



IBM Software Group

DB2 9.7 Vendor Enablement Preview

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IBM Information Management software

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IBM DB2 for Linux, UNIX and Windows



Lowest TCO

*Unparalleled Automation
Deep Compression
Lightning Fast*

Simple to Run

*Flexible Development
Industry leading XML support*

Most Reliable

*World class audit & security
Easy High Availability
Workload Management*

Business Performance Advantage



25 of the Top 25
Worldwide Banks



9 of the Top 10
Global Life / Health
Insurance Providers



23 of the Top 25
US Retailers



Cost Effective Solutions



DB2 9.7 Themes

- **Resource Optimization**

- ▶ Best performance with most efficient utilization of available resources

- **Ongoing Flexibility**

- ▶ Allow for continuous and flexible change management

- **Service Level Confidence**

- ▶ Expand your critical workloads confidently and cost effectively

- **XML Insight**

- ▶ Harness the business value of XML

- ➔ **Break Free with DB2**

- ▶ Use the database server that gives you the freedom to choose

- **Balanced Warehouse**

- ▶ Create table ready warehouse appliance with proven high performance



Agenda

- Why should I?
- Why haven't I done it?
- What's changed in the new DB2?
- How do I do it?
- What's suitable?



Why should I move to DB2?

- I'm a **customer** and
 - ▶ My current DBMS doesn't scale to my needs
 - ▶ I have no leverage when negotiating prices with one vendor
 - ▶ I think DB2 provides better value
 - ▶ I pay too much for my current DBMS

- I'm a **vendor** and
 - ▶ I want to expand my customer base
 - ▶ I want to get enabled on a "blue" stack
 - ▶ I don't want to fund my competitor
 - ▶ I think DB2 provides better value for money

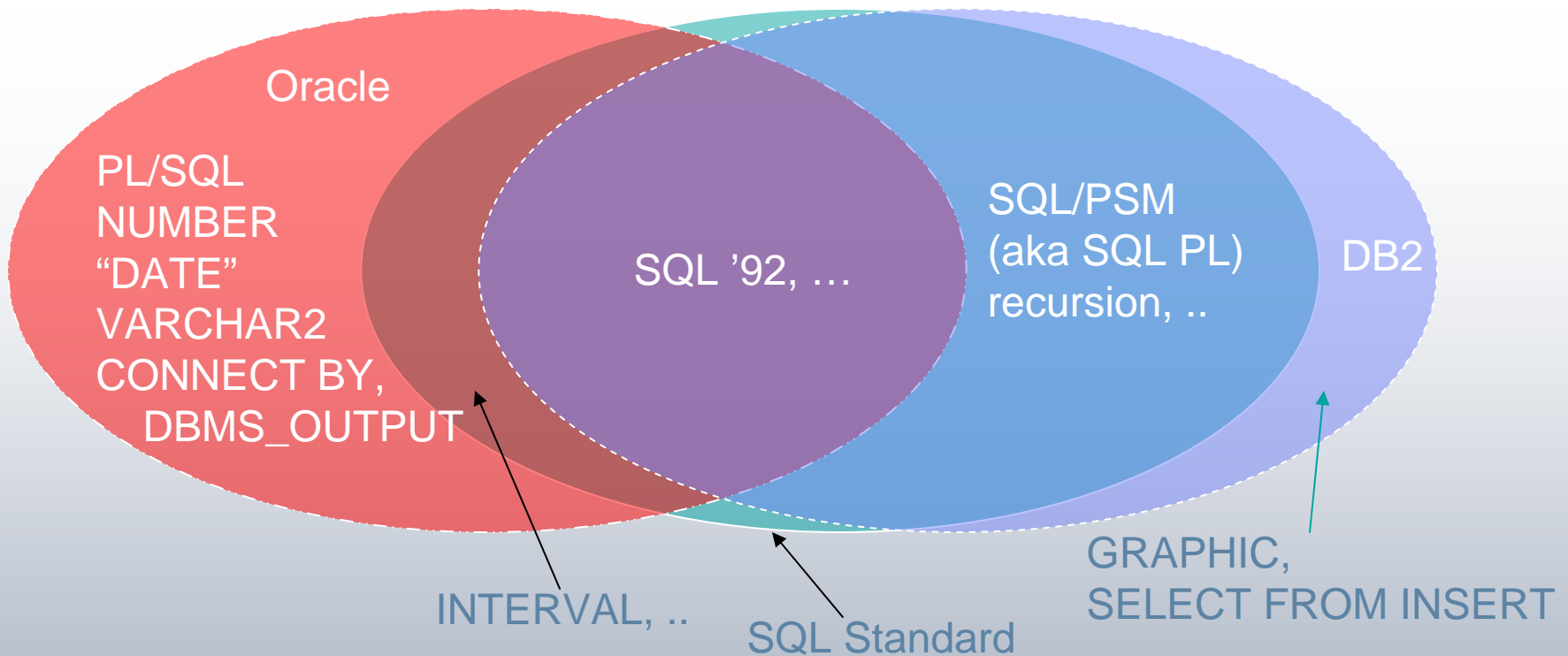


Why Have I Not Moved to DB2 Yet?

- I'm a **customer** and
 - ▶ It's risky to move my critical apps
 - ▶ The return on investment is too far out
 - ▶ My developers have no DB2 skills

- I'm a **vendor** and
 - ▶ Porting to and maintaining another platform is too expensive
 - ▶ The return on investment is too far out
 - ▶ My developers have no DB2 skills

Babylonian Confusion (aka Lock-In)



Where does this leave YOU?

