979	0.034	10.114	--	--	0.215	0
Show	testapplication_1 4	10.641	12.343	21.344	0.815	0.033	9.792	--	--	0.195	0
Show	testapplication_1 3	9.601	10.375	24.219	0.916	0.031	8.654	--	--	0.188	0
Show	testapplication_1 0	9.232	35.875	15.375	0.991	0.033	8.208	--	--	0.161	0
Show	testapplication_1 8	8.381	4.328	14.703	1.024	0.037	7.320	--	--	0.174	0
Show	testapplication_1 7	8.258	6.422	18.703	0.993	0.028	7.236	--	--	0.161	0
Show	testapplication_1 6	8.095	6.843	22.672	0.985	0.029	7.082	--	--	0.195	0
Show	testapplication_1 1	8.050	6.656	16.828	0.991	0.031	7.028	--	--	0.188	0
Show	Client user IDs	9.692	35.875	26.281	0.943	0.034	8.715	--	--	1.725	0
Show	testuser_1 0	10.601	12.343	24.219	0.933	0.035	9.633	--	--	0.544	0
Show	testuser_1 1	9.388	20.407	24.500	0.951	0.032	8.405	--	--	0.591	0
Show	testuser_1 2	9.160	35.875	26.281	0.946	0.034	8.181	--	--	0.591	0
Show	Application Types	9.692	35.875	26.281	0.943	0.034	8.715	--	--	1.725	0
Show	Host names/IP address	9.692	35.875	26.281	0.943	0.034	8.715	--	--	1.725	0

Charts for selected workload cluster groups

Extended Insight Analysis Dashboard

Show additional graphs for selected workload clusters



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Welcome - My Optim Central | Manage Database Connections | **Extended Insight Dashboard** | Health Summary

Recent | History | Refresh

08/23/10 02:37 03:41 04:30 05:19 06:08 06:56 07:45 08:34 09:23 10:12 11:01 11:50 12:39 13:28 14:17 15:06 15:55 16:44 08/23/10 17:48

Aggregation level: 1

08/23/10 15:56 - 08/23/10 16:16 GMT +02:00

End Time: 08/23/10 16:16
Duration: 20 Mins

Extended Insight Analysis Dashboard: SN51 SN51 | Disconnect

Workloads are listed in the grid. Click in the left column to show the chart for the workload. Use the second column to expand and collapse workload clusters in the grid. Double-click a row to view details. Click New to create a workload cluster group.

Open Details | Activate... | Deactivate... | New... | Edit... | Copy... | Reset | Delete | View All Known Clients | Transaction Topology Expand Collapse

Graph	Workload Cluster Group/Workload Cluster	Average End-to-End Response Time (sec)	Maximum Inflight Elapsed Time (sec)	Maximum End-to-End Response Time (sec)	Average Data Server Time (sec)	Average Network Time (sec)	Average Client Time (sec)	Warning (%)	Critical (%)	Transactions (/min)	Statement Failure Rate (%)
Show	SN51	9.501	10.156	21.234	0.961	0.032	8.508	--	--	3.095	0
Show	Client user IDs	9.501	10.156	21.234	0.961	0.032	8.508	--	--	3.095	0
Hide	Client application name	9.501	10.156	21.234	0.961	0.032	8.508	--	--	3.095	0
Show	testapplication_ 2	11.375	10.156	21.234	0.904	0.050	10.421	--	--	0.381	0
Show	testapplication_ 1	11.078	0	16.828	0.890	0.031	10.157	--	--	0.333	0
Show	testapplication_ 5	10.848	0	21.234	1.063	0.032	9.754	--	--	0.333	0
Hide	testapplication_ 3	10.483	8.531	14.484	0.838	0.030	9.614	--	--	0.429	0
Hide	testapplication_ 4	10.367	7.437	17.000	0.907	0.026	9.434	--	--	0.381	0
Show	testapplication_ 0	10.323	8.125	12.875	0.982	0.040	9.301	--	--	0.286	0
Show	testapplication_ 6	8.027	0	14.172	1.037	0.033	6.957	--	--	0.333	0
Show	testapplication_ 8	7.333	4.328	13.937	0.963	0.025	6.344	--	--	0.333	0
Show	testapplication_ 7	4.393	0	9.516	1.148	0.019	3.227	--	--	0.286	0

Charts for selected workload cluster groups

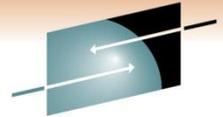
Client application nan Fit Average Alert History On

testapplication_ | 3 Fit Average Alert History On

testapplication_ | 4 Fit Average Alert History On

Extended Insight Analysis Dashboard

Show response time histogram for selected workload



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Task Manager | Manage Database Connections | Welcome - My Opti...

