DB2 for z/OS
Version 10 Technical Update

The future runs on System z

Agenda

- Business Overview
- Field Update on DB2 9
- Looking at DB2 X from a Stakeholder Perspective
- Questions

Top Challenges for CIO

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

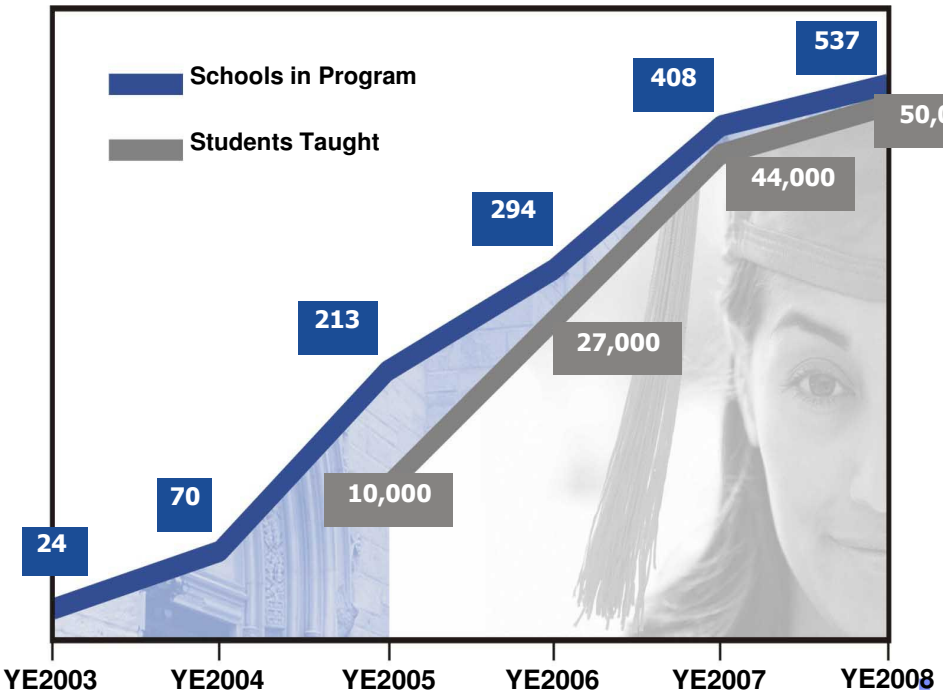
DB2 for z/OS Technical Strategy

- 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
  - Workload consolidation: System z is the ultimate consolidation platform
  - Eliminate all causes of outages
- Reduce cost of ownership
  - DB 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

Adding mainframe skills for the community

- Where am I going to find good skills
  - DB2 Outreach and Academic Initiative Programs – Globally Growing University Skills
  - Universities include: Marist, San Jose State, Illinois State University, Tonji University and in process in Brazil