- Pick one dialect and stick (or be stuck) with it
- For ISVs: Pick two or all and have dual/triple maintenance
- Pick intersect only and escape to Java®, Hibernate etc...
- You lose either way!

What has DB2 Done to Bridge the GAP?

- Traditionally
 - ▶ Implement SQL Standard features
 - ▶ Extend SQL standard with popular features
 - ▶ Map proprietary SQL using Migration Tool Kit (MTK)

- Problem
 - ▶ MTK can only help with data base objects and DDL
 - e.g. procedures, triggers, functions, tables
 - ▶ ..but SQL is littered throughout the application code!
 - ▶ Impedance mismatch can cause performance issues



A New Approach!

- Syntax toleration – Where no semantic conflicts exist
- Add infrastructure - eliminate impedance mismatch
- Compatibility modes - overcome clashes between DB2 and other SQL dialects

- Out of the box compatibility for your application
 - ▶ Client side
 - ▶ Server side



Alternate Vendor Support

- Support other vendor's SQL
 - ▶ Easy for developers to query DB2
- Native execution of all SQL statements
 - ▶ Fast performance for queries
- Easily import other vendor's schemas
 - ▶ Easy for developers to set up DB2
- Support other vendor's concurrency models
 - ▶ Easy for developers to use DB2
- Support flexible data typing
 - ▶ Easy for developers to work with DB2
- And more...



Oracle application enablement made easy

- Porting?? I meant **ENABLING!!!**
 - Changes to applications are the exception – not the rule

Concurrency Control
Oracle SQL
PL/SQL
Packages
Built-in packages
JDBC
SQL*Plus Scripts



What's changed in DB2 9.7?

Oracle	→	DB2 9.7
Concurrency Control	→	No change
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JDBC	→	No Change
SQL*Plus Scripts	→	No Change

Changes are the exception. Not the rule.

THIS IS WHY WE CALL IT ENABLEMENT AND NOT PORT !



DB2 9.7 Oracle Enablement Early Feedback

- More than 200 participants in the Early Access Program by April, 2009
 - Some participants with multiple applications
 - Applications that currently use other major databases
 - Many participants enabled their applications to use DB2 in a few days

- Detailed analysis reveals that
 - On average, participants experience 90% less effort to enable DB2

Changes are the exception. Not the rule.



Currently Committed Locking

- Readers don't block writers (readers avoid locking)
- Writers don't block readers (readers bypass locks)
- Enabling Oracle application to DB2 required significant effort to re-order table access to avoid deadlocks



	Blocks ->	Reader	Writer
Oracle Snapshot Isolation	Reader	No	No
	Writer	No	Yes

	Blocks ->	Reader	Writer
DB2 pre-DB2 9.7 CS Isolation	Reader	No	Maybe
	Writer	Yes	Yes

	Blocks ->	Reader	Writer
DB2 9.7 CS Isolation w/CC	Reader	No	No
	Writer	No	Yes

- Log based
- No management overhead
- No performance overhead

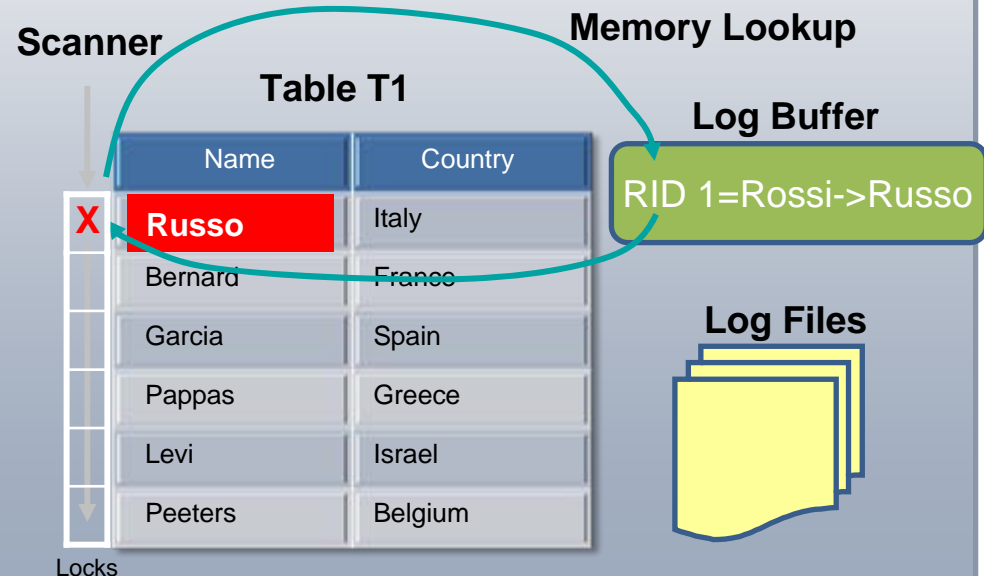
Concurrency Control in DB2 9.7

- **Reads the currently committed version of a row**
 - ▶ If uncommitted row-change found use currently committed version

- **Log based**
 - ▶ No management overhead
 - ▶ No performance overhead
 - ▶ No wasted memory/storage (no undo tablespace)

User 1:
`update T1 set name = 'Russo'`
`where country='Italy'`

User 2:
`select * from T1`



Currently Committed Advantage

- Only incur added processing when a reader and writer are working on the same row

