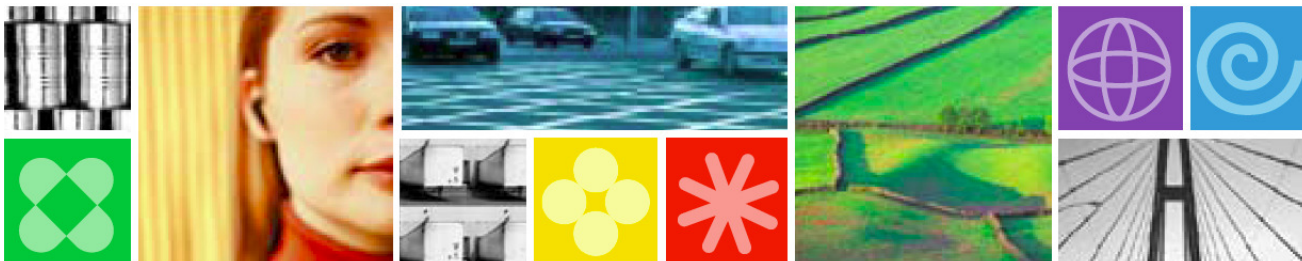# Information on Demand – Database Technology Enhancements

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DB2 for z/OS

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Agenda Topics for Today

- **Business Overview**

- **Field Update on DB2 9**

- **DB2 X**

- **Questions**

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Top Challenges

1. Reducing Costs of Information Technology

2. Continuous Service Availability

3. Boost Business Resilience and Reduce Risks

4. Deliver Differentiating Innovative Solutions

5. Security, Auditing and Regulatory Compliance

6. Accessing intelligent information on demand

DB2 for z/OS Technical Strategy

➢ **Extend the lead in availability, scalability and performance.**

  ➢ Parallel Sysplex: the best scale-out solution in the industry

  ➢ Tight integration between DB2 and the System z hardware and z/OS operating system