Growing Academic Initiative

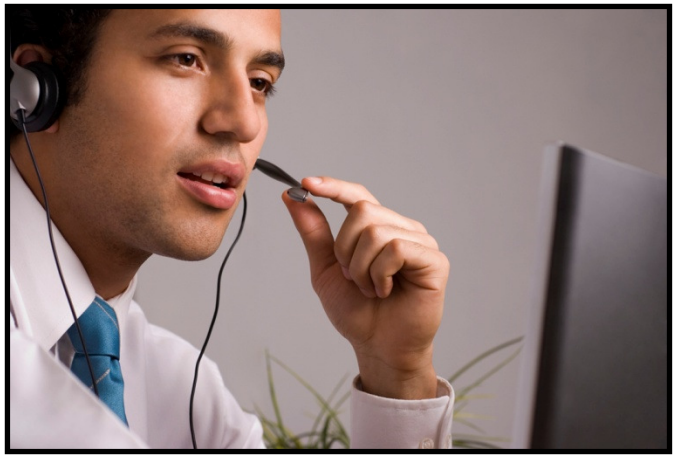


- **System z Academic Initiative by the numbers:**
  - Participation – 537 schools registered, >50,000 students attended mainframe education
  - Courses – 30 (plus more under development) & Mastery Exam Certifications
  - zCommunity – 25 z Roundtables events with Clients / Schools / ISVs / Business Partners
  - Resources – Access to Mainframes worldwide for teaching (6 Univ hubs)
  - Student MF Contests – 9 contests with 8,180 students, 1,136 schools…more planned WW
  - IBM zSkills Help Desk (zskills@us.ibm.com) + over 300 IBM Mainframe ambassadors
  - Assist Professors – Fourth annual Professor Summer Seminar, 5 Faculty awards &, education

Web site - www.ibm.com/university/systemz

DB2 9 Field Update

DB2 9 for z/OS field update



- DB2 9: Climbing Sharply
  - 39% of Top 100 31% of Top 200
  - Over 500 customers
- How's the Quality (compared to V8)?
  - Lower overall PMR volume
  - Less Severity 1 APARs
  - Lower PE rate
- DB2 V8: Migration is finishing in most of world
  - 100% of Top 100 Over 99% of Top 200
  - V7 End of Service: June 30, 2008
  - V8 Withdrawal from Marketing
    - Announced: Dec. 2, 2008
    - Effective: Sept. 8, 2009

DB2 9 Best Practices and Recommendations

- 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
- Ensure an PMR is opened prior to migration start
- Migration Planning Workshop
  - Contact your local DB2 Advisor for current information

What customers are saying about DB2 9

"We are in great shape. **DB2 9 is very solid and stable**. Our reorgs are running great and **performance is the best that it has ever been**. We are a very happy customer!"
-***Mark Shackelford, VP Infrastructure Baldor Electric***

"Like a good wine, DB2 has certainly gotten better with age!"
-***Debra L Cook, ExxonMobil Global Services Company***

"We needed a database that represented the future and DB2 9 is the future. DB2 9 compression capabilities are key in helping reduce the size of our databases — in one case by up to **83 percent**. This ultimately helps us **minimize storage costs and increase performance.**"
-***Jean Holley, CIO, Tellabs, Inc.***

"Not only is our IBM infrastructure **rock solid**. Our total cost of ownership is very low compared to other solutions. Our administrative framework for health education is **far superior in terms of cost compared to any other implementation** I've seen on campus. It took us a **fraction of the time** to develop than it would have on any other platform, and it's providing us with a reliable, fast solution for moving our health education program forward into the future."
- ***Steve Ware, Systems Coordinator, University of Florida Computing & Networking Services***

What customers are saying about DB2 9

"DB2 9 for z/OS will result in an **increased level of performance** with our data warehousing environment. We also look forward to using the new XML capabilities in DB2 9 to provide even **greater efficiency and consistency our XML applications**."
- Pavel Batista, IT Director, Petrol