- No added overhead for a “just in case” collision
 - ▶ With Oracle past images are stored in the undo tablespace just in case there is a collision

- DB2 uses existing log infrastructure to retrieve currently committed data in flight
 - ▶ Better performance
 - ▶ Lower overhead
 - ▶ Simplified management



Externals – How To Get/Request Currently Committed

- **CUR_COMMIT** database configuration parameter

ON : default for new DB's created in DB2 9.7 - all CS is CC

AVAILABLE : equivalent to DB2/zOS default - need to request CC (below)

DISABLED : default value on migration - doesn't support CC

- **BIND**

```
>--+-----+----->
      |--CONCURRENTACCESSRESOLUTION--+--USE CURRENTLY COMMITTED--+--'
                                     |--WAIT FOR OUTCOME-----'
```

- **PREPARE**

```
concurrent-access-resolution:
|--USE CURRENTLY COMMITTED+-----|
  |--WAIT FOR OUTCOME-----'
```

Oracle types in DB2 9.7

Type	Comment
NUMBER	Exploits P6 hardware accelerated DECFLOAT
VARCHAR2	NULL = "", trailing blank sensitive collation
TIMESTAMP(n)	0 (date + time) <= N <= 12 (date + time + picoseconds)
"DATE"	Year to seconds, SYSDATE
BOOLEAN	In procedural code
INDEX BY (Hash Tables)	Associative arrays in procedural code
VARRAY	Regular arrays in procedural code
Row Type	In procedural code, VARRAY, INDEX BY
Cursor Type	Allows passing, and predefining of cursors

TIMESTAMP WITH TIMEZONE and **INTERVAL** in development

Weak Typing in DB2 9.7

- DB2 has been following strict SQL standard typing rules
 - ▶ The trend is towards weak typing (PERL, RUBY, PHP, ...)
- New behavior
 - ▶ Implicit conversion between numerics and strings on:
 - Assignment
`SET salary := '52000'`
 - Comparison
`WHERE salary > '52000'`
 - Most built-in functions
`'salary: ' || 52000`
 - ▶ Substitutability between DATE and TIMESTAMP
 - Save 40% storage by using SQL Standard DATE without changing an Oracle “DATE” based application
 - ▶ More aggressive usage of NULL and parameter markers
 - Function invocation with untyped parameter markers and NULL
`values foo(?, NULL)`

Oracle functions in DB2 9.7

Function	Comment
Conversion and Formatting	TO_CHAR, TO_DATE, TO_TIMESTAMP, TO_NUMBER, TO_CLOB
Datetime arithmetic	EXTRACT, ADD_MONTHS, ...
String manipulation	INITCAP, RPAD, LPAD, INSTR, REVERSE, ...
Misc	DECODE, NVL, LEAST, GREATEST, BITAND

Oracle SQL in DB2 9.7

Feature	Comment
CONNECT BY	Tree walk recursion, includes helper functions (DB2 9.5)
(+)-join	Old style OUTER JOIN syntax (DB2 9.5)
DUAL	Equivalent to SYSDUMMY1 (DB2 9.5)
ROWNUM	Pseudo column syntax for ROW_NUMBER() (DB2 9.5)
NEXTVAL/CURRVAL	Pseudo column syntax for sequences
SELECT INTO FOR UPDATE	Get UPDATE lock without a cursor
AUTONOMOUS TX	Independent transactions for auditing
TRUNCATE table	Quickly delete table contents with no logging
Public synonym	For table, sequence, module/package
CREATED temp table	Temp table with persistent definition

PL/SQL Features in DB2 9.7

Function	Comment
All logic	IF, WHILE, :=, etc..
EXCEPTION	Try/catch handling
User Defined Exceptions	Define conditions with or without SQLCODEs
Constant variables	Variables that cannot be set
FOR over range	Step through numbers
over SELECT	Step through result set of query
over cursor	Step through result set of cursor
%TYPE	Anchored scalar data types
%ROWTYPE	Anchored row types
BULK COLLECT/FETCH	Aggregate result set into array
FORALL	Pipe array into SQL statement
AUTONOMOUS transaction (#PRAGMA AUTONOMOUS)	Executes a procedure in an independent TX

PL/SQL in DB2 9.7

Area	Comment
Anonymous block	Server Side Scripting New also in SQL PL dialect
Scalar function	
Procedure	Including DEFAULT parameters
Package	Known as MODULE in DB2
Trigger	Row Level, Before or After

PL/SQL Package in DB2 9.7

Feature	Comment
CREATE PACKAGE	Defines prototypes and public objects
CREATE PACKAGE BODY	Defines content and private objects
Replace package body	Replace body without losing prototypes or public objects
PKG [BODY] VARIABLE	Public/private variables
CURSOR	Public/private cursors
TYPE	Public/private types
EXCEPTION	User defined exceptions
PROCEDURE FUNCTION	
SYNONYM ON PACKAGE	Public synonyms

- DB2 shreds package and body into individual *module* objects
- External management view is preserved