  ➢ Advanced solutions for compliance with data security and privacy regulations

  ➢ Workload consolidation: System z is the ultimate consolidation platform

  ➢ Eliminate all causes of outages

➢ **Reduce cost of ownership**

  ➢ Database technology that can handle large workloads with fewer people

  ➢ Storage and CPU optimization, including specialty engines

  ➢ Advanced autonomics to make the system more self-managing and self-tuning

➢ **Application enablement**

  ➢ Apps can easily connect to DB2 from anywhere

  ➢ Advanced SQL, XML capability, application portability

➢ **Improved data warehousing capabilities**

DB2 for z/OS Into the Future
Delivering Customer Value

20xx

2007

2004

2001

■DB2 X

■ DB2 9

■ V8

V7

64 bit

data definition on demand

pureXML™
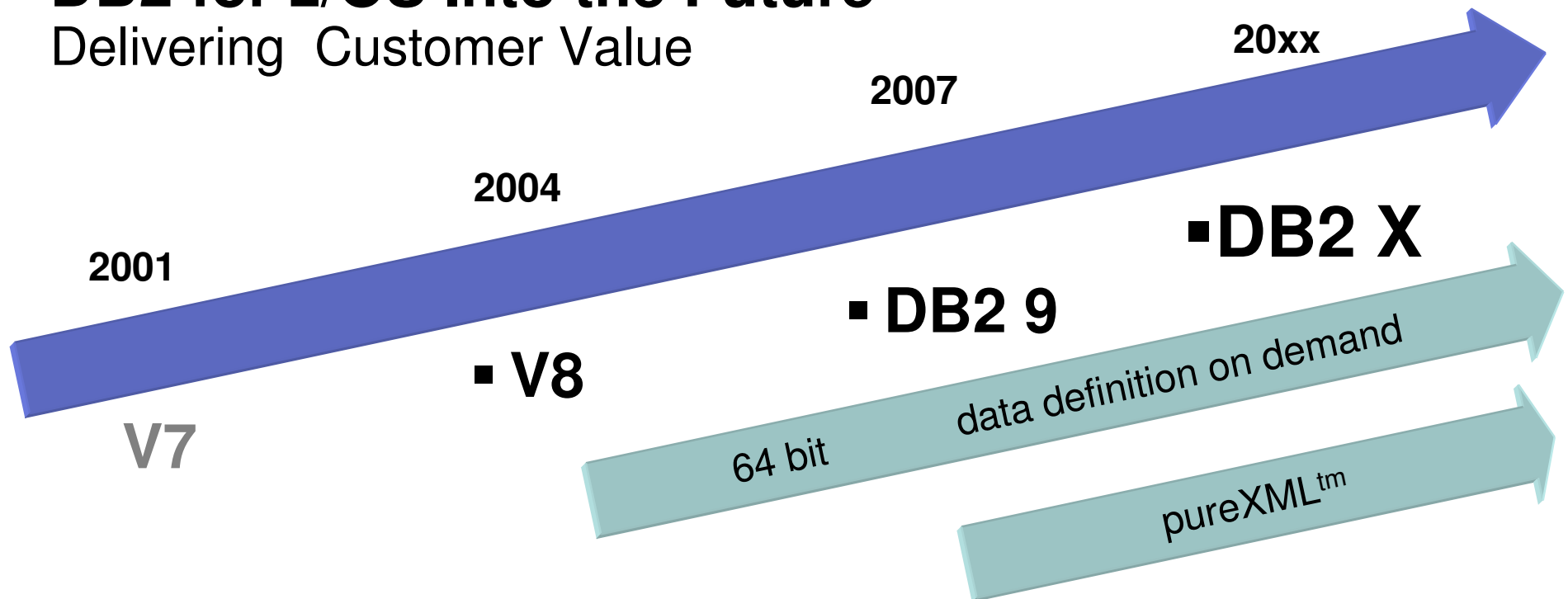
Themes
Reliability Availability Serviceability
Performance   Scalability
Security Productivity
Application Development
SQL XML SOA

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DB2 9 Field Update

DB2 9 for z/OS field update

- **DB2 9: Climbing Sharply**

- **DB2 V8: Migration finishing in most of world**
  - **100% of Top 100   99.5% of Top 200**
  - **V7 End of Service: June 30, 2008**
  - **V8 Withdrawal from Marketing**
    - **Announced: Dec. 2, 2008**
    - **Effective: Sept. 8, 2009**

- **How's the Quality (compared to V8)?**
  - **Lower overall PMR volume**
  - **Less Severity 1 APARs**
  - **Lower PE rate**
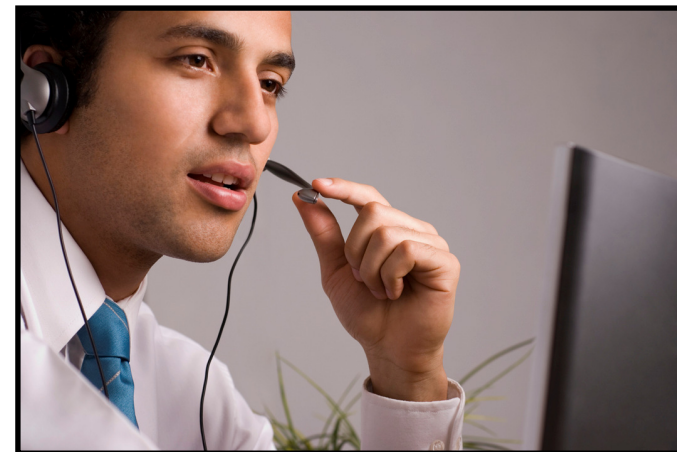
Best Practices When Going to DB2 9

- **Leverage CST/RSU process: Start with latest RSU + Identified Hipers**
  - Apply 2 to 3 preventative service drops annually
  - Exploit Enhanced HOLDDATA to be vigilant on HIPERs and PEs

- **Use the DB2 9 'Package Stability' function for static SQL**
  - Offers access path preserving option. Recovers to prior access path if regression is encountered

- **Minimize potential query performance issues**
  - Use Optimization Service Center to capture SQL statements
  - Run Stats Advisor to generate the recommendation for stats collection
  - Run RUNSTATS to ensure critical stats are collected as recommended by the advisor

- **Every customer experience is different**
  - Contact your local DB2 Advisor for current information

- **Ensure an PMR is opened prior to migration start**

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Casas Bahia and DB2 9 for z/OS

👍 Migration is much easier compared to Version 8

👍 Migration process in phases helps your planning and it gives you more confidence during the whole process

"We turned to NFM in a Monday morning, few minutes before business hours…"