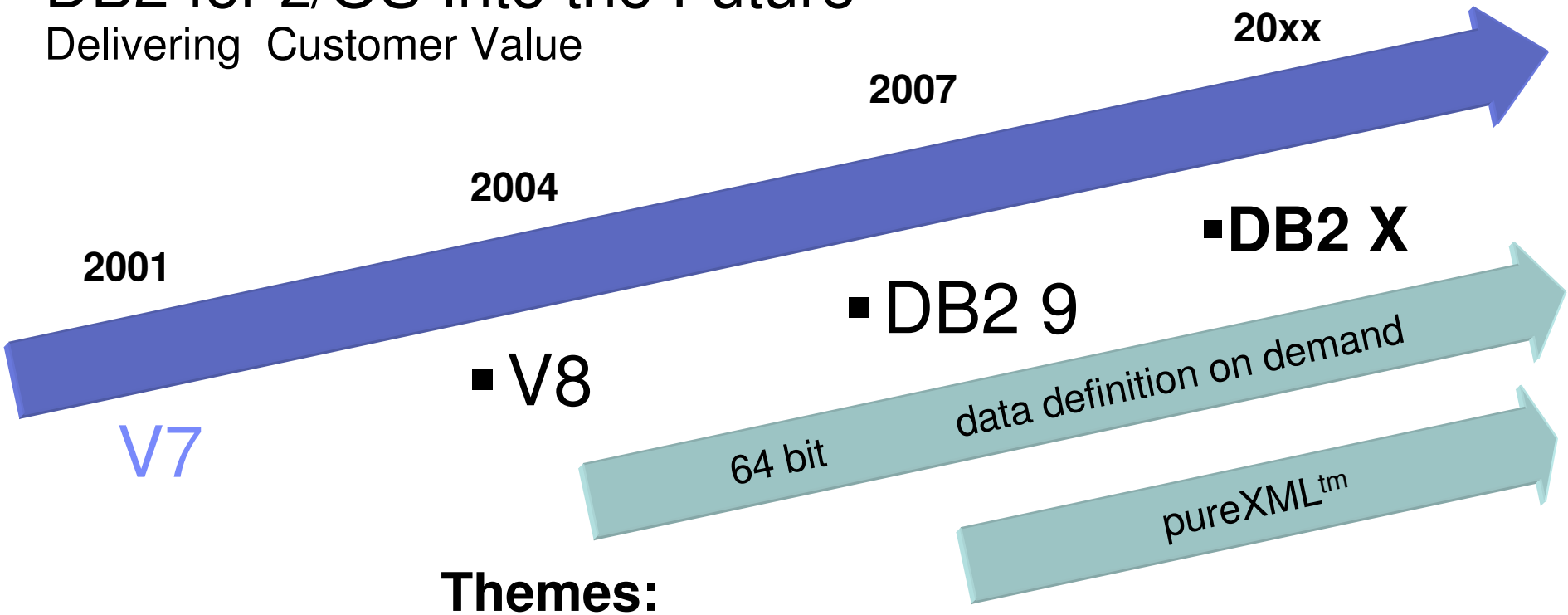
"The new security and compliance tracking capabilities of DB2 9 for z/OS will allow us to **simplify our existing process** for the management reporting of changes to our production database systems. In addition, we have evaluated the new **native XML support** that DB2 9 provides and view this as a **major technological advancement** to help us to integrate XML data into a format that will allow for more robust and efficient usage by applications."
- Bob Perih, Senior Vice President, Citigroup

"IBM and SAP have cooperated very closely on DB2 9 for z/OS and we look forward to supporting our customers with these new capabilities. The SAP Banking Services 5.0 release, which will be released soon, will be the first SAP product to take advantage of many new beneficial features in DB2 9 for z/OS."
- Torsten Wittkugel, Vice President of Database and Operating System Platform Development, SAP

DB2 X - A Stakeholder View

DB2 for z/OS Into the Future

Delivering Customer Value



Themes:

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

DB2 X for z/OS At a Glance

Application Enablement	• Versioned data or temporal queries • pureXML enhancements • Last committed reads • SQL improvements that simplify porting
RAS, Performance, Scalability, Security	• Wide range of performance improvements • Hash access to data • More online schema changes • Catalog restructure for improved concurrency • Row and column access control • Administrator privileges with finer granularity
Simplification, Reduced TCO	• 5 – 10 times more threads per DB2 image • Auto statistics Data compression on the fly • Query stability enhancements • Reduced need for REORG • Utilities enhancements
Dynamic Warehousing	• Moving sum, moving average • Many query optimization improvements • Query parallelism improvements • Advanced query acceleration

Application Portability, Productivity

Make porting easier

- SQL improvements that simplify porting (inline LOB, administrative privileges)
  - 'currently committed' locking semantics
    - Writer does not block readers
  - Implicit casting or weak typing
  - Timestamp with timezone
  - Greater timestamp precision
- Loading and unloading tables with LOBs
  - LOBs in input/output files with other non-LOB data