Recent: 03/18/10 00:00 | History: 16 sec | Aggregation level: 1

Extended Insight Analysis Dashboard: OMP1D911

Workloads are listed in the grid. Click in the left column to show the chart for the workload. Click New to create a workload cluster group.

Open Details | Activate... | Deactivate... | New... | Edit... | Copy... | Refresh

Graph	Workload Cluster Group/Workload	Average End-to-End Response Time	Maximum Inflight Elapsed...	Maximum End-to-End Response Time
Sh...	OMP1D911	0.650	0	2.094
Hide	Host names	0.650	0	2.094
Sh...	Application	0.650	0	2.094
Sh...	WebSphere	N/P	N/P	N/P
Sh...	WebSphere	N/P	N/P	N/P

Overall average response time per transaction: 0.650
 Maximum response time: 2.094
 Maximum Time of running transactions: 0
 Warning threshold: None | Critical threshold: None

Alert History

Number vs Time

Response Time Histogram

Warning | Problem

% vs Time

Go to the workload cluster details graphs.

OK | Apply | Cancel

Host names/IP addresses

Response Time

Click to show response time histogram

Dashboard
 GMT +01:00
 03/26 12:18
 End Time: 03/26/10 12:18
 Duration: 4 Hours

OMP1D911 | Disconnect
 double-click a row to view details.

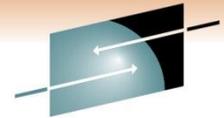
Expand Collapse

Critical (%)	Transactions (/min)
N/P	0.831
N/P	0.831
N/P	0.831
N/P	N/P
N/P	N/P

Results

Extended Insight Analysis Dashboard

Zoom into selected workload and see the TOP SQL list



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Extended Insight Dashboard

Extended Insight Analysis Dashboard: OMP1D911

[Back](#)

Locate the source of performance problems, determine how those problems affect different parts of the workload, and analyze the performance of individual SQL statements, clients, and partitions.

Response Time Details: 9.152.205.30

Graph | Grid

Selected layer: Average End-to-End Response Time | [Show Maximum](#)

Detail Area for Average End-to-End Response Time

End-to-End Response Time

Overall average response time per transaction:	0.075 sec
Maximum response time:	15.282 sec
Maximum Time of running transactions	10.688 sec
Number of transactions:	61,245
Statements:	65,344

SQL Statements | Clients

Show highest 10 by Average Data Server Time (sec)

Statement Text	Statement Executions	Average Data Server Time (sec)
SELECT 'PVT_40K' AS WKLID, '...	1	0.504
SELECT 'PVT_40K' AS WKLID, '...	1	0.474
SELECT 'PVT_40K' AS WKLID, '...	1	0.518
SELECT 'PVT_40K' AS WKLID, '...	1	1.393
N/P	1	1.023

Display this list by the selected graph (a...)

Time Distribution (%)

Transaction Throughput

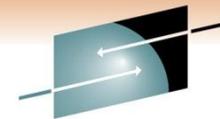
Statement Throughput

Shows top SQL statements executed by distributed Java or CLI applications like SQW, SAP, Cognos, DataStage, or WebSphere.

➤ Zoom in (double click) on a selected SQL in question

Extended Insight Analysis Dashboard

Select SQL from list and zoom into SQL level details



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Extended Insight Analysis Dashboard: OMP1D911

[Back](#)

Locate the source of performance problems, determine how those problems affect different parts of the workload, and analyze the performance of individual SQL statements, clients, and partitions.

Response Time Details: 9.152.205.30

Graph | Grid

Selected layer: No layer selected Show Maximum

SQL Statements | Clients

Show highest 10 by Average Data Server Time (sec)

Statement Text	Statement Executions	Average Data Server Time (sec)
SELECT 'PVT_40K' AS WKLID, '...	1	0.504
SELECT 'PVT_40K' AS WKLID, '...	1	0.474
SELECT 'PVT_40K' AS WKLID, '...	1	0.518
SELECT 'PVT_40K' AS WKLID, '...	1	1.393
N/P	1	1.023

Display this list by the selected graph layer

Detail Area for SQL Statements

Statement information

```
SELECT 'PVT_40K' AS WKLID, '100319#13:45:21:250' AS TIME, '1' AS STMTNR, '40000' AS LENGTH, '0' AS LB, '0' AS TB, 'false' AS TABNEWLINE, COUNT(*) AS COUNT FROM LGQ#0002 WHERE A=0001000 OR A=0001000 OR...
```