DB2 X

DB2 10 for z/OS At a Glance
Addressing Corporate Data Goals

Application Enablement	• pureXML enhancements • Temporal queries • Last Committed reads • Timestamp with timezone • SQL improvements that simplify porting
RAS, Performance, Scalability, Security	• Wide range of performance improvements • More online schema changes • Catalog restructure for improved concurrency • Fine grained access control • Hash access to data • New DBA privileges with finer granularity
Simplification, Reduced TCO	• Full 64-bit SQL runtime • Auto stats • Data compression on the fly • Query stability and management enhancements • Reduced need for REORG • Utilities enhancements
Data Warehousing	• Moving sum, moving average • Many query optimization improvements • Query parallelism improvements • Advanced query acceleration

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DB2 10 for z/OS: Out-of-the-Box Savings

Up to 20% CPU reductions for transactions, queries, and batch

- Out-of-the-box CPU reductions of 5-10% for traditional workloads
- Out-of-the box CPU reductions of up to 20% for new workloads
- Up to additional 10% CPU savings using new functions

Scales with less complexity and cost

- 5-10x more concurrent users – up to 20,000 per subsystem
- Significant scale-up capabilities in addition to existing scale-out support
- Consolidate to fewer LPARs and subsystems

Improved operational efficiencies and lower administration cost

- Automatic diagnostics, tuning, and compression

Even better performance

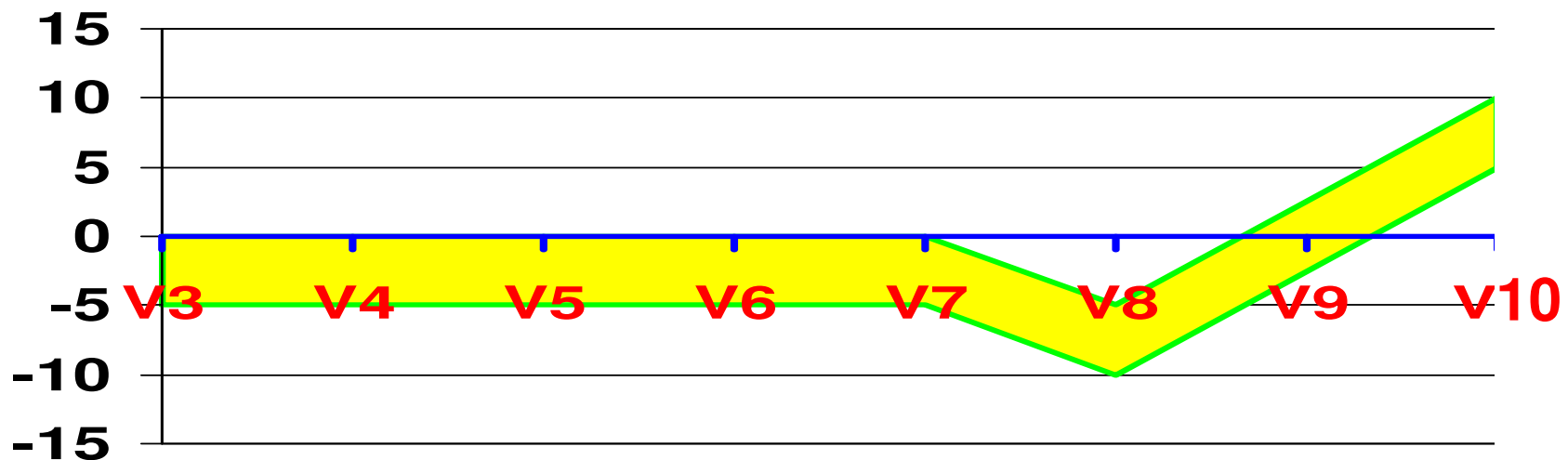- Elapsed time improvement for small LOBS and Complex Queries

DB2 10 Performance Objective

➢ Historical goal under 5% performance regression
➢ Goal 5% -10% initial performance improvement
➢ Many customers reduce CPU time 10% - 20%

**Average %CPU improvements
version to version**

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Performance

- Internal performance optimizations – Improvements Day 1
  - Improved CPU cache performance
  - Exploit new z10 z/Architecture instructions
  - Streamlined DDF, RDS, DM, Index Mgr. performance-critical paths
  - Buffer pool enhancements: utilize z10 1MB page size
  - Virtual Storage Relief (64 bit exploitation)
  - New Access Path possibilities
  - No application changes required!