Application Portability, Productivity

Integrated XML Support

- XML schema validation in the engine for improved usability, performance
  - XML schema association with XML columns
  - Using z/OS XML System Services, 100% zIIP / zAAP eligible
- Native XML Date and Time in business processing
  - xs:date, xs:dateTime, and xs:dateTime support and XML index support
- Allow easy update of sub-parts of an XML document
- XML support in SQL PL stored procedures & user defined functions
- Performance enhancements

Temporal Data – Query ‘AS OF’

Need to query data ‘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, 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

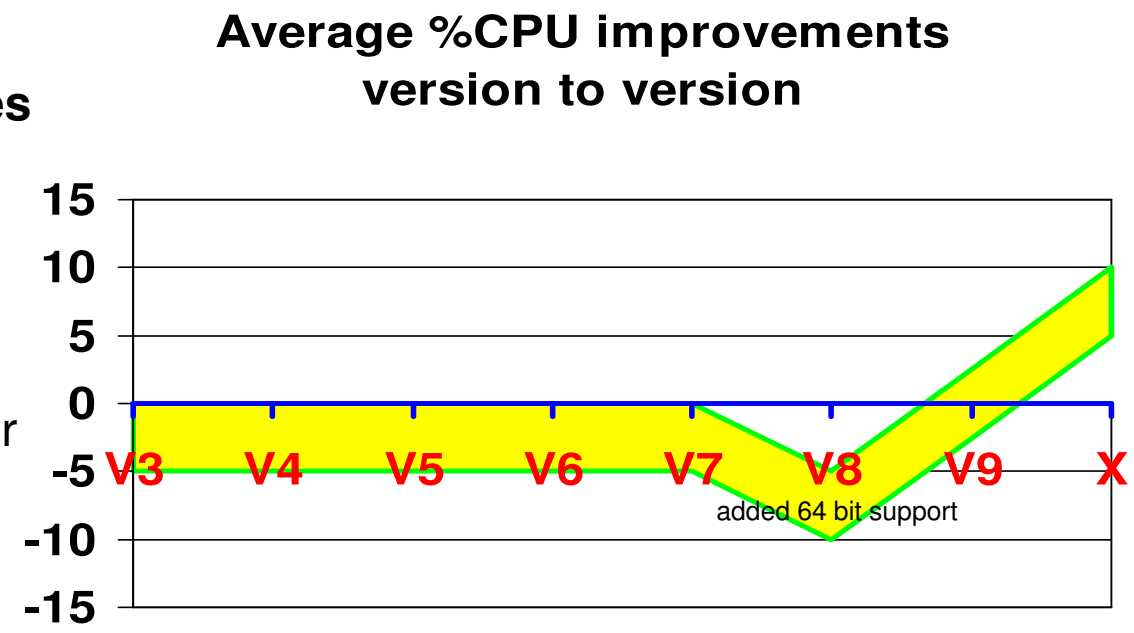
Performance

Constant Cost Pressures

Performance improvements in key workloads: transactions, Batch, Insert, others

- **Improve transaction times**
- **Lower CPU usage for large & small DB2 subsystems**

- **DB2 X Performance Objectives**
  - Historical goal of <5 % version-to-version performance regression
  - Goal of 5% -10% performance improvement for DB2 X



Improved performance on day 1

- **Internal performance optimizations**
  - 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