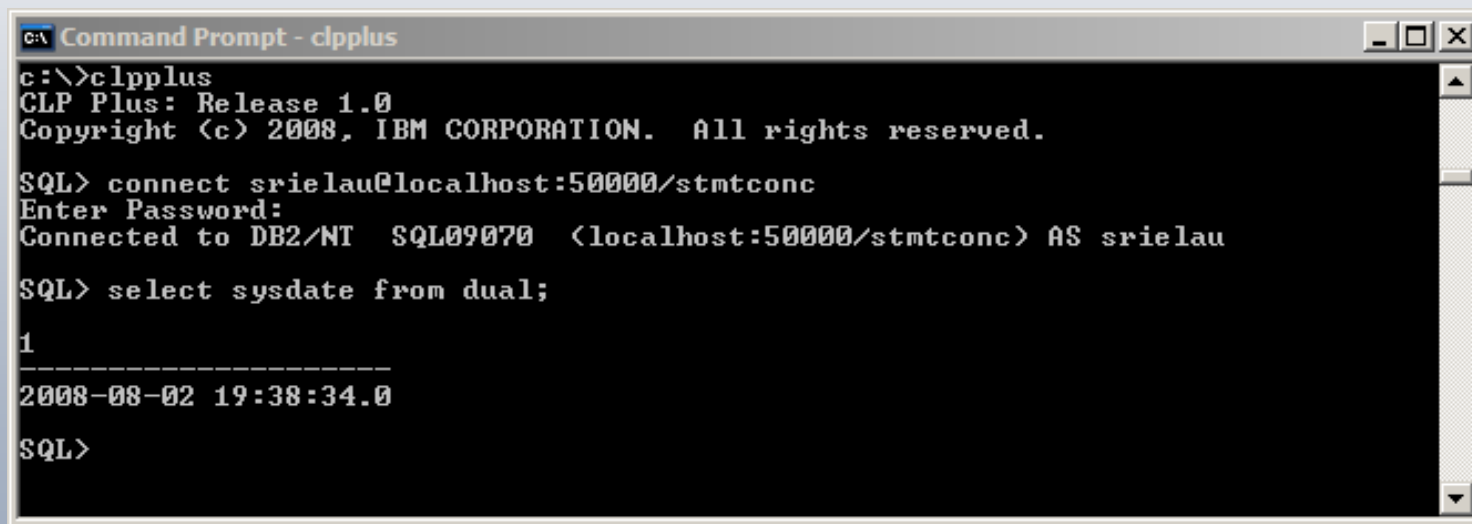
Built-in package libraries in DB2 9.7

Feature	Comment
DBMS_OUTPUT	“print debugging” and simple reporting
UTL_FILE	Server side I/O API
DBMS_ALERT	Cross session semaphoring
DBMS_PIPE	Cross session data pipe
DBMS_JOB	Job scheduler
DBMS_LOB	Alternate API to DB2 native LOB functions
DBMS_SQL	Alternate API to PREPARE/EXECUTE
DBMS_UTILITY	Misc functions and procedures
UTL_MAIL	Server API to email
UTL_SMTP	Server API to SMTP

Option to add more libraries as needed.

Using SQL*Plus scripts in DB2 9.7

- CLPPlus
 - ▶ SQL*Plus compatible command
 - ▶ Variable substitution
 - ▶ Column formatting
 - ▶ Simple reporting
 - ▶ Control variables



```
c:\>clpplus
CLP Plus: Release 1.0
Copyright (c) 2008, IBM CORPORATION. All rights reserved.

SQL> connect srielaui@localhost:500000/stmtconc
Enter Password:
Connected to DB2/NT  SQL09070  (localhost:500000/stmtconc) AS srielaui

SQL> select sysdate from dual;

1
-----
2008-08-02 19:38:34.0

SQL>
```

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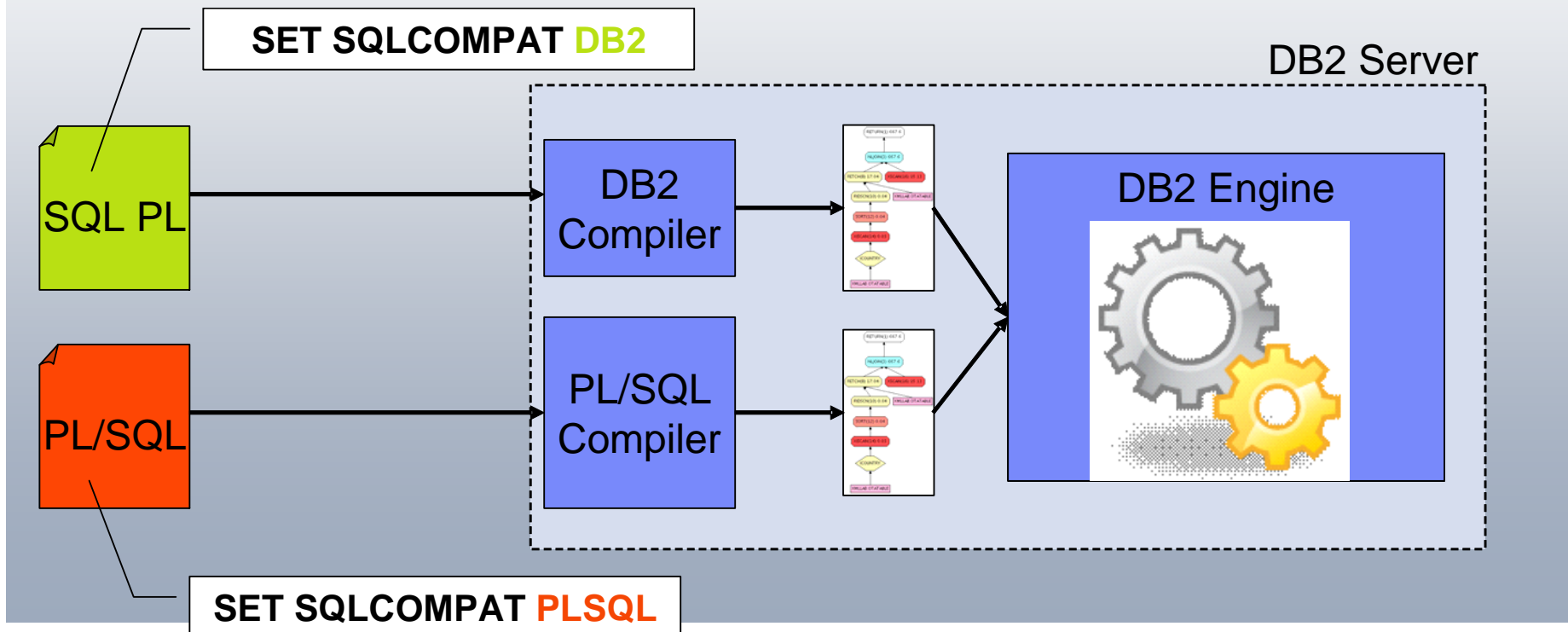
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Oracle application enablement made easy