- Performance Improvements with NFM
  - Hash access path
  - Index include columns
  - Inline LOBs
  - Efficient caching of dynamic SQL statements with literals
  - Exploitation of Solid State Disk (SSD)

Business Security & Compliance Needs

- ## Simplify compliance
  - Simpler, easier security privileges with finer granularity authority
  - Ability to have administrators without data access, better auditing

Security Administrator Tasks

System Administrator Tasks

Access

Monitor

- ## Fine grained access control
  - Allow masking of value
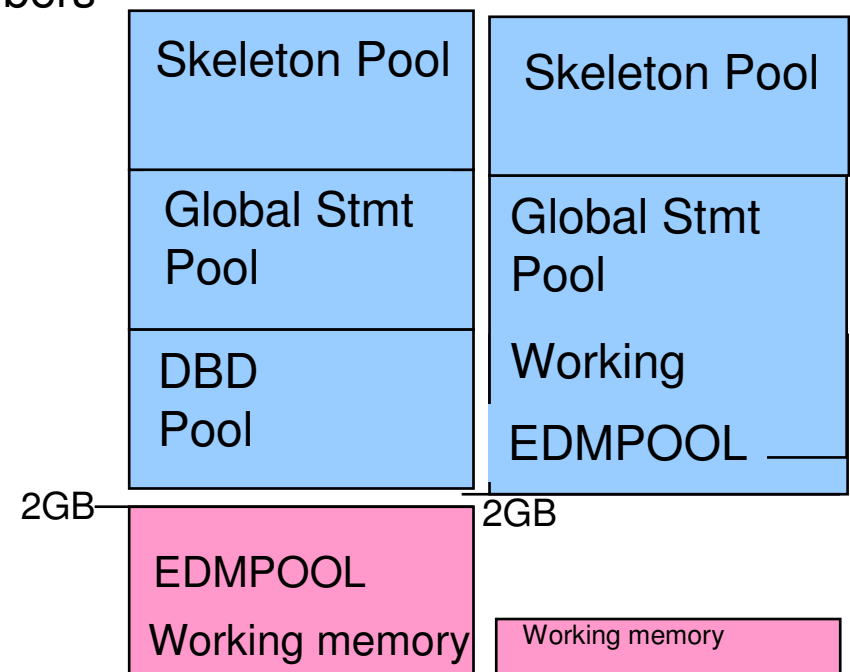 - Restrict user access to individual cells

Use disk encryption

Scalability

- **DB2 scales to support the largest business needs**
  - 64 bit support: DB2 has supported 64-bit addressing since V6 ('99)
  - DB2 thread storage remains in the 31-bit region
    - Can limit number of active threads per DB2 member
    - Customers scale by adding DB2 members

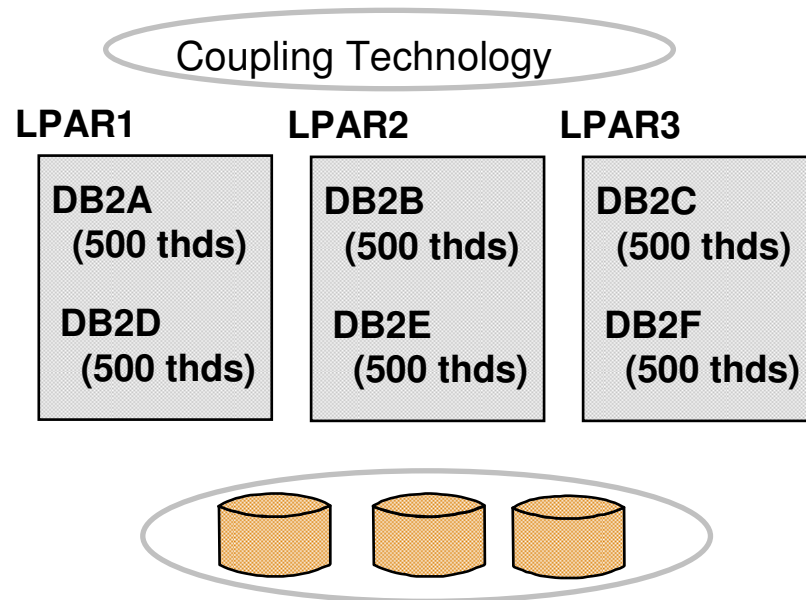- **DB2 10 moves thread storage to the 64-bit region**
  - 5-10x more threads per DB2 region
  - More concurrent work
  - Reduce need to monitor
  - Able to consolidate LPARs
 - Reduced cost
  - Easier to manage
  - Easier to grow