Performance

Improved performance in NFM

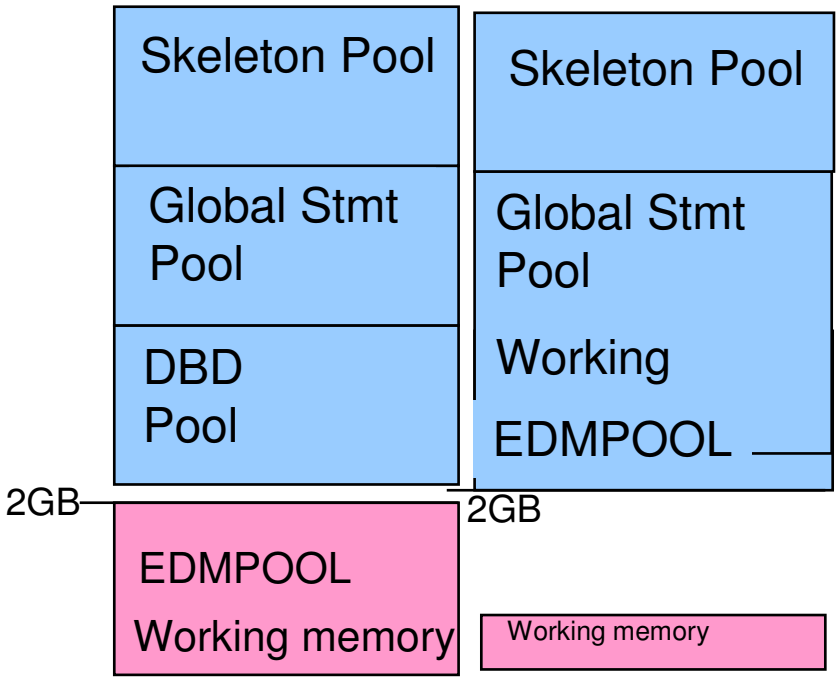
- Hash access path
- Inline LOBs
- Efficient caching of dynamic SQL statements with literals
- Exploitation of Solid State Disk (SSD)

Scalability

Need DB2 to continue to scale with my business

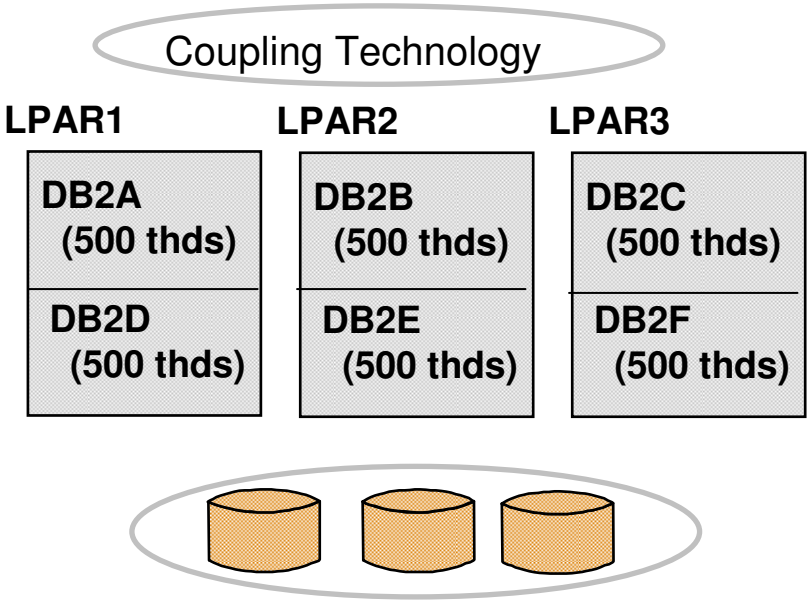
- 64 bit support: Many more concurrent workload, simpler growth
- Reduce DBA workload, eliminate time-consuming tasks

- DB2 9 helped (~10% - 15%)
- DB2 X expect 80% to 90%
  - More concurrent work
  - Reduce need to monitor
  - Able to consolidate LPARs
  - Reduced cost
  - Easier to manage
  - Easier to grow



