IBM Information On Demand
Unlock The Business Value Of Information

Why DB2 Is The Right Database For New Intelligence

New Intelligence Demands A High Efficiency Foundation

Data warehousing, business intelligence and content management all put demands on the underlying database.
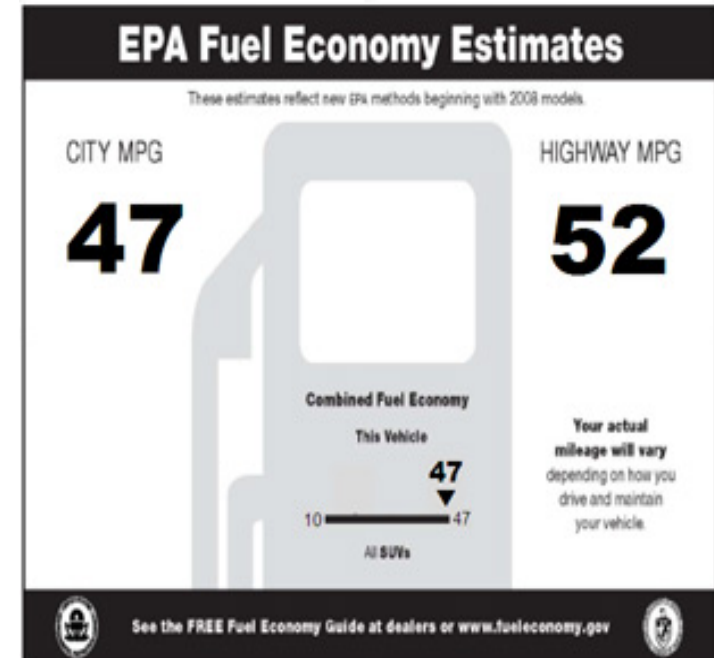
Your database software is the foundation for New Intelligence. DB2 is not only inexpensive but highly efficient.

Service Oriented Finance CIO

IBM

DB2 Is A High-Efficiency Design

- **High Efficiency Scalability** keeps things simple and postpones scale-out

- DB2 has **High Efficiency Compression** that saves twice as much on storage ****ENHANCED****

- DB2's **High Efficiency XML** storage takes less space and has much better performance ****ENHANCED****

- New **High Efficiency tools** make developers and DBAs more productive ****ENHANCED****

- **High Efficiency DB2 HADR** beats Oracle RAC

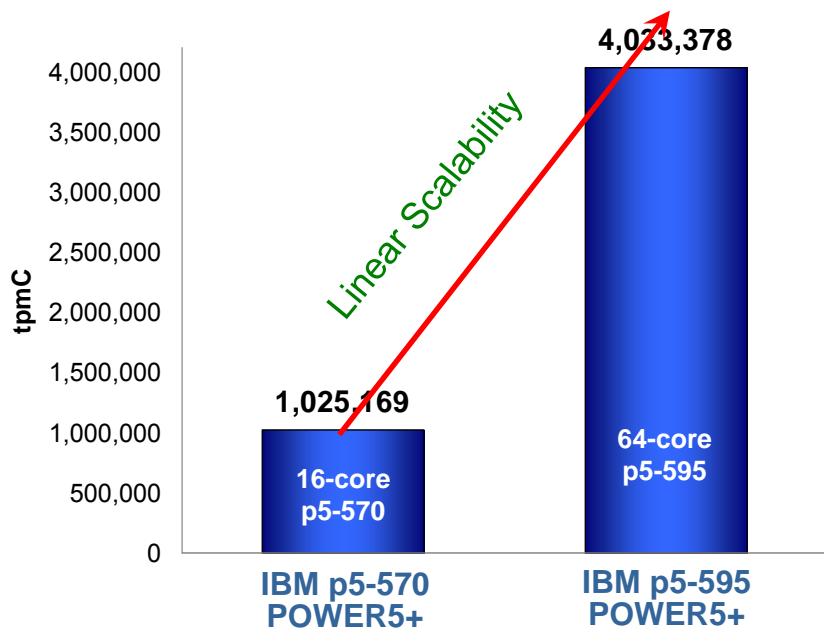- DB2 exploits IBM hardware to improve performance and availability

EPA Fuel Economy Estimates

These estimates reflect new EPA methods beginning with 2008 models.

CITY MPG **47** HIGHWAY MPG **52**

Combined Fuel Economy
This Vehicle **47**
10 ────────▼──── 47
All SUVs

Your actual mileage will vary depending on how you drive and maintain your vehicle.

See the FREE Fuel Economy Guide at dealers or www.fueleconomy.gov

Oracle 11g, Oracle RAC and Microsoft SQL Server require more resources to perform the same work!
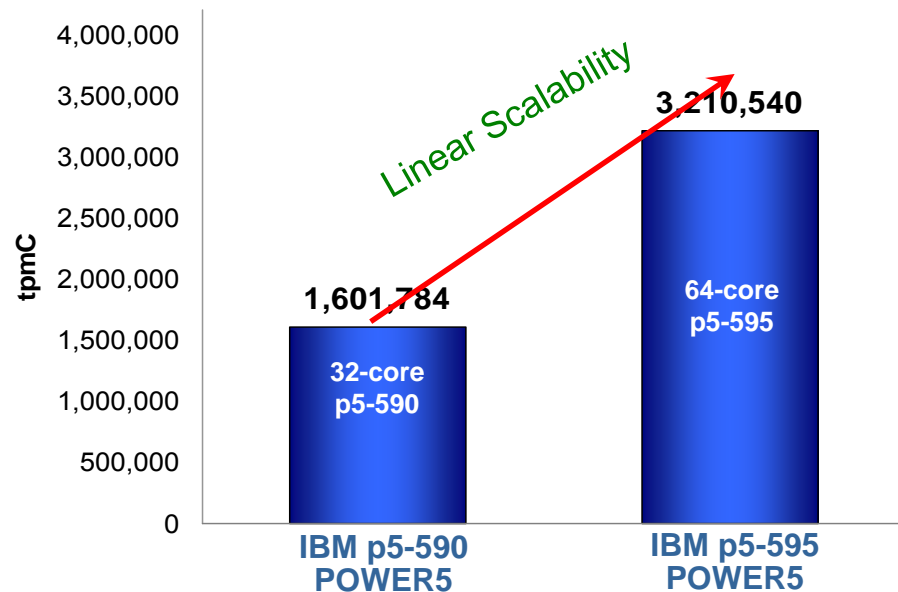
DB2 9.7 makes this story even better