Skeleton Pool	Skeleton Pool
Global Stmt Pool	Global Stmt Pool
DBD Pool	Working
	EDMPOOL

2GB — 2GB

| EDMPOOL Working memory | Working memory |

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Running a Large Number of Threads

Today

DB2 10

Coupling Technology

Coupling Technology

LPAR1	LPAR2	LPAR3
DB2A (500 thds) **DB2D** (500 thds)	**DB2B** (500 thds) **DB2E** (500 thds)	**DB2C** (500 thds) **DB2F** (500 thds)

LPAR1	LPAR2	LPAR3
DB2A (2500 thds)	**DB2B** (2500 thds)	**DB2C** (2500 thds)

- Data sharing and sysplex allows for efficient scale-out of DB2 images
- Sometimes multiple DB2s / LPAR
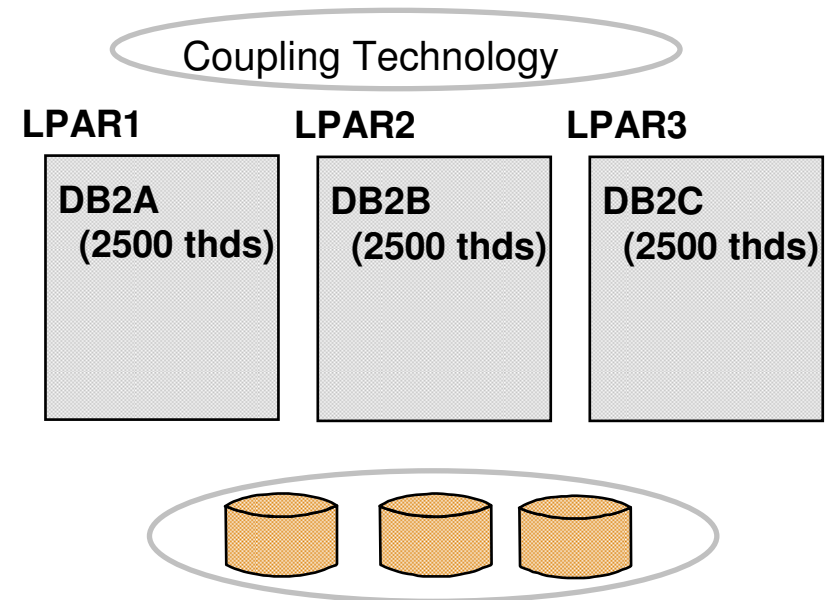
- More threads per DB2 image
- Potential for fewer members / LPARs
- More efficient use of large n-ways
- SSI constraints are relieved
- Easier growth, lower costs, easier management
- Data sharing required for continuous availability and XL scale

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Academic Initiative System z Milestones

✓ **608 schools, over 50,000 students in 61 countries worldwide**

✓ **13 Student Contests in 13 countries with 14,672 students from 1,956 schools**

✓ **IBM Student Opportunity System (Student resume database)**

✓ **Entry Level Mastery Test (Validate student skills)**

✓ **Community involvement (Roundtables, partnerships, hiring)**

✓ **Access to Mainframes worldwide for teaching (6 University hubs)**

✓ **30 Courses available (foundational to advanced), Ongoing faculty education**

✓ **More educators and students are embracing IBM Enterprise Systems**

✓ **Students are getting jobs**

" 'Master the Mainframe Contest' helped me get a job at Bank of Montreal."