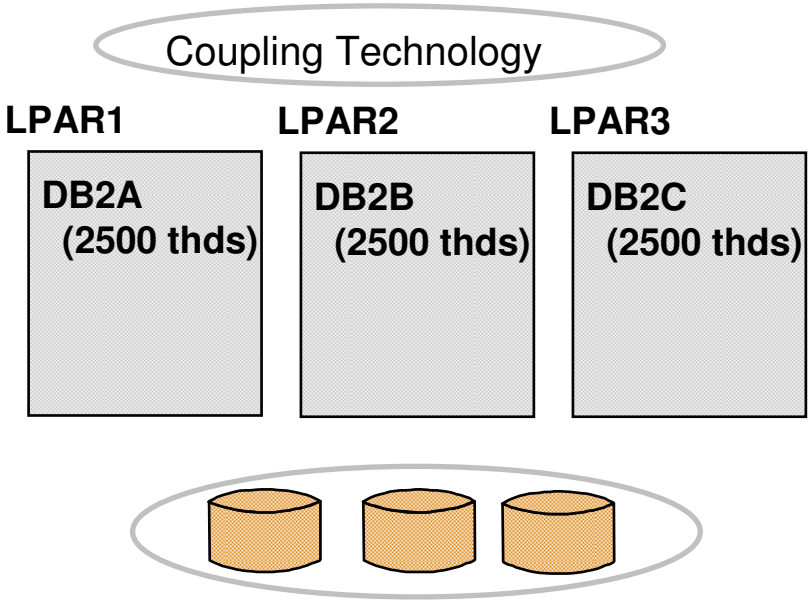
Running a Massive Number of Threads

Today



- Data sharing and sysplex allows for efficient scale-out of DB2 images
- Sometimes multiple DB2s / LPAR

DB2 X

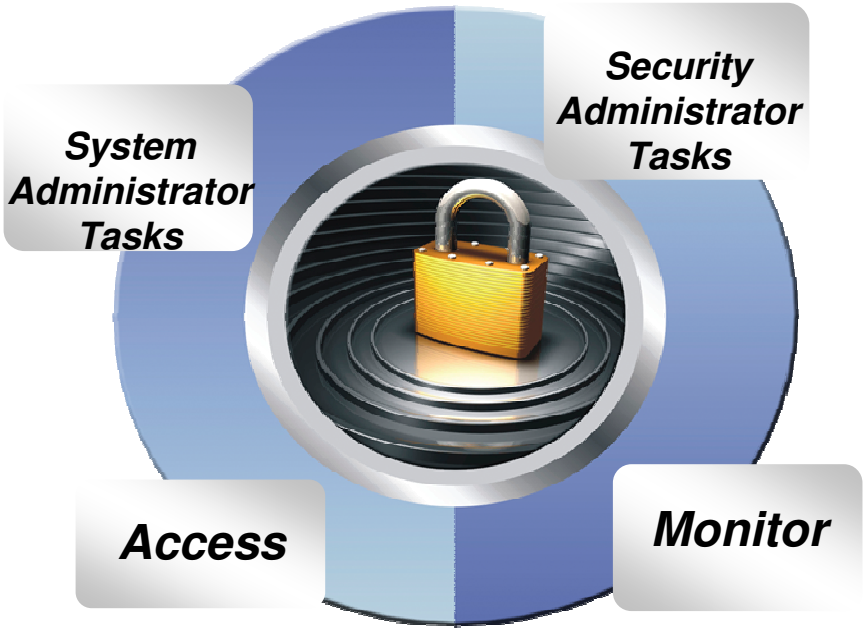


- More threads per DB2 image
- More efficient use of large n-ways
- SSI constraints are relieved
- Easier growth, lower costs, easier management
- Data sharing and Parallel Sysplex still required for HA and XXL scale