Package name: N/P
Section number: 0
Package Consistency token: N/P
Package Version: N/P
Collection: N/P

Java class	Java package	Method	Source line number	Build version	Source expression	Method Signature	Application Name	Metadata File

Transfer Volume

Average bytes transferred locally: 0 bytes
Average bytes transferred remotely: 41.369 KB
Average rows returned: 0
Average number of round trips: 1

Statement Performance

Number of Executions: 1
Average end-to-end elapsed time: 0.488 sec
Average client time: 0 sec
Average driver time: 0 sec
Average network time: 0.013 sec
Average data server time: 0.474 sec

[Open Optim Query Tuner to analyze this SQL statement.](#)

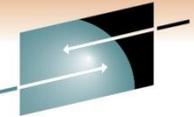
Launch Optim Query (workload) Tuner (or Data Studio) to explain and tune the selected SQL statement

Statement Outcome

Failure rate (with negative SQL code): 0 %
First SQL code: N/P

Extended Insight Analysis Dashboard

Page down to review the host Dynamic SQL statement cache metrics



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Detail Area for SQL Statements

General Information | **Statement Server Execution Details**

Most Recent Identification

Package name:	--
Statement Type:	--
Package Version:	--
Cache Insert time stamp:	07/28 10:37:30
Last execution:	--

Most Recent Compilation

Isolation level:	CS
First referenced table:	--
Authorization ID:	JEN
CURRENT SQL ID:	JEN
Client user ID:	--
Client workstation name:	--
Client accounting string:	--
Object qualifier:	JEN
Literal replacement:	--
CURRENTDATA bind option:	N
DYNAMICRULE bind option:	R
CURRENT RULES:	D
CURRENT PRECISION:	N
Cursor WITH HOLD:	Y

Data Server Execution Time

Number of transactions:	1,029
Average execution time:	0 sec
Average CPU time:	0 sec

Overall Time Distribution

Lock Wait Time	100.00%
Latch & Drain Lock Wait Time	0.00%
Time waiting	0.00%

Statement Row and Sort Details

Average rows read:	1
Average rows returned or modified:	1
Average index scans:	0
Average table space scans:	1
RID usage failures due to internal DB2 limits:	0
Average RID usage failures due to RID list storage:	0
Average Number of Parallel Groups:	0
Total sorts:	0

Row Efficiency

Rows Read and Not Used	50.00%
Rows Returned or Modified	50.00%

I/O Statistics

Buffer Pool Hit Ratio:	99.903 %
Logical page I/O:	2,058
Physical page I/O:	2

Transaction Logging Statistics

Average log writer wait time:	0 sec
-------------------------------	-------

Locking Statistics

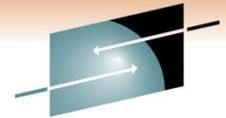
Average local lock wait time:	0 sec
Average global lock wait time:	0 sec
Average latch request wait time:	0 sec
Average page latch wait time:	0 sec
Average drain lock wait time:	0 sec
Average drain claim release wait time:	0 sec
Average read wait time for another thread:	0 sec
Average write wait time for another thread:	0 sec

Data retrieved from the host Dynamic SQL Statement Cache

Transferring data from localhost...

Extended Insight Analysis Dashboard

Select SQL from list and zoom into SQL level details



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Extended Insight Analysis Dashboard: OMP1D911

[Back](#)

Locate the source of performance problems, determine how those problems affect different parts of the workload, and analyze the performance of individual SQL statements, clients, and partitions.

Response Time Details: 9.152.205.30

Graph | Grid

Selected layer: No layer selected | Show Maximum

SQL Statements | Clients

Show highest 10 by Average Data Server Time (sec)

Statement Text	Statement Executions	Average Data Server Time (sec)
SELECT 'PVT_40K' AS WKID, '...	1	0.504
SELECT 'PVT_40K' AS WKID, '...	1	0.474
SELECT 'PVT_40K' AS WKID, '...	1	0.518
SELECT 'PVT_40K' AS WKID, '...	1	1.393
N/P	1	1.023

Display this list by the selected graph layer

Detail Area for SQL Statements

Statement information

```
SELECT 'PVT_40K' AS WKID, '100319#13:45:21:250' AS TIME, '1' AS STMTNR, '40000' AS LENGTH, '0' AS LB, '0' AS TB, 'false' AS TABNEWLINE, COUNT(*) AS COUNT FROM LGQ#0002 WHERE A=0001000 OR A=0001000 OR...
```

All | Time

Package name: N/P
Section number: 0
Package Consistency token: N/P
Package Version: N/P
Collection: N/P

Java class	Java package	Method	Source line number	Build version	Source expression	Method Signature	Application Name	Metadata File

Statement Performance

Number of Executions: 1
Average end-to-end elapsed time: 0.488 sec
Average client time: 0 sec
Average driver time: 0 sec
Average network time: 0.013 sec
Average data server time: 0.474 sec

Open Optim Query Tuner to analyze this SQL statement.