TPC-C Benchmarks Demonstrate DB2's High Efficiency Scaling On Power Systems

4x Cores, 3.93x Throughput

DB2 Benchmarks on Power Systems POWER5+

2x Cores, 2.00x Throughput

DB2 Benchmarks on Power Systems POWER5

System z With DB2 Scales Further Than Best Oracle On HP Superdome Banking Benchmark

- **Kookmin Bank**
  - ▶ **IBM System z9 and DB2**
  - ▶ **TCS BaNCS (Cobol)**
  - ▶ **15,353** Transactions/second
  - ▶ **50** Million Accounts
  - ▶ IBM benchmark for customer
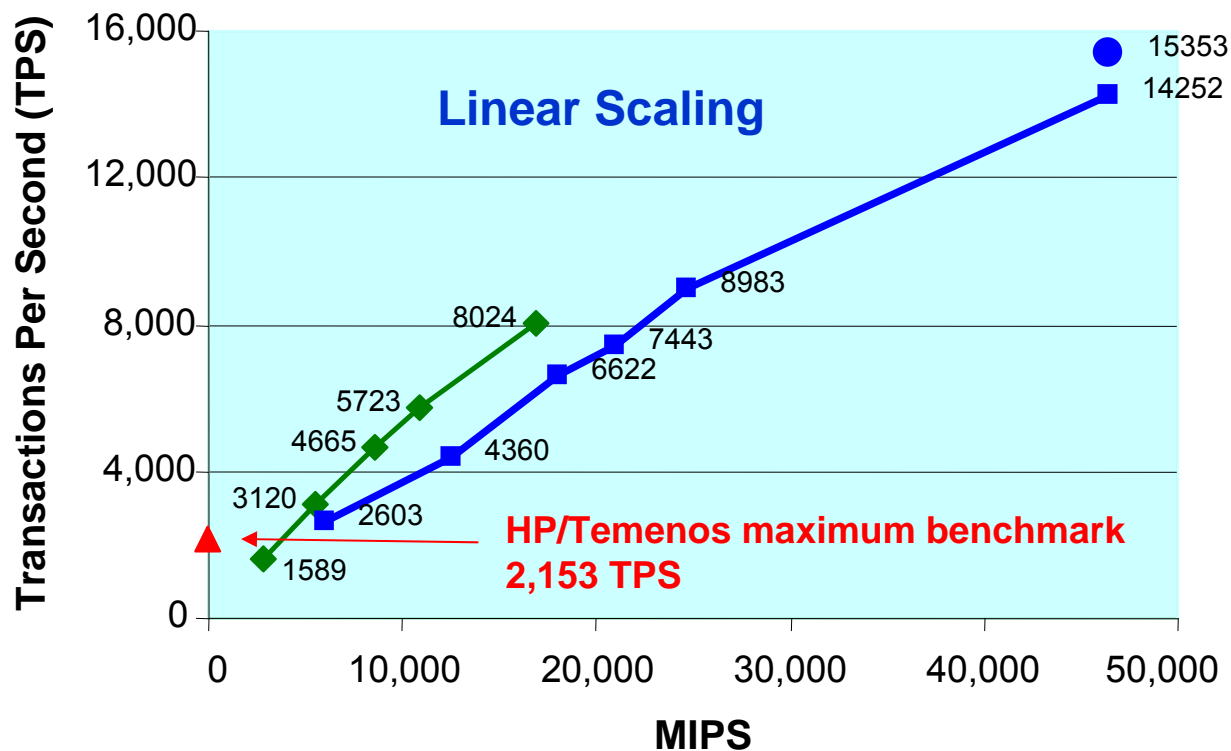
- **Bank of China** **
  - ▶ **IBM System z9 and DB2**
  - ▶ **TCS BaNCS (Cobol)**
  - ▶ **8024***** Transactions/second
  - ▶ **380** Million Accounts
  - ▶ IBM benchmark for customer

- **HP/Temenos** *
  - ▶ **HP Itanium and Oracle**
  - ▶ **Temenos T24 (Java)**
  - ▶ **2,153** Transactions/second
  - ▶ **13** Million Accounts
  - ▶ Largest banking benchmark performance claimed by HP

System z and BaNCS Online Banking Benchmarks

Transactions Per Second (TPS) vs **MIPS**

Linear Scaling

- 15353
- 14252
- 8983
- 8024
- 7443
- 6622
- 5723
- 4665
- 4360
- 3120
- 2603
- 1589

HP/Temenos maximum benchmark 2,153 TPS

* **SOURCE**: TEMENOS BENCHMARKS; http://h71028.www7.hp.com/enterprise/downloads/TemenosBenchmark.pdf
** **SOURCE**:http://www.enterprisenetworksandservers.com/monthly/art.php?2976 **Source**: InfoSizing FNS BANCS Scalability on IBM System z – Report Date: September 20, 2006
*** Standard benchmark configuration reached 8024 tps, a modified prototype reached 9445 tps

What Is DB2 Storage Compression?