Business Security & Compliance Needs

Simplify compliance

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



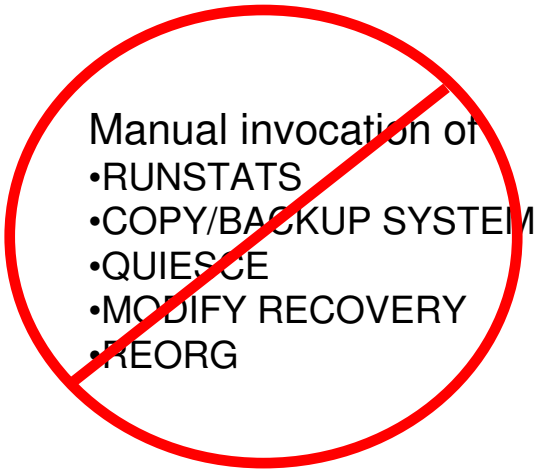
Use disk encryption

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

Productivity

Need to do more with less

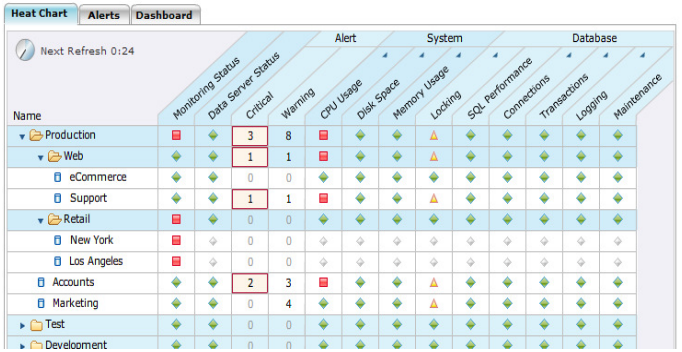
- **More online schema changes – ALTER & Online REORG**
  - Table space type to universal
  - Page size
  - Data Set Size - DSSIZE
  - Member cluster with UTS
- **Catalog restructure for improved concurrency and usability**
  - Multiple BINDs at same time with DDL, Grants and Revoke
  - Query your SQL statements with SQL without having to write a program



Productivity

Need to do more with less

- REORG SHRLEVEL CHANGE for LOBs
- Consistent image copy without quiesce
- Inline copies to allow for data set-level Flash Copy
- Online REORG usability and performance enhancements



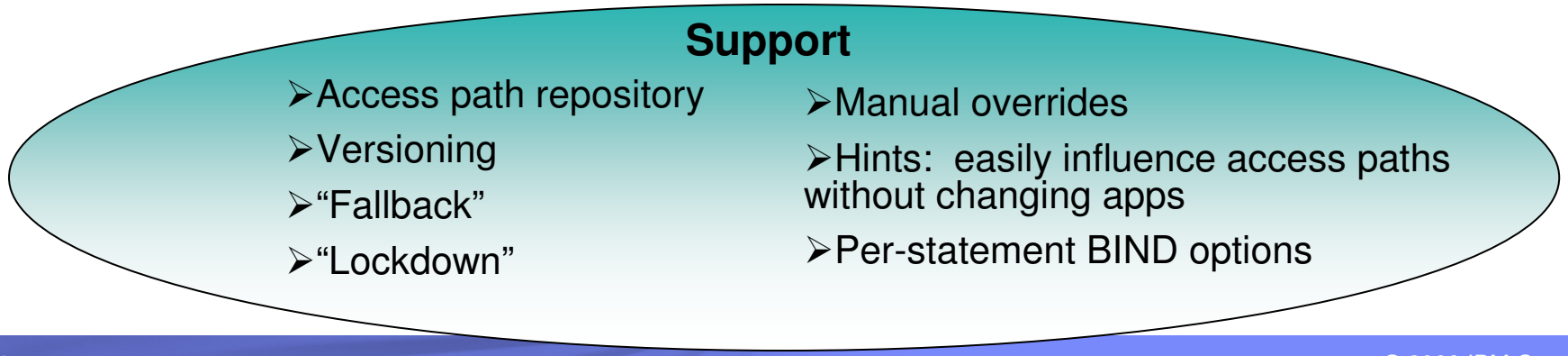
- Auto statistics collection Compression 'on the fly'
  - avoid need to run utility
- Checkpoint intervals based on both time and # log records
- Much simpler memory management

Optimization Stability and Control

REBIND without fear

- Query stability enhancements
- Plan Stability

- Provide unprecedented level of stability for query performance by stabilizing access paths:
  - Static SQL
    - Relief from REBIND regressions
    - Enable REOPT support
  - Dynamic SQL
    - Remove the unpredictability of PREPARE
    - Extend Static SQL benefits to Dynamic SQL