Statement Outcome

Failure rate (with negative SQL code): 0 %
First SQL code: N/P

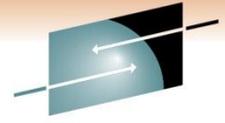
Transfer Volume

Average bytes transferred locally: 0 bytes
Average bytes transferred remotely: 41.369 KB
Average rows returned: 0
Average number of round trips: 1

Java class / - package / method, etc. shown if pureQuery Is installed. ==> next 2 slides

How pureQuery Runtime can help !

Extended Insight feature can tell you where the query came from ...



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```

Application source
public class TestOPM {
    public static void main(String [] args) throws Exception{
        String url = "jdbc:db2://sv1-imtstgl2.svl.ibm.com:50000/SAMPLE";
        Connection con = SampleUtil.getConnection(url, "db2admin", "hot6cold");
        ((com.ibm.db2.jcc.DB2Connection) con).setDB2ClientApplicationInformation("blah");

        Statement stmt = con.createStatement();
        for(int i = 0; i<10000; i++){
            stmt.execute("SELECT * FROM DB2ADMIN.INVENTORY");
            Thread.sleep(1000);
            System.out.println(i);
        }
    }
}
    
```

application name



```

Capture SQL with pureQuery runtime
pdq.captureMode=ON
pdq.executionMode=DYNAMIC
pdq.pureQueryXml=pureQueryFolder/capture.pdqxml
pdq.cmx.controllerURL=9.30.77.61:60000
    
```



Response Time Details: growth

Graph Grid

Selected layer: No layer selected

SQL Statements

Statement Text	Statement Executions	Average Data Server Time (sec)
SELECT * FROM DB2ADMIN.I...	619	5.410

Statement Performance

Number of Executions: 619

Average end-to-end elapsed time: 5.661 sec

Average client time: 0.251 sec

Average driver time: 0.001 sec

Average network time: 0 sec

Average data server time: 5.410 sec

Statement Time Distribution (%)

- Client time: 95.25%
- Driver time: 0.02%
- Network time: 4.43%
- Data server time: 0.02%

Java class	Java package	Method name	Source line number	Build version	Source expression	Method Signature	Application Name	Metadata File

Transfer Volume

Average bytes transferred locally: 16.773 KB

Average bytes transferred remotely: 0 bytes

Average rows returned: 0

Average number of round trips: 1



Upload collected metadata into OPM

Transfer Application Metadata

Choose to transfer the metadata to a repository or save the metadata to the file system.

Destination

Transfer to a metadata repository

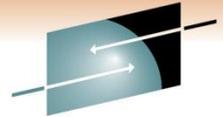
- GaryPerfDB
 - ProductProcessingApp
 - OPM_Test01
 - OrderHistoryApp
 - OrderHistoryApp
 - OPM_Test2
 - orderprocessingapp
 - OPM_Test0
 - OPM_Test

Save to file system

Application Information

Runtime group name: blah

Version: blahVer



How pureQuery Runtime can help !

Extended Insight feature can tell you where the query came from ...

```
Application source  
public class TestOPM {  
    public static void main(String [] args) throws Exception {  
        String url = "jdbc:db2://sv1-1mtestgl2.svl.ibm.com:50000/SAMPLE";  
        Connection con = SampleUtil.getConnection(url, "db2admin", "hot6cold");  
        ((com.ibm.db2.jcc.DB2Connection) con).setDB2ClientApplicationInformation("blah");  
  
        Statement stmt = con.createStatement();  
        for(int i = 0; i<10000; i++){  
            stmt.execute("SELECT * FROM DB2ADMIN.INVENTORY");  
            Thread.sleep(1000);  
            System.out.println(i);  
        }  
    }  
}
```

application name