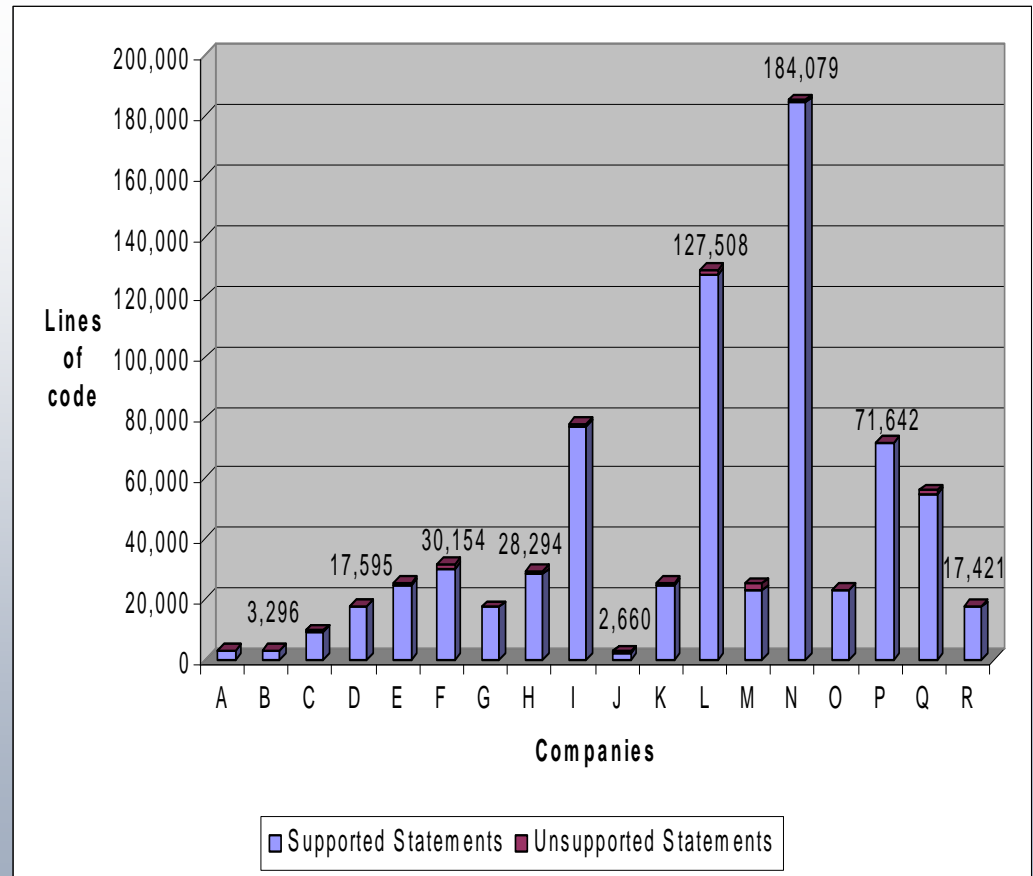
■ New DB2 9.7's Compatibility Features

- ▶ New Registry variable: DB2_COMPATIBILITY_VECTOR
- ▶ PL/SQL language is supported by DB2 interface
 - SET SQLCOMPAT PLSQL – command to setup the CLP environment so that it can compile PL/SQL code



Number of Supported PL/SQL Statements

- SQL in procedural code
 - ▶ Functions
 - ▶ Built-in functions
 - ▶ Procedures
 - ▶ Packages
 - ▶ Triggers
- Use measurement tool
 - ▶ 18 companies agreed
- Variety of applications
 - ▶ Big (185k statements)
 - ▶ Small (2k statements)