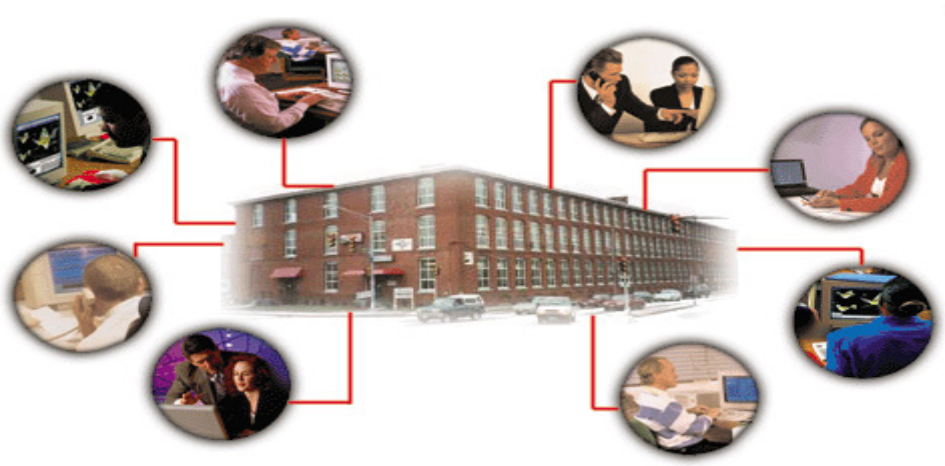


Utilities Enhancements

- Improved online processing
  - Online REORG enhancements
    - SHRLEVEL(CHANGE) support for all catalog/directory objects
    - Option to cancel blocking threads
    - Faster SWITCH phase
    - Allow disjoint partition ranges
  - REORG SHRLEVEL(CHANGE) for LOBs
  - Increased utility & catalog concurrency
- Improved processing for LOBs data inline
- FlashCopy for faster, less disruptive operations
- Repartition with LOBs
- More productive, reduced need to run utilities

Data Warehousing

- Moving Sum, Moving Average
- Enhanced query parallelism technology for improved performance
  - Remove query parallelism restrictions
- In-memory techniques for faster query performance
- Advanced query acceleration techniques

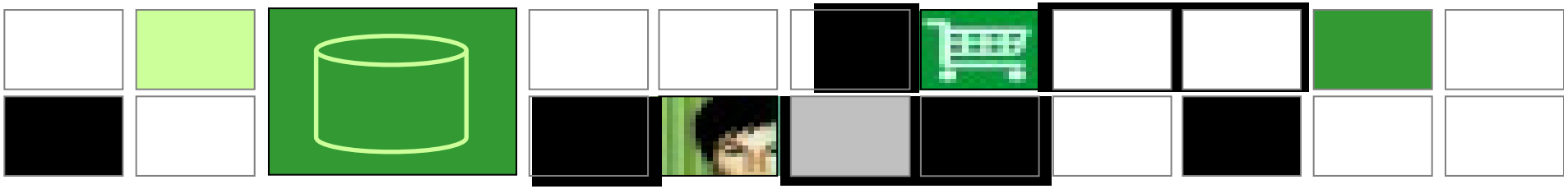


Key details about DB2 X

- **CM, ENFM, NFM**
- **Probable Prerequisites**
  - z/OS V1.10
  - System z10, z9, z890, z990, and above (no z800, z900)
- **Eliminated:**
  - Private protocol → DRDA (new help in DSNTP2DP)
  - Old plans and packages V5 or before → REBIND
  - Plans containing DBRMs → packages
  - XML Extender → XML type
  - DB2 MQ XML user-defined functions and stored procedures → XML functions
  - DB2 Management Clients feature (DB2 Administration Server, Control Center, & Development Center) → IBM Data Studio application & administration services
  - BookManager use for DB2 publications → Info Center, pdf

Why Migrate to DB2 X for z/OS?

- **Business needs to save money**
  - Reduce CPU time
  - Service Oriented Architecture
- **Application developers need improved productivity and integration**
  - pureXML for a powerful SQL and XML interface to XML data
  - Powerful new SQL enhancements & portability
- **Database Administrators need**
  - Improved performance
  - Availability, scalability & memory management
  - Simpler security and regulatory compliance
  - More productive database administration



Questions?

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