- Implemented by software

- Compression looks for repeating patterns <u>across the entire table</u>
  - ▶ Replaces repeating strings with a 12-bit symbol
  - ▶ Symbols are stored in a dictionary for fast lookup
  - ▶ Oracle and SQL Server use page level compression

- Data resides in compressed form in memory and on disk
  - ▶ **Significant disk storage cost savings**
  - ▶ **I/O bandwidth savings**
  - ▶ **Memory usage savings**
  - ▶ Some CPU costs
    - – Rows must be decompressed before being processed for evaluation

DB2 9.7 Compression Is Even Better

- DB2 9.7 adds more compression features
  - ▶ Adds index compression
    - Row id (RID) list compression
    - Between 30 and 55% compression for SAP test indicies
  - ▶ Adds temp table compression
  - ▶ Adds inline LOBs
    - which can take advantage of page compression
  - ▶ Adds XML XDA page compression

- Only DB2 does RID list and temp table compression
  - ▶ Neither Microsoft or Oracle can do this

XML – The Difference Is Fundamental

- **Relational is a data model**
    - Relations (tables)
    - Attributes (columns)
    - Set based w/some sequences
    - Strict schema

SSN	CreditReportID	CreditDate
111111111	1234	Dec 12, 2007
111111111	4456	Feb 8, 2008
123456789	2314	Nov 30, 2007

SSN	LastName	FirstName	Street	City	State	Zip
111111111	Haan	Brian	1 Harry Rd	San Jose	CA	95141
123456789	Smith	Joe	555 Bailey Ave	San Jose	CA	95141

CreditReportID	CreditBureau	CreditLiability	Rating
1234	ABC Credit	Collection	649
1235	ABC Credit	Collection	687
2314	TRW Reporting	Mortgage	750

- **XML is a data model**
    - Hierarchical tree structure
    - Nodes (elements, attributes, comments, etc.)
    - Relationships between nodes
    - Sequence based w/ some sets
    - Flexible schema

```
<MISMOversionID="2.3.1" ?>
<RespondingParty="ABC Credit">
  <RESPONSE_DATA>
    <CREDIT_RESPONSE_MISMOVersionID="2.3.1"
      CreditResponseID="CRResp0001"
      CreditRatingCodeType="Equifax">

    <CREDIT_BUREAU _Name="ABC Credit" _StreetAddress=".."
     ...
    </CREDIT_BUREAU>
    <BORROWER BorrowerID="B1" _FirstName="Joe" _LastName="Smith"
     ....
    </BORROWER>
    <CREDIT_LIABILITY CreditLiablityID="CrL12923"
     ....
      <_CURRENT_RATING _Code="9" _Type="Collection/>
.......
</RESPONSE_DATA>
```

DB2 9 Native XML Storage Is Called pureXML

- A "Hybrid" data base environment combining the relational and XML hierarchical data models
  - ▶ Adds a new "XML" data type

- A new storage mechanism to efficiently manage XML data
  - ▶ "Native" means that XML documents are stored on data base pages as parsed tree structures to reflect XML's hierarchical structure

- This avoids conversions between XML and relational structures, and the corresponding limitations
  - ▶ Input and retrieval are faster, performance is better, and querying is better and faster
  - ▶ With BLOBs and shredding, every operation (parsing, etc.) is expensive and there is a potential loss of data
  - ▶ The XML document might be too complex to shred

Demo: Side-By-Side Race Between Data Studio Developer And Visual Studio
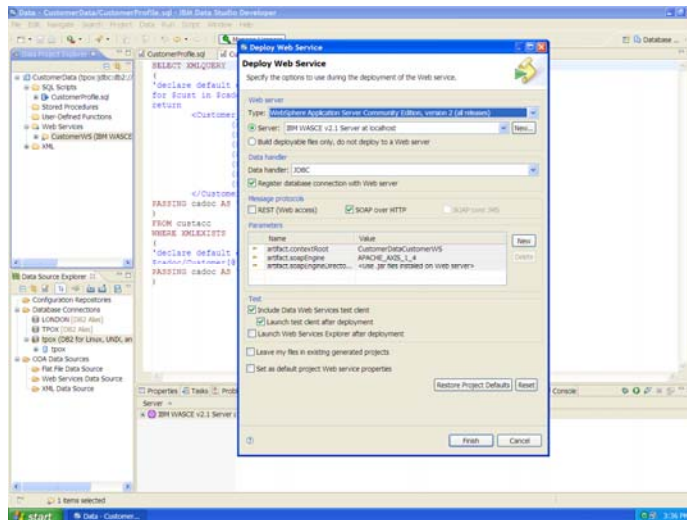
Project steps to expose XQuery data as a web service

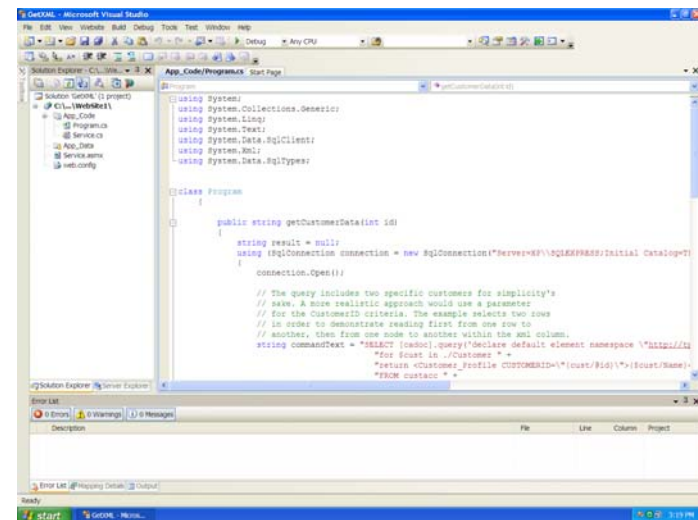✓ 1) Create Project, add database connection and test

✓ 2) Import and test XQuery

3) Create Web Service from XQuery

4) Test Web Service and package it for installation

IBM Data Studio
Developer 2.1

Microsoft
SQL Server 2008

DB2 9.7 Extends XML Support

- XML now fully supported in Multidimensional Clustering (MDC) tables
  - ▶ Dimensional indexes can be combined with XML indexes
  - ▶ Not clustering the XML Data itself
    - – Storage for XML remains in XML storage objects (XDA objects)
  - ▶ XML column is not part of the clustering key

- XML now fully supported in Range Partitioned Tables
  - ▶ Partitions can contain XML columns
  - ▶ XML column is not part of the partitioning key

DB2 Has Autonomic Capabilities To Make Administrators More Productive

Everyday tasks are simply automatic with the DB2 Control Center!