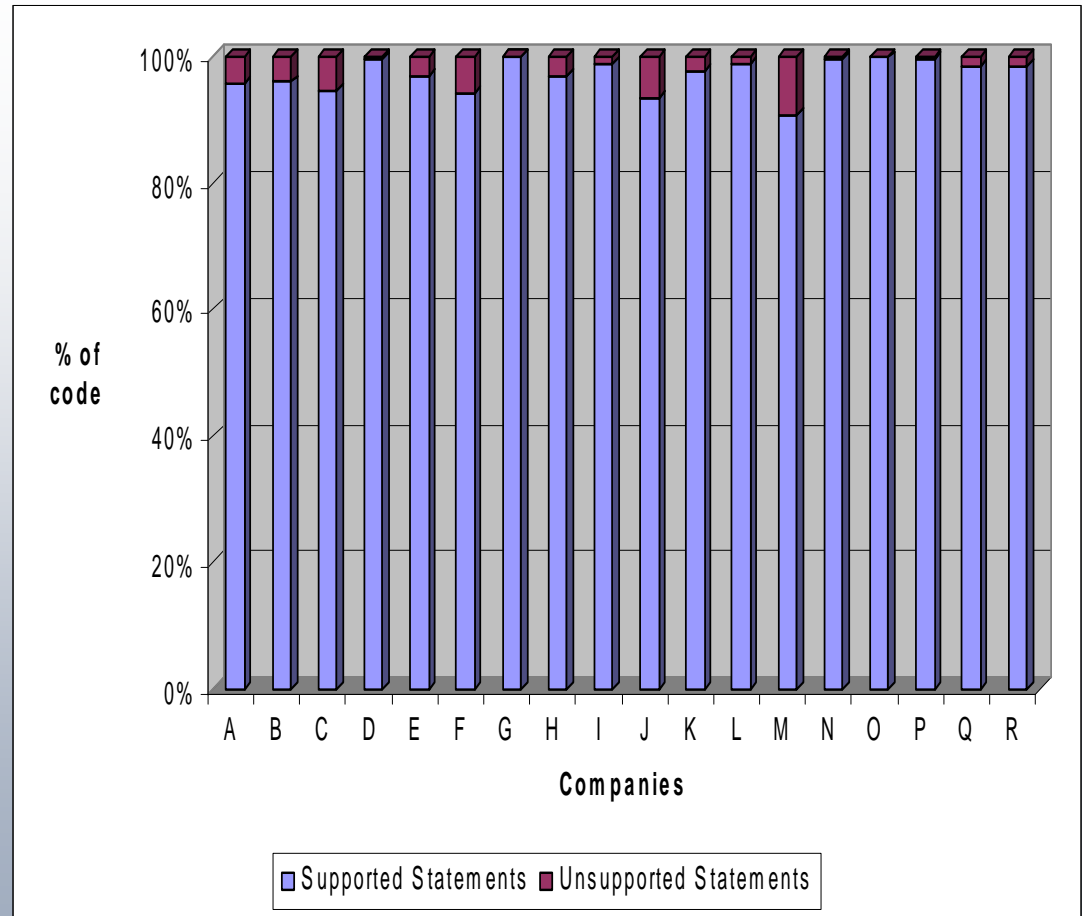


Percentage of Supported PL/SQL Statements

- Variety of participants:
 - ▶ Different industries
 - ▶ Different solutions
 - ▶ Different app sizes
 - ▶ Different countries

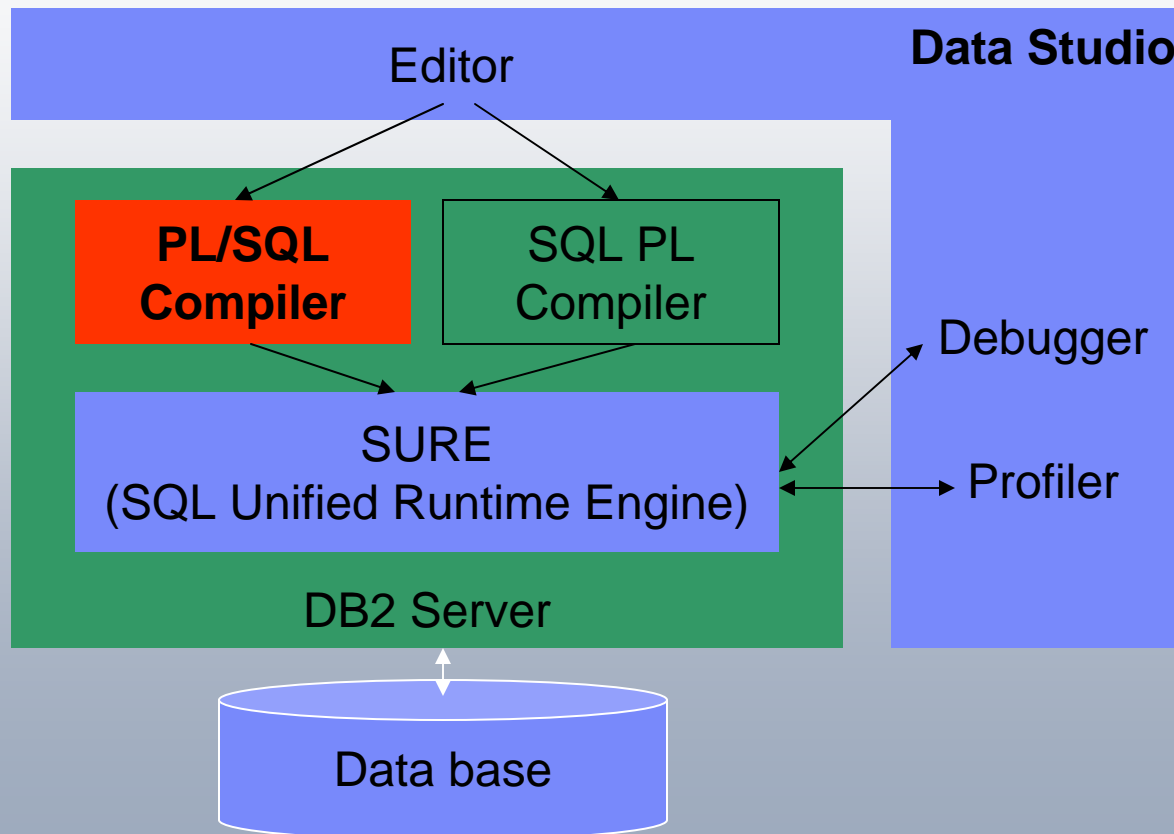
- PL/SQL supported:
 - ▶ > 750,000 lines of code