Elizabeth Bell, Georgian College

DB2 for z/OS enables Application Development, Drives Innovation !
Leveraging Technologies and Communities

- Use new converged SQL & Optim Studio tooling
- Key Database Technologies
  - SQL, SQL Procedures
  - XML
  - SOA, Web Services
- Developer communities
  - COBOL, PL/I, C, C++, assembler
  - REXX, APL2, Fortran
  - Java (JDBC / SQLJ)
  - .NET (C#, VB .NET)
  - Open Source
    - PHP
    - Perl
    - Python
    - Ruby on Rails
    - TOAD for DB2
  - Rational Developer for Z
  - WebSphere Developer for Z

Design, develop, deploy, operate, optimize and govern enterprise data throughout its lifecycle

perl

eclipse

php

Microsoft Visual Studio .net

Python

Zend Core™ for IBM

Rational the software development company

RAILS

WebSphere

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Integrated XML Support

– Declarative language, reduce complexity, dramatically improve application development

– Directly store and query XML in inherent hierarchical format
  • No decomposition/composition
  • No normalize/de-normalize

– Native processing with good XML index design = high performance

– Ideally suited
  • Versatile schemas that are diverse and evolve, and end-user customizable applications
  • Sparsely populated attribute values (null vs. absence)

– Manage XML data with ACID properties, auditing and regulatory compliance, together with relational data

Temporal Data – Need to Query 'AS OF'

Temporal Query & Business Timestamp

- Table-level specification to control data management based upon time
- Two notions of time:
  - **System time:** notes the occurrence of a data base change
    - "row xyz was deleted at 10:05 pm"
    - Query at current or any prior period of time
    - Useful for auditing and compliance
  - **Business time:** notes the occurrence of a business event
    - "customer xyz's service contract was modified on March 23"
    - Query at current or any prior/future period of time
    - Useful for tracking of business events over time, application logic greatly simplified
- New syntax in FROM clause to specify a time criteria for selecting historical data

End Users & DBAs: Simpler, Easier, More Productive

- **Performance**
  - General performance enhancements
  - Hash Access, Inline LOBs

- **Workload is growing, while resources are shrinking**
  - CPU reductions without programming

- **I need to be more productive**
  - More online schema changes
  - Catalog restructure for improved concurrency

- **I need to be able to recover faster**
  - Query stability enhancements
  - Plan Stability

DB2's Deep Synergy With System z

The key is leveraging integration points throughout the system

- Data sharing (availability and scale out)

- Instruction set and memory structure

- Hardware data compression

- zIIP specialty engines

- Unicode conversion

- Encrypted TCP/IP communication (SSL), encrypted data

- Cross-memory, memory protection keys

- Sorting

- Multi-core, large N-way

- 1 MB page size (z10 – DB2 VX)

- Decimal float arithmetic (z10)

- 64-bit addressing and large memory

- z/OS Workload Manager

- z/OS Security Server (RACF)

- z/OS RRS integrated commit coordinator

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DB2 for z/OS & IBM zIIP Continued Value

Portions of DB2 V8 and DB2 9 (blue) workloads may benefit from zIIP*:

ERP, CRM, Business Intelligence or other enterprise applications

- **Via DRDA over a TCP/IP connection**
- **DB2 9 for z/OS Remote native SQL procedures**
- **DB2 9 XML parsing via DRDA to fully utilize zIIP**

Specialty Engine

Data warehousing applications*: Large parallel SQL queries

DB2 9 higher percentage of parallel queries eligible for zIIP

DB2 Utilities LOAD, REORG & REBUILD maintaining index structures

IBM Smart Analytics Optimizer

Today's News...

Delivering Powerful Analytics to Existing Systems…Technology Preview

High Performance Extension

- Order-of-magnitude faster, predictable analytic response times

- Less Administration & Lower Operating Costs

Application Transparency

Extends System z Availability & Security & Skills to Smart Analytics Workloads

Creates New Opportunities for Existing Systems By Using New Technology Approaches

- *Exploits In-memory techniques*

- *Leverages vector processing*

- *Evaluates predicates in parallel*

- *Employs new scanning strategies*

- *Minimizes need for indexes & related administration*

* Based on IBM Laboratory Tests. Actual results may vary depending on specific environment and configuration.

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Information Management Software for z/OS Solutions Information Center

- **Find the latest product information for DB2® for z/OS®, IMS™, DB2 QMF™, IBM® DB2 and IMS Tools, Replication and Event Publishing, and Data Warehousing and Analytics.**

- **Learn how to use the information center by taking the animated tours that are available from the home page.**

- **Subscribe to RSS feeds for automatic notification of updates; information is frequently updated.**

- **Find troubleshooting information (search for Technotes, APARs, PTFs, and IBM Redbooks).**

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