■ Automatic Configuration Parameters

■ Automatic Statistics collection

■ Automatic Backup

■ Automatic Table reorganization

Number of asynchronous page cleaners	(AUTOMATIC)1	(AUTOMATIC)1 num_iocleaners
Number of I/O servers	(AUTOMATIC)3	(AUTOMATIC)5 num_ioservers
Package cache	(AUTOMATIC)320	(AUTOMATIC)1533 pckcachesz
Recovery range and Soft checkpoint inter...	520	1000 softmax
Sort heap size	(AUTOMATIC)83	(AUTOMATIC)304 sortheap

Database - TPOX

Alias name	: TPOX	Status as of:	4/23/09 2:01 PM	Refresh
System	: XP			
Type	: Local	DBM State:	Started	Stop
Actions:		Last Backup:	None	Backup
Application		Size:	62 MB	View
Design		Capacity:	2668 MB	
Activity			2%	
Query		Health:	Normal	Monitor DB
Create New		Maintenance:	Partially automated	Maintenance

Online maintenance window

Online automatic maintenance can occur during the following window

Time	00:00 - 05:00 (5 hours)
Days of the week	All
Days of the month	All
Activities using this window	Backup database (BACKUP), Optimize data access (RUNSTATS)

Change...

10:00
11:00
12:00
1:00
2:00

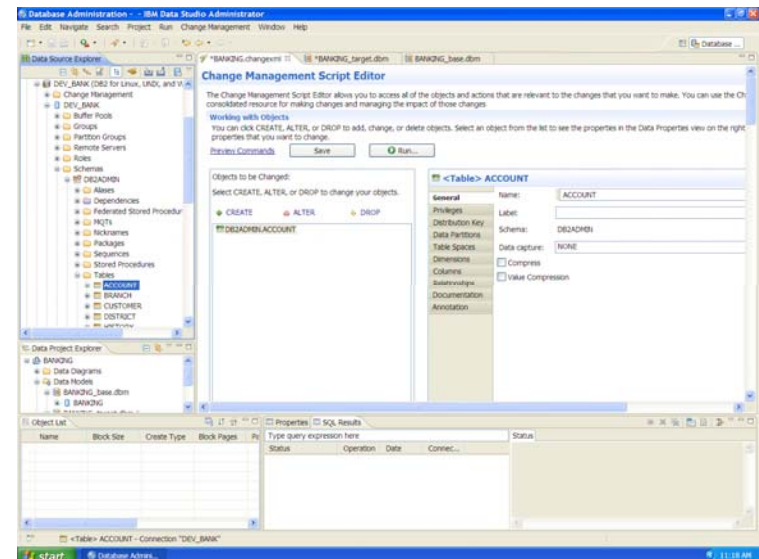# IBM Optim Database Administrator 2.2 Improves Administrator Productivity

- Simplifies promoting changes from development to test or test to production
  - ▶ Compare, synchronize, copy, clone, or merge database schema definitions from the source to the target
  - ▶ Specify masks and ignores to simplify the comparison of tables
  - ▶ Migrate objects from physical data models, live database connections, or from scripts
  - ▶ Move objects and data with copy and paste, drag and drop, or directly from a comparison
  - ▶ Make changes-in-place or develop scripts for later use
- Eclipse-based
- Integrates with Rational ClearCase or other version control systems

DEMO: Easily Manage Changes With Optim Database Administrator 2.2

Optim Database Administrator

- Enable new DB2 capabilities in Service Oriented Finance application environment

  ▶ Automatically detect and synchronize changes between Development and Testing Banking Database

  ▶ Enable compression
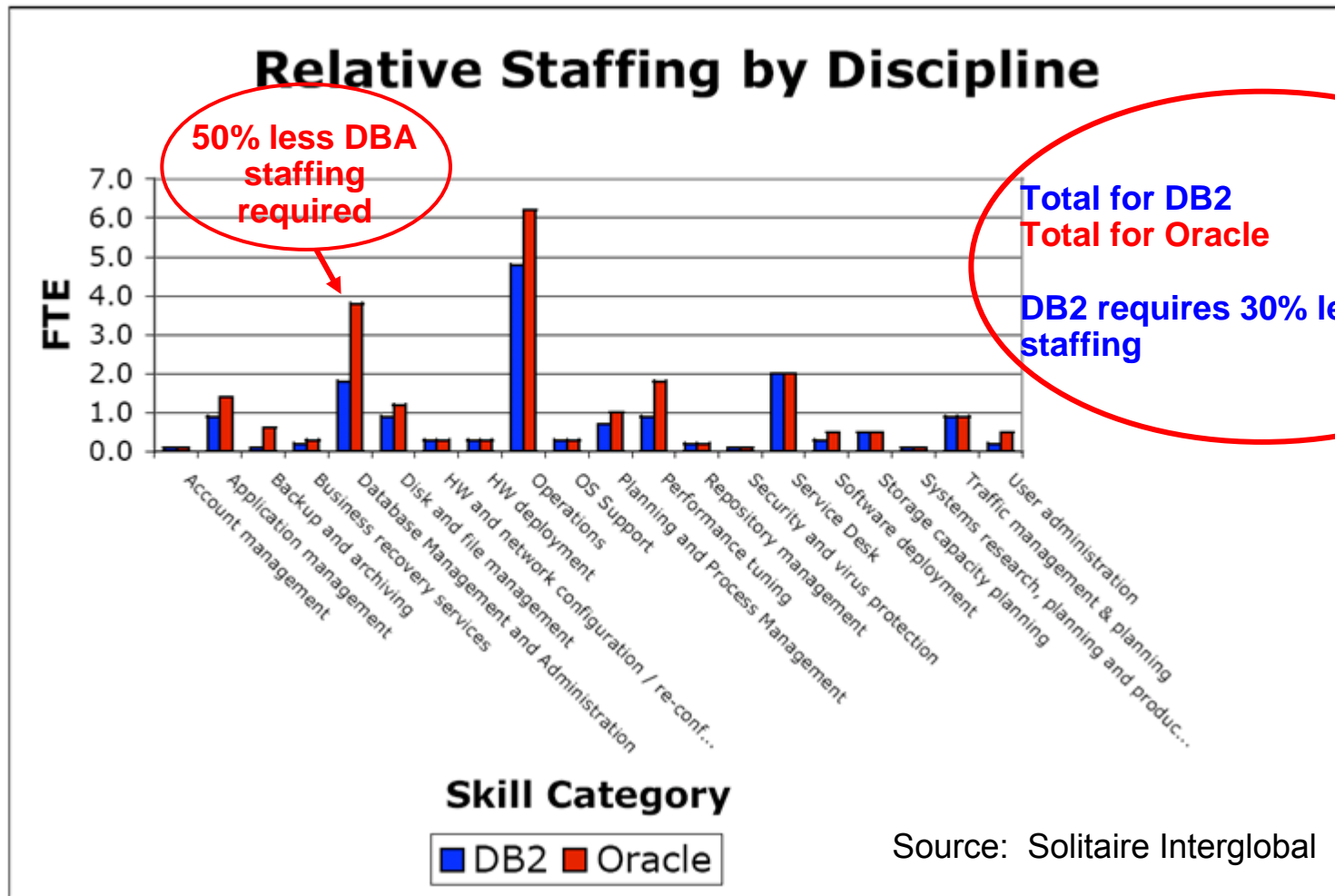
  ▶ Add table for XML data