```
Capture SQL with pureQuery runtime  
pdq.captureMode=ON  
pdq.executionMode=DYNAMIC  
pdq.pureQueryXml=pureQueryFolder/capture.pdqxml  
pdq.cmx.controllerURL=9.30.77.61:60000
```

Java class	Java package	Method	Source line number	Build version	Source expression	Method Signatur e	Applicati on Name	Metadata File
TestOPM	my.test	main	13	blahVer	N/P	N/P	blah	capture...

Area for SQL Statements

Statement Performance

Number of Executions: 017
Average end-to-end elapsed time: 5.661 sec
Average client time: 0.251 sec
Average driver time: 0.001 sec
Average network time: 0 sec
Average data server time: 5.410 sec

Statement Time Distribution (%)

95.03% Client time
0.02% Driver time
0.02% Network time

Statement Outcome

Failure rate (with negative SQL code): 0 %
First SQL code: N/P

Transfer Volume

Average bytes transferred locally: 16,773 KB
Average bytes transferred remotely: 0 bytes
Average rows returned: 0
Average number of round trips: 1

Transfer to a metadata repository

- GaryPerDB
- ProductProc...
- OrderHistory...
- OrderHistory...
- OPM_Test2
- orderprocess...
- OPM_Test1
- OPM_Test...
- blah

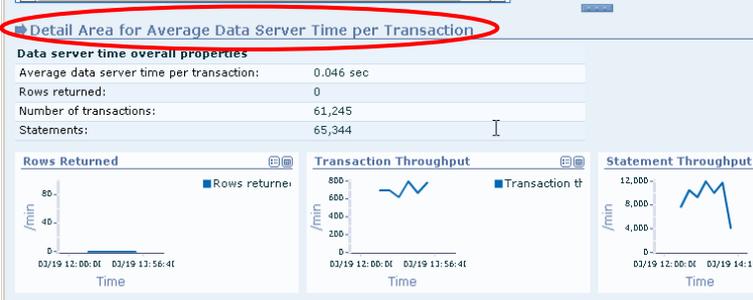
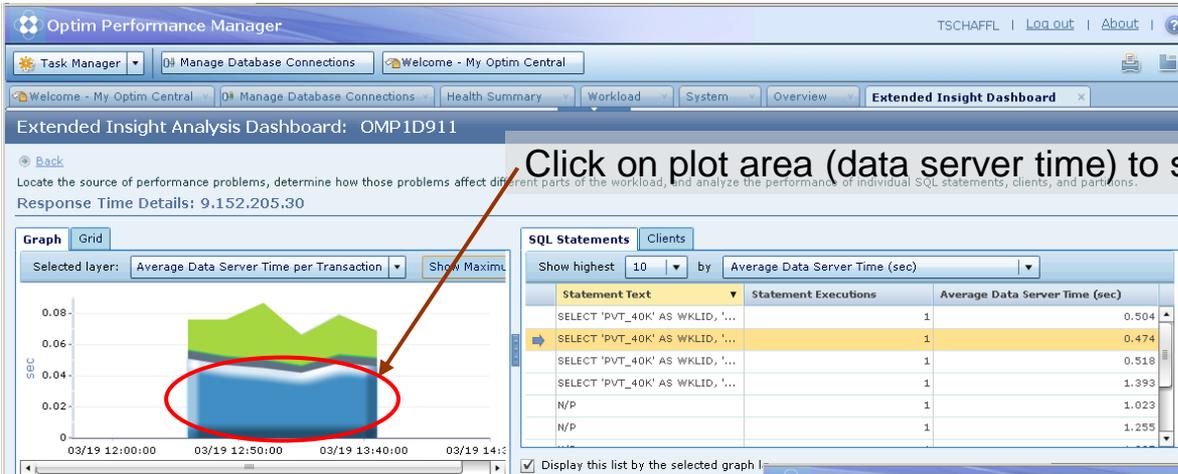
Save to file system

Application Information

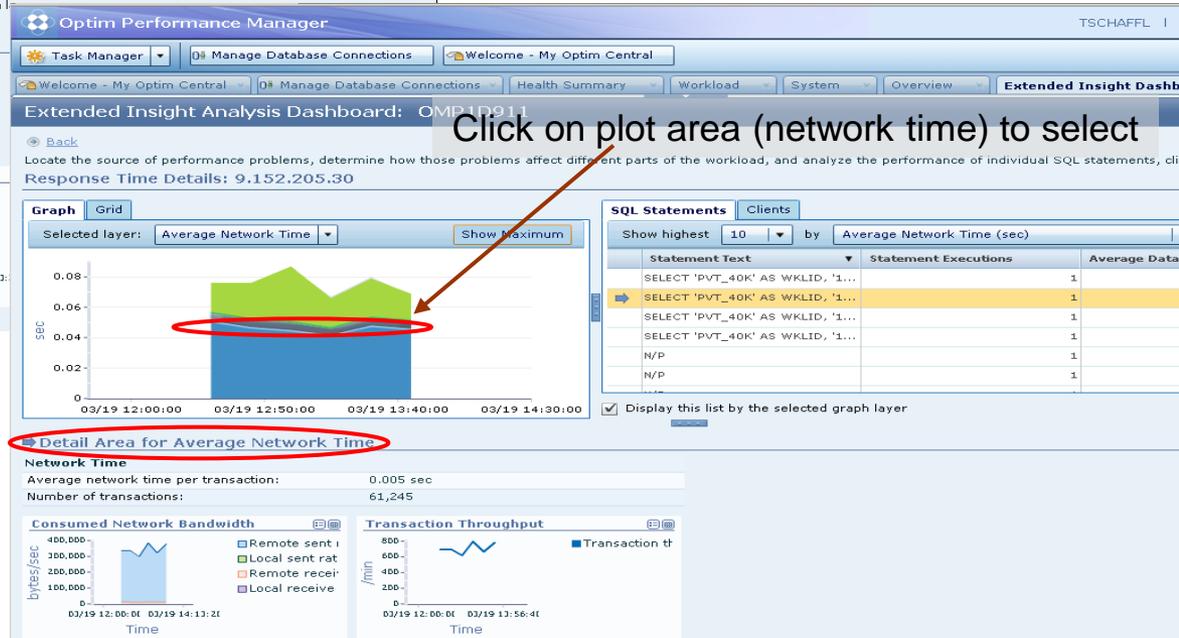
Runtime group: N/A
Version: N/A

Extended Insight Analysis Dashboard

Select a plot area and see the corresponding performance metrics



... for network times and throughput



WebSphere – another area to be monitored in context



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Extended Insight Analysis Dashboard: DEMO@local

← Back

Locate the source of performance problems, determine how those problems affect different parts of the workload, and analyze the performance of individual SQL statements, clients, and partitions.

Response Time Details: profit

Graph Grid

Selected layer: Average End-to-End Response Time Show Maximum

SQL Statements **Clients**

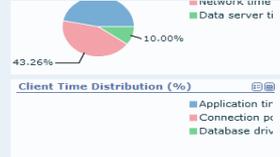
Show highest 10 by Average Response Time (sec)

Client Host Name or IP Address	Transaction Executions	Time of First Connection	Average Response Time (sec)