- Average: 98.43%



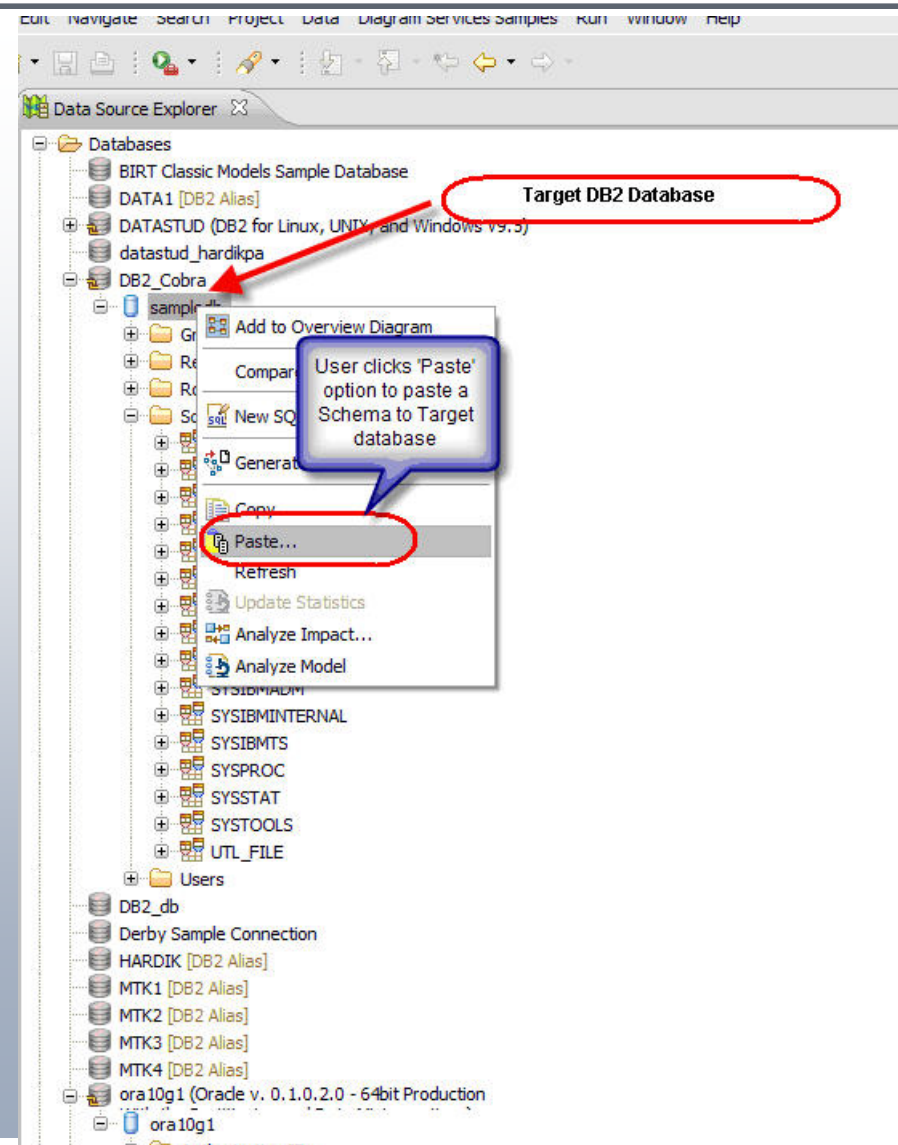
PL/SQL in DB2 9.7

- Built in PL/SQL compiler
- Source level debugging and profiling

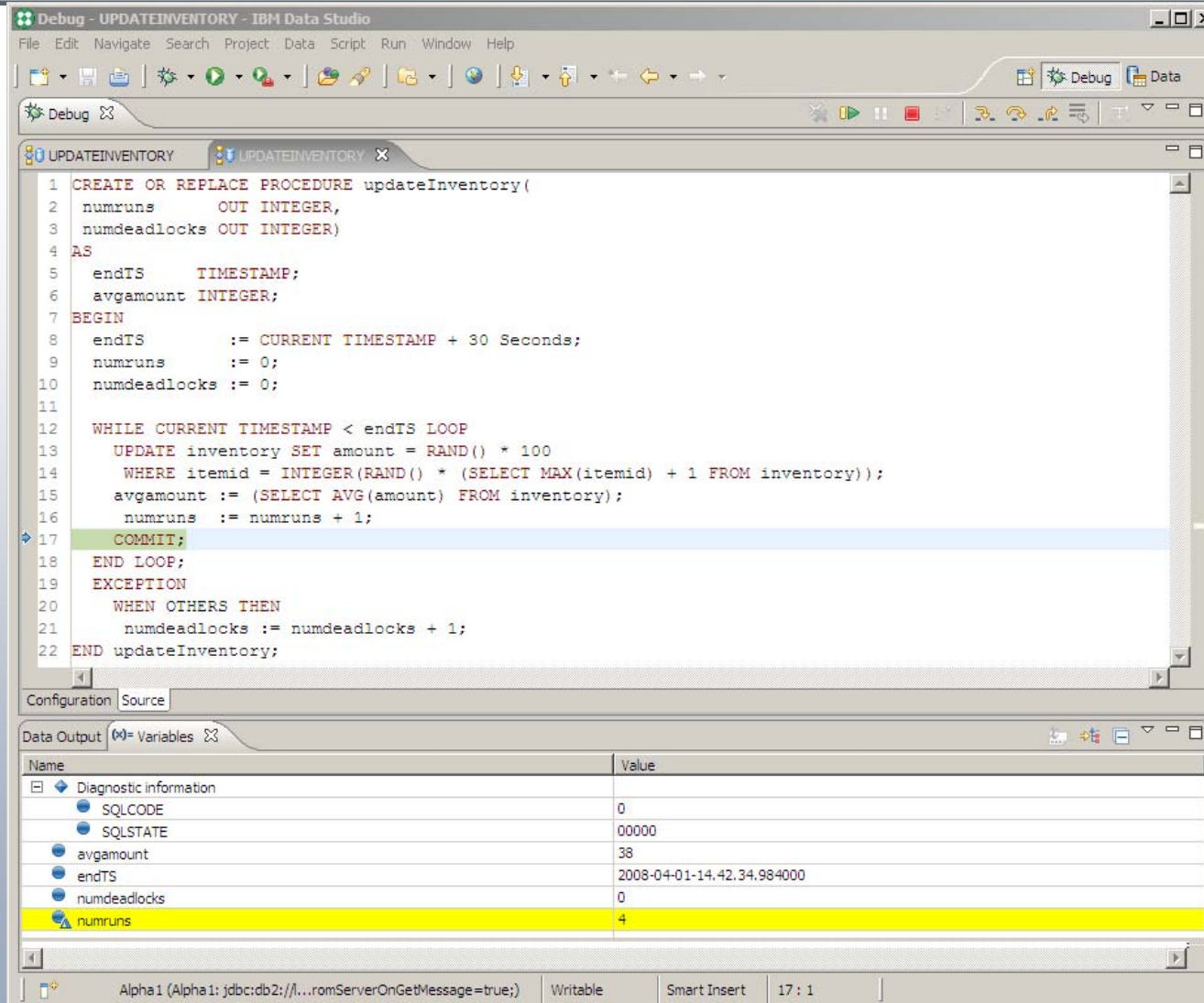


Easily Import Other Vendor's Schemas

- Drag and drop schemas between Oracle database and DB2 for quick movement and trials
- Easily map schemas and data types from Oracle database to DB2
- Automatically map schemas and data types
- Oracle database developers can quickly start using DB2



Debugging PL/SQL in DB2 9.7



The screenshot shows the IBM Data Studio interface for debugging a PL/SQL procedure. The main window displays the source code of the procedure 'updateInventory'. The 'Data Output' window shows the current state of variables and diagnostic information.

```
1 CREATE OR REPLACE PROCEDURE updateInventory(  
2   numruns      OUT INTEGER,  
3   numdeadlocks OUT INTEGER)  
4 AS  
5   endTS      TIMESTAMP;  
6   avgamount  INTEGER;  
7 BEGIN  
8   endTS      := CURRENT TIMESTAMP + 30 Seconds;  
9   numruns    := 0;  
10  numdeadlocks := 0;  
11  
12  WHILE CURRENT TIMESTAMP < endTS LOOP  
13    UPDATE inventory SET amount = RAND() * 100  
14    WHERE itemid = INTEGER(RAND() * (SELECT MAX(itemid) + 1 FROM inventory));  
15    avgamount := (SELECT AVG(amount) FROM inventory);  
16    numruns   := numruns + 1;  
17  COMMIT;  
18  END LOOP;  
19  EXCEPTION  