Customers See The Benefits Of DB2's High Efficiency Administration

"There's far less administration involved with DB2 than with Oracle." **BOC runs "50-100 SAP systems," supported by 12 people "That is really quite extraordinary." -** Sheila Moran at BOC in UK

"DB2 requires significantly less database administration than Oracle. **We can now deploy our IT staff for more productive and business-critical needs" -** Zdenek Vosahlo, Head of IT at Precheza
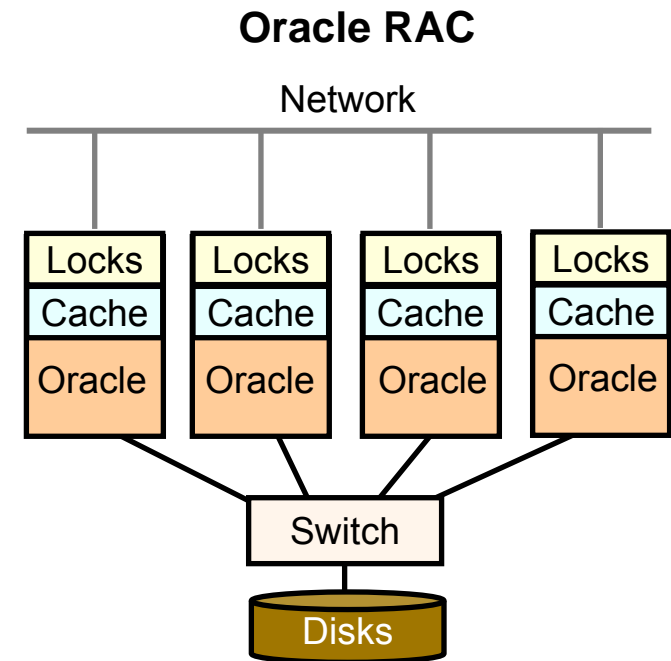
Ease Of Administration – Big Part Of TCO

Solitaire Interglobal Study - Staffing
Real world study of 250 sites

Relative Staffing by Discipline

50% less DBA staffing required

Total for DB2   15.6 FTE
Total for Oracle   22.1 FTE

DB2 requires 30% less overall staffing

Skill Category

■ DB2 ■ Oracle
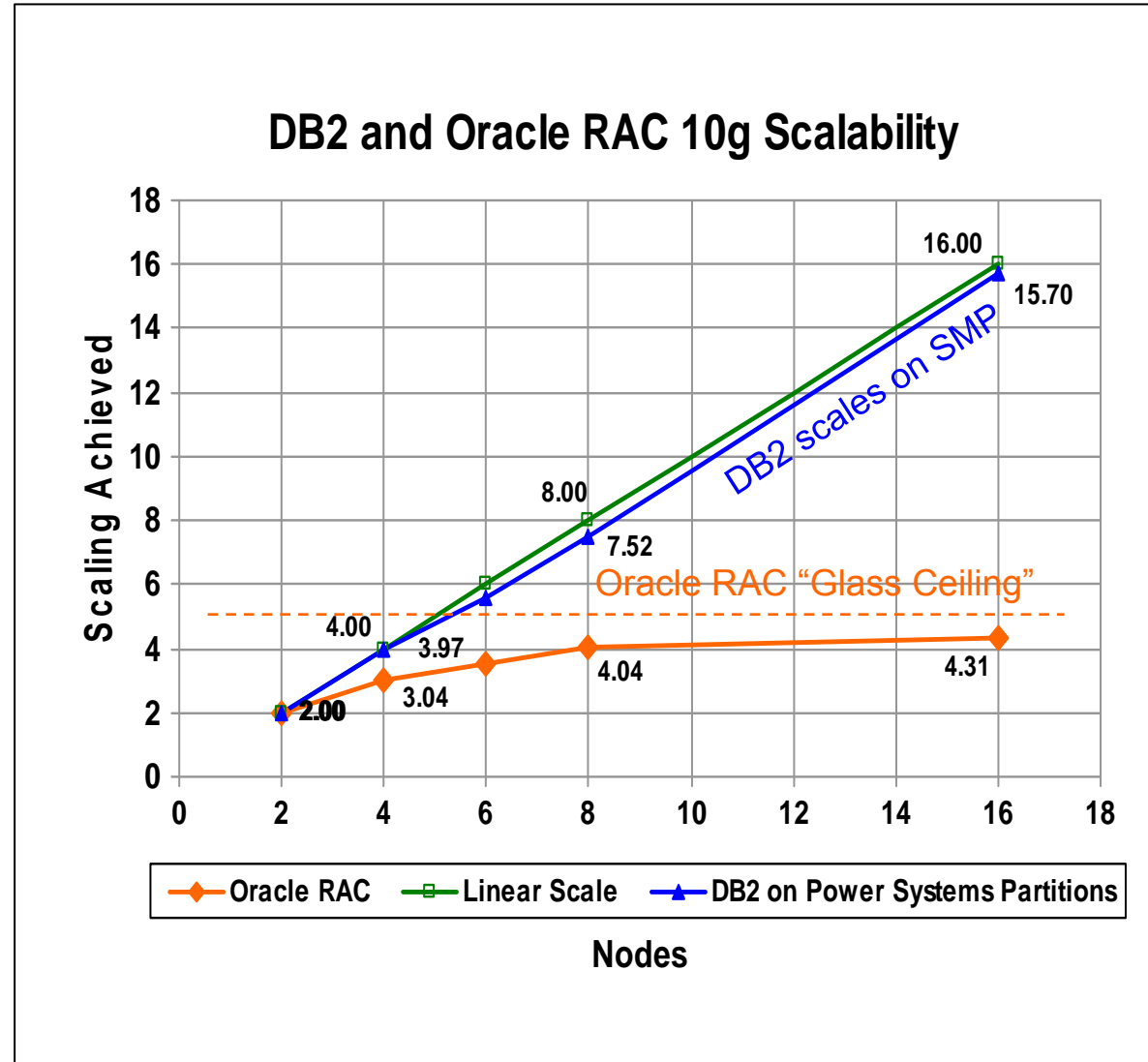
Source: Solitaire Interglobal