GoSales2.ibm.com	18	03/31 12:52:22	01:04.491
GoSales1.ibm.com	35	04/07 17:17:39	4.758

Display this list by the selected graph layer

pureQuery level: 2.15.14
 JRE vendor: Sun Microsystems Inc.
 JRE version: 16.2-b04
 JVM specification: Java SE Runtime Environment 16.0.2

WebSphere Application Server data source name: GSDB
 WebSphere Application Server server name: GoSales2
 WebSphere Application Server version: 7.0.1



WebSphere support has a built-in support for OPM (starting with WAS V6.0.21), allowing to ...

- identify problems with WAS connection pool
- identify differences in the configuration of nodes in a WAS cluster
- check if a node in a WAS cluster has a system or network problem

WAS Connection Pool

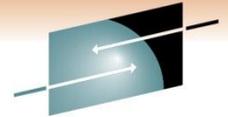
Connection pool size: 50
 Average connections in use: 17
 Maximum connection wait time:

Pool Usage

Client Comparison

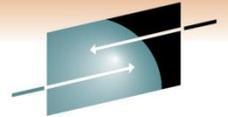
Client Comparison

Client Host Name or IP Address	Time of First Connection	Network Time	Client Time	Currently Used Connections	Connection Pool Size	Maximum Connection Wait Time	JRE Version	Operating System	Database Driver Level
GoSales2.ibm.com	03/31 1...	13:50.8...	11:04.0...		50		16.2-b04	Window...	3.58.82
GoSales1.ibm.com	04/07 1...	7.367	25.33%		100		16.2-b04	Window...	3.58.82



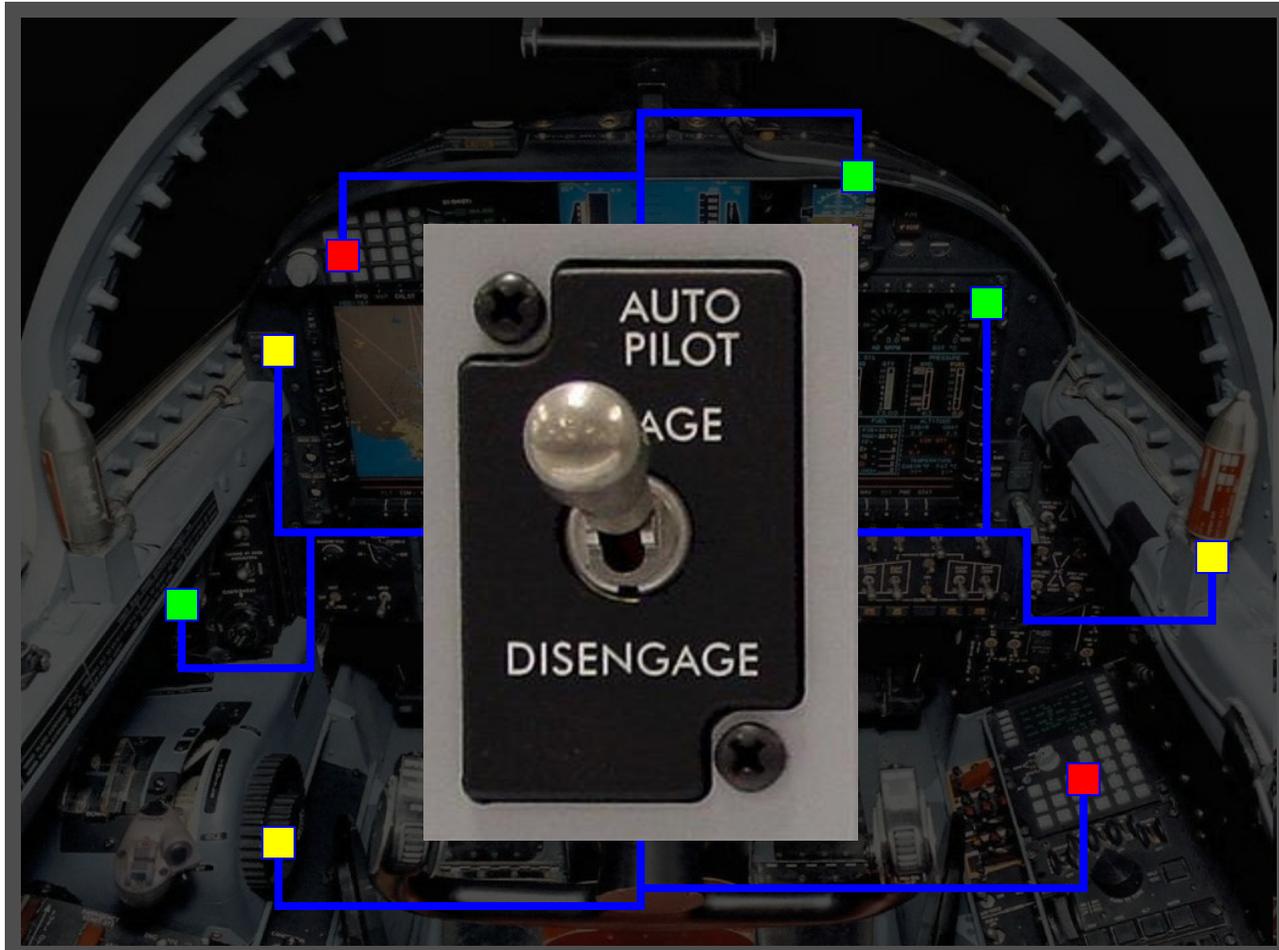
What's cooking back at the lab ?

- Configuration Management
 - Speeding up problem determination by analyzing what has changed
 - Simplifying implementation of and checking adherence to best practices
 - Centralizing control of client configuration
- Maintenance Management
 - Managing large, complex enterprise environments by exception
 - Shifting from time-based maintenance via utilities to policy-based maintenance
 - Visualization of space management



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The problem ... Our solution!



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2011

Manage by Exception to Lower TCO

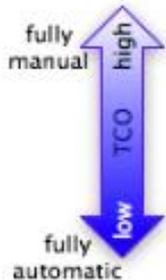


Name	Monitoring Status		Alert		System				Database				