20  WHEN OTHERS THEN  
21    numdeadlocks := numdeadlocks + 1;  
22 END updateInventory;
```

Name	Value
Diagnostic information	
SQLCODE	0
SQLSTATE	00000
avgamount	38
endTS	2008-04-01-14.42.34.984000
numdeadlocks	0
numruns	4

Alpha1 (Alpha1: jdbc:db2://...romServerOnGetMessage=true;) Writable Smart Insert 17 : 1

Enabling DB2: Before and After

Before:

- Map schema and data types
- Move data
- Translate (semi-automated)
 - ▶ Triggers
 - ▶ Procedures
 - ▶ Functions
 - ▶ Anonymous blocks
- Translate SQL (manual)
- Debugging
- Tuning
- Parallel production
- Cut over

After:

- Import schema and data types
- Move data
- Runs natively
- Handle exceptions
- Debugging
- DB2 auto tunes
- Parallel production
- Cut over

Now takes
days instead
of months!

Preferred target applications

- Cross vendor standardized client APIs
 - ▶ JDBC
 - ▶ ODBC
 - ▶ .NET

- Isolated/no dependencies on Oracle extended options/features
 - ▶ Oracle Spatial
 - ▶ Oracle Streams
 - ▶ Oracle Text
 - ▶ ...



Enablement Summary

- Enable instead of Port
 - ▶ Easy skills transfer
 - ▶ Easy code transfer

- DB2 9.7 breaks with traditional approach to migration
 - ▶ Re-use existing skills
 - ▶ PL/SQL and SQL PL have similar performance characteristics

- Remain in your dialect of choice

- Significantly simplifies enablement



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