Oracle RAC Cluster Model Is An Inefficient Design

- **Incoming requests are dispersed (sprayed) among the nodes**
  - ▶ RAC maintains locks, cache per node

- **Requires two separate networks**
  - ▶ A private network for internal traffic between the nodes and the database
  - ▶ A public network for external communication and incoming requests

- **Requires a single copy of the database in storage**

Oracle RAC

Network

Locks	Locks	Locks	Locks
Cache	Cache	Cache	Cache
Oracle	Oracle	Oracle	Oracle

Switch

Disks

HP Agrees! Oracle Scale-Out Glass Ceiling

- DB2 provides near-linear scalability on Power Systems

- With Oracle RAC, overhead increases rapidly as additional nodes are added, and performance degrades significantly after only 4 to 6 nodes
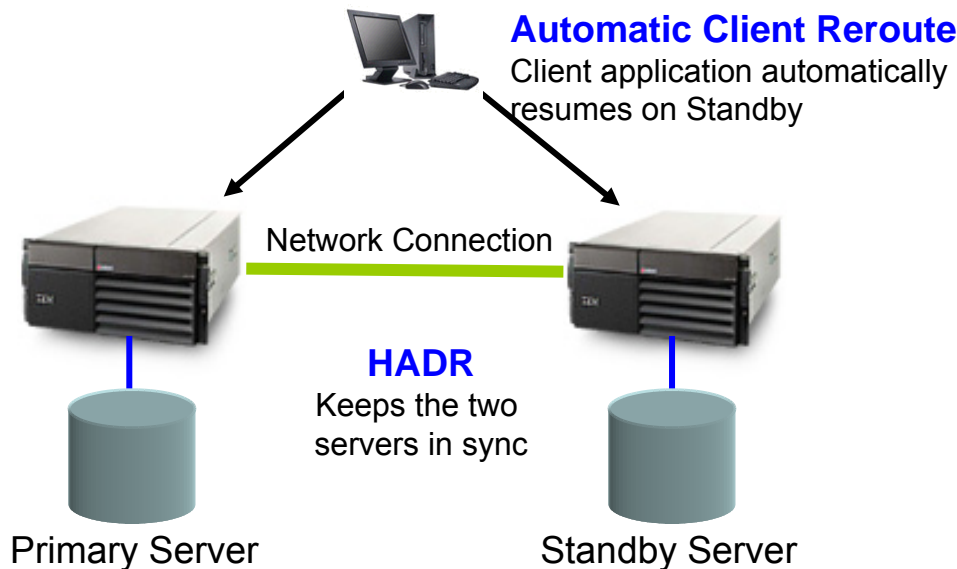
Sources: "Scale-up versus scale-out using Oracle 10*g* with HP StorageWorks", Hewlett-Packard, 2005;

"Enterprise Data Base Clustering Solutions" ITG, October 2003;

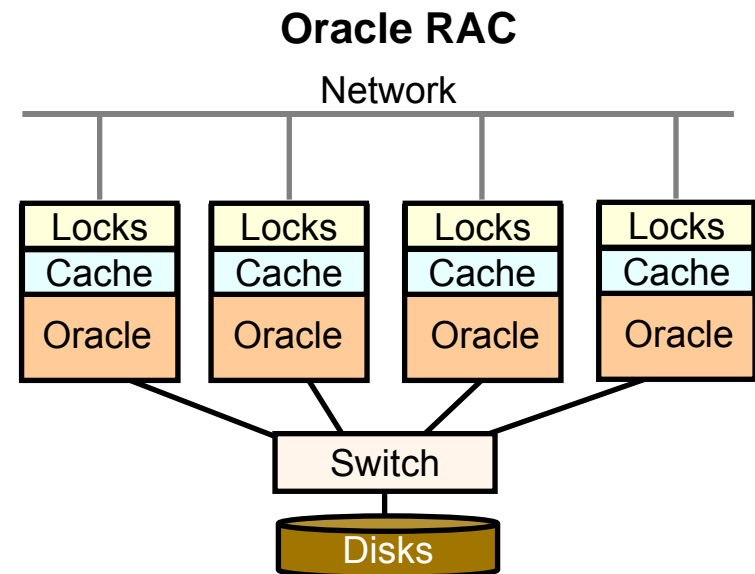Benchmark tests, IBM Toronto Labs and Systems and Technology Group, using TPC-C-like workload, 2.2 GHz POWER5+, 2006 Power Systems TPC Benchmarks

DB2 and Oracle RAC 10g Scalability

Chart: Scaling Achieved vs Nodes

- DB2 scales on SMP
- Oracle RAC "Glass Ceiling"

Data labels:
- 16.00
- 15.70
- 8.00
- 7.52
- 4.00
- 3.97
- 3.04
- 2.00
- 4.04
- 4.31

Legend: Oracle RAC — Linear Scale — DB2 on Power Systems Partitions

DB2 High Availability And Disaster Recovery (HADR) Is Better Than Oracle RAC's

- DB2 HADR provides high availability and fast failover
- **Failover in less than 15 seconds**
- **Real SAP workload failover for 600 SAP users performed in 11 seconds**
- Storage mirror survives disaster
- Buffer pool primed on standby server with recent updates
- 100% performance after server failure
- Uses ordinary network and storage devices