	Data	Server Status	Critical	Warning	CPU Usage	Disk Space	Memory Usage	Locking	SQL Performance	Connections	Transactions	Logging	Maintenance
▼ Production	🔴	🟢	3	8	🔴	🟢	🟢	🟡	🟢	🟢	🟢	🟢	🟢
▶ Web	🟢	🟢	1	1	🔴	🟢	🟢	🟡	🟢	🟢	🟢	🟢	🟢
▶ Retail	🔴	🟢	0	0	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
▢ Accounts	🟢	🟢	2	3	🔴	🟢	🟢	🟡	🟢	🟢	🟢	🟢	🟢
▢ Marketing	🔴	🟢	0	4	🔴	🔴	🟢	🟡	🟢	🟢	🟢	🟢	🟢
▶ Test	🟢	🟢	0	0	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
▶ Development	🟢	🟢	0	0	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢

Disk Efficiency Alert



*In excess of 40% of allocated space for database objects can be reclaimed.
Recommended courses of action:*



- ▶ Turn off alert - "I don't care or I will handle this all on my own"
- ▶ Change alert threshold - "Customize to my environment or workload"
- ▶ Reclaim space now - "I need to fix it now, but need some options to tailor."
- ▶ Reclaim space later - "Schedule during maintenance window, possibly repeatedly."
- ▶ Automate space reclamation - "Just do it for me, I have more important things to do."

Enable Fully-manual to Fully-automated Management

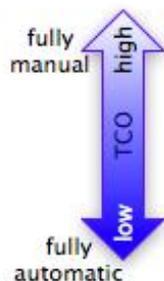
Name	Monitoring Status		Data Server Status		Alert		System			Database			
	Critical	Warning	Critical	Warning	CPU Usage	Disk Space	Memory Usage	Locking	SQL Performance	Connections	Transactions	Logging	Maintenance
▼ Production	3	8	3	8	⬇	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆
▶ Web	1	1	1	1	⬇	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆
▶ Retail	0	0	0	0	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆
▣ Accounts	2	3	2	3	⬇	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆
▣ Marketing	0	4	0	4	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆
▶ Test	0	0	0	0	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆
▶ Development	0	0	0	0	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆

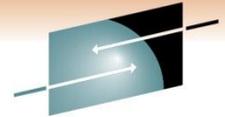
Best Practice Violation Alert: **Log and Data Files Collocated on Single Disk**

⬇ *Log files are on same disk as table space container files which negatively impacts performance and may potentially prevent full recovery upon disk failure.*