- RAC failover is delayed due to remastering of distributed locks
- Only one copy of storage
- Degraded performance after server failure
- Pay for Oracle RAC for every node
- Specialized network and storage raises cost of ownership, erodes any savings from commodity servers

Automatic Client Reroute
Client application automatically resumes on Standby

Network Connection

HADR
Keeps the two servers in sync

Primary Server

Standby Server

Oracle RAC

Network

Locks	Locks	Locks	Locks
Cache	Cache	Cache	Cache
Oracle	Oracle	Oracle	Oracle

Switch

Disks

Data Security And Compliance: DB2 For z/OS Has A Proven Track Record

DB2 for z/OS Security

- 10 security related patches in the last 10 years

- Proven RACF and Multi Level Security

- End-to-end encryption via hardware assist

- Optim Test Data Management
  - ▶ Ensures anonymous access to data necessary for testing

- Optim Archiving Expert
  - ▶ Allows customers to easily archive and access data

- DB2 Audit Management Expert
  - ▶ Supports compliance requirements
  - ▶ Consul for enterprise wide audit

Oracle's Security Exposures

- **Oracle.com – July 2009**
  30 security patches, including **12** for the database (with 3 being remotely exploitable WITHOUT authentication!)

- **Oracle.com – April 2009**
  43 security patches, including **16** for the database

- **eWeek.com – January 2009**
  41 security patches, including **10** for the database

- **eWeek.com – October 2008**
  23 security patches, including **7** for the database

In the last year Oracle has issued 137 security patches, **45** for the database

DB2 Is Optimized To Take Full Advantage Of System z

- Coupling Facility enables unmatched scalability through centralized cache and lock management

- Hipersockets enable fast, secure communication between DB2 z/OS and zLinux applications

- Integrated with RACF and Multi Level Security

- Supports System z hardware encryption – Crypto Express 2

- DB2 Recovery Expert for automatic recovery and backup

- Offload up to 40% of workload onto zIIP processors to reduce licensing costs

- Hardware compression in addition to "Venom" deep compression can reduce storage up to 70%

- System z parallel sysplex supports rolling updates to running DB2

Oracle is Not !

DB2 Is Also Optimized To Take Full Advantage Of Power Systems And AIX

- Supports AIX 64KB, 16MB and 16GB large page sizes
- Optimized DB2 resource object alignment with Power Systems architecture
- DB2 takes advantage of AIX storage protection keys for security
- Deep integration between AIX workload management (WLM) and DB2 WLM
  - ▶ Helps meet service levels and maintain predictable performance via work priority settings and finer levels of monitoring
- Dynamic reconfiguration
  - ▶ Allows administrators to add and remove processors, memory and I/O adapters to and from LPARs, without disturbing operations or applications
- Recovery integration
  - ▶ DB2 recovery process with Power Systems autonomic computing technologies
- First Failure Data Capture (FFDC)
  - ▶ Provides failure analysis and automated recovery capabilities
- Oracle has a product philosophy of running on commodity servers

Oracle is Not !

DB2 v9.5 Costs 22% Less Than Oracle 11g

	DB2 v9.5 Enterprise Edition	Oracle 11g Enterprise Edition
Base CPU license (dual core Intel/AMD)	$ 40,500	$ 47,500

Popular Options		
XML	INCLUDED	INCLUDED
Compression	$ 15,300	$ 11,500
Advanced Security	$ 11,100	$ 11,500

SUPPORT (First year)	INCLUDED	$ 15,510 ($10450 + $2530 + $2530)

TOTAL	$ 66,900	$ 86,010

Prices for Dual Core Intel Server

Break Free From Oracle With DB2 9.7

That all sounds great BUT …

We have Oracle applications written in PL/SQL. I can't afford to port those applications and retrain my development staff.

Good news with DB2 9.7 you can use PL/SQL with DB2.

Service Oriented Finance CIO

IBM

Consolidate Oracle Database Applications On DB2 9.7 With The SQL Compatibility Feature

- Run Oracle workloads in DB2 9.7 without porting or rewriting code
  - ▶ Easier for applications to use DB2
  - ▶ Easier for developers to use DB2
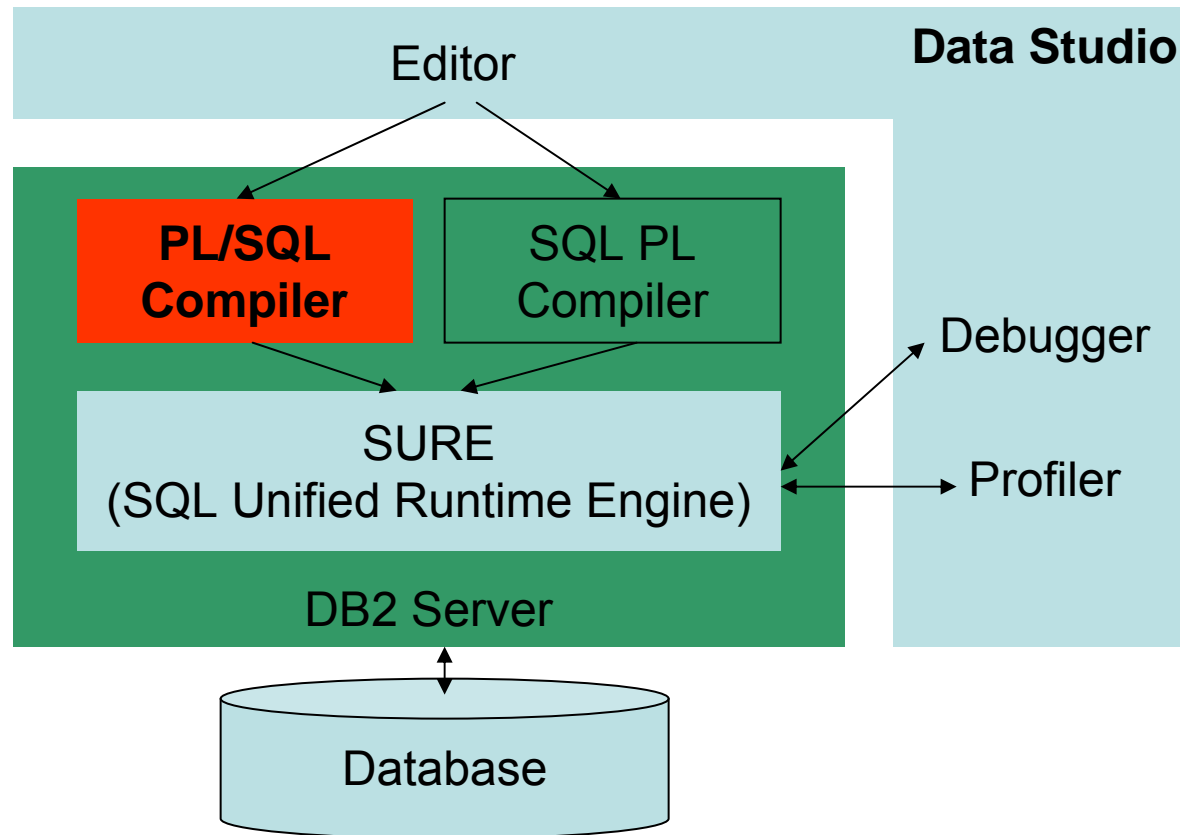 - ▶ Easier to migrate from Oracle to DB2
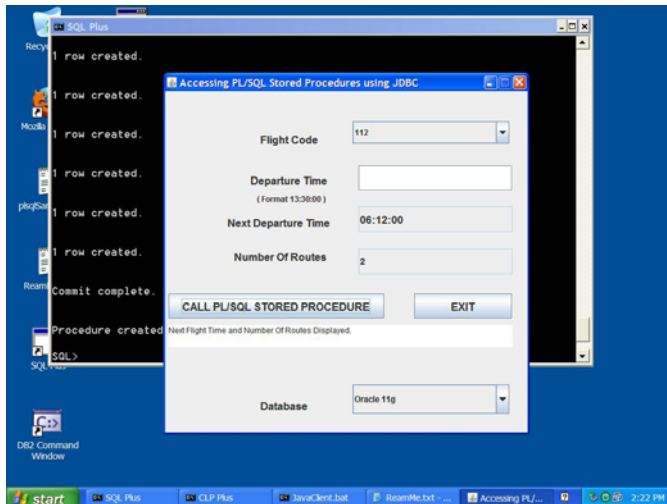
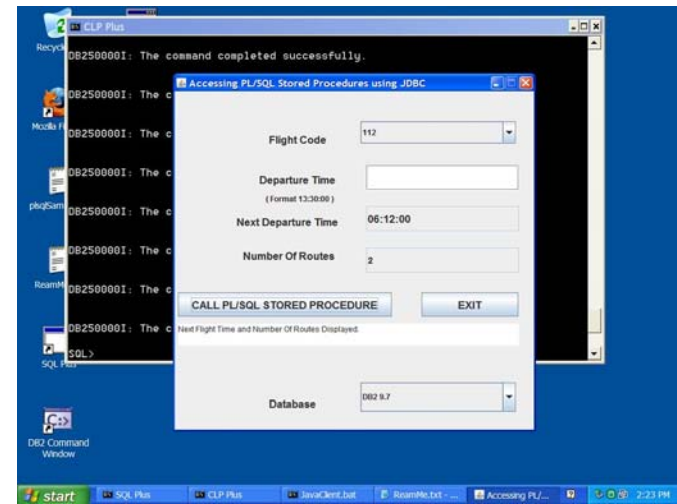| What Needs To Change With DB2 9.7?		
Oracle		**DB2**
Oracle Data Types	→	Native support
Oracle SQL	→	Native support
Oracle PL/SQL	→	Native support
Oracle Functions and Built-in packages	→	Native support
Oracle Concurrency Control	→	Native support
JDBC	→	Native support
SQL*Plus Scripts	→	Native support

Native Execution Of All SQL Statements

- **Built in PL/SQL native compiler**
  - ▶ NOT an emulator or translator
- **Source level debugging and profiling**

DEMO: Use PL/SQL With DB2 9.7

- ■ Run PL/SQL app on Oracle 11g
  - ▶ Run Oracle SQL script
    - – Create tables
    - – Populate tables
    - – Create PL/SQL stored procedure
  - ▶ Connect to Oracle
  - ▶ Run Oracle application against Oracle

- ■ Run PL/SQL app on DB2 9.7
  - ▶ Run Oracle SQL script
    - – Create tables
    - – Populate tables
    - – Create PL/SQL stored procedure
  - ▶ Connect to DB2
  - ▶ Run Oracle application against DB2

Praise For SQL Compatibility

Gartner.

"The Oracle compatibility feature will **enable Oracle applications to run natively on DB2**. In discussions with Gartner, reference customers tell us that DB2 runs 95% or more of Oracle specific functionality found in SQL statements and natively runs PL/SQL, Oracle's stored procedure language. This **native functionality is not an emulator, nor does it require changes to the application code** (other than the 5%, which is mostly minor functionality, not found in many applications). Any provider offering applications that run with the Oracle DBMS can easily port its application to IBM's DB2…"
– Donald Feinberg, Gartner VP Distinguished Analyst

Venedim

"You no longer have to migrate and painfully transcode your Oracle code. Instead, there is a simple flag that will let you compile and run your PL/SQL as is .. **Developers can now choose to code in DB2 SQL/PL or Oracle PL/SQL language, depending on their skills**"
— Jean-Marc Blaise, Technical Architect at Venedim

openbravo opening ERP's future!

"To move our application to a previous version of DB2 would have taken an **estimated two-year effort**. We were **thrilled to see it took only one week** to move it to the new version of DB2.." — Paolo Juvara, CTO of Openbravo

The Openbravo application contains about 2 _MILLION_ lines of code

High Efficiency DB2 Is The Winning Foundation For New Intelligence At Service Oriented Finance

Now I'm convinced!

We can leave our tired, old databases behind and move forward with DB2.

With DB2, InfoSphere, Cognos, FileNet and IBM Mashup Center, you have everything you need to make better business decisions and beat your competitors.

Service Oriented Finance CIO

IBM