Recommended courses of action:

- ▶ Turn off alert - "I will figure out how to handle this all on my own"
- ▶ Manually reconfigure now - "I need to fix it myself now, but a little guidance would be nice."
- ▶ Reconfigure later - "Script the reconfiguration and schedule during maintenance window."
- ▶ Automate this best practice - "Just do it for me, I have more important things to do."





Manage by Exception to Lower TCO

Heat Chart Alerts Dashboard

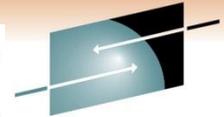
Next Refresh 0:01

Name	Monitoring Status		Data Server Status		Alert		System		Database				
	Critical	Warning	Critical	Warning	CPU Usage	Disk Space	Memory Usage	Configuration	SQL Performance	Connections	Transactions	Logging	Maintenance
▼ Production	◆	●	3	8	◆	●	●	▲	●	●	●	●	●
▶ Web	●	●	1	1	◆	●	●	▲	●	●	●	●	●
▶ Retail	◆	●	0	0	●	●	●	●	●	●	●	●	●
▢ Accounts	●	●	2	3	◆	●	●	▲	●	●	●	●	●
▢ Marketing	◆	●	0	4	●	●	●	●	●	●	●	●	●
▶ Test	●	●	0	0	●	●	●	●	●	●	●	●	●
▶ Development	●	●	0	0	●	●	●	●	●	●	●	●	●

Configuration Change Alerts:

- ◆ Table space container 'tblsp25003' is no longer on disk
- ◆ Index 'idx00453' has been dropped from table 'mkt.tblA'
- ◆ Column 'A' of table 'mkt.tblA' changed data type from INT to FLOAT
- ◆ Configuration parameter 'Automaintenance' changed from ON to OFF

IBM Integrated Data Management



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- Getting started
- Downloads
 - IBM Data Studio
 - IBM Optim
- Community
 - developerWorks
 - forums
 - zone and space
 - articles
 - tutorials
- Documentation
- Support

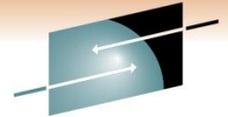
Data Management Communities for DB2



- IDUG – the worldwide community of DB2 users
 - Membership is FREE – join today! www.idug.org
- Data Management Community – share and interact with peers around the world
 - www.ibm.com/software/data/management/community.html
- Information Champions – recognizes individuals who have made the most outstanding contributions to the Information Management community
 - www.ibm.com/software/data/champion

IOD 2009
Content Planning

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