DB2 for z/OS evolution in an SOA world
DB2 9 for z/OS and beyond

August 2007

DB2 track session 3

Information Management software

- This presentation will provide an overview of trends and directions of DB2 on z/OS. Special focus will be on SOA enablement, with the primary focus on DB2 9. First there will be a little about V8. Then

- In these highlights, we'll talk briefly about the new function for pureXML and SQL. We'll note the improvements for regulatory compliance, in performance and in availability. XML work across the DB2 family is a much larger step than ever before. While V7 and V8 removed many differences from DB2 for Linux, UNIX & Windows, V9 SQL takes the next big step to improved productivity and consistency. Performance improves for utilities, optimization and LOBs. Data definition on demand extends the theme of online schema evolution from V8. Additional Unicode and text enhancements continue the work from V7 and V8. Utility enhancements help with new function, more LOB and XML support, better performance and improved availability, removing the BUILD2 step from online reorg. V9 enhances DB2's ability to handle new and enterprise applications. V9 improves with XML, large objects, and many SQL and security improvements. V9 builds upon and extends DB2 traditional strengths and the ground-breaking V8 in many areas: online schema evolution, Unicode, XML, DB2 family SQL, utilities, security and 64-bit virtual storage.

SOA and Information on demand
What the market is telling us

Huge investment in traditional programs & data
- "200 Billion lines of COBOL …"
- "more than a trillion dollars' worth of legacy mainframe code."

The key to unlocking value:
- Unstructured and structured
- Easy to find & use, tailored, cost-effective & integrated

How do you unlock the value in your applications?

WebSphere
Rational
the software development company
SOA
DB2.

IBM
Powering SOA with IBM Data Servers

How do you unlock the value in your data?

Redbooks

It's time to unlock the value of these assets

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- Significant investment in traditional assets:
  - "200 Billion lines of COBOL code in existence" eWeek May 28th 2005
  - "Mainframe users are sitting on more than a trillion dollars' worth of legacy mainframe code."   Computerworld, 2006
  - "Majority of our customer data still on mainframes" Don Greb, Mellon Financial Corp from Computerworld 2002
- The key to unlocking the value is often in the WebSphere, Rational and DB2 portfolios:
  - 85% of information is unstructured. 48 disparate financial systems and 2.7 ERP systems in the average $1B company. Only 1/3 of CFOs believe that the information is easy to use, tailored, cost-effective or integrated.
  - 30% of people's time is spent searching for relevant information
  - Sources: IBM & Industry Studies, Customer Interviews
- For more on SOA and how DB2 works in the services oriented architecture, see the recent redbook, Powering SOA with IBM Data Servers, SG24-7259.
http://www.redbooks.ibm.com/abstracts/SG247259.html

"The biggest company in the computer industry by far is IBM. They have four times the employees that I have, way more revenues than I have. IBM has always been our biggest competitor. The press just doesn't like to write about IBM."

Bill Gates, Reuters January 5, 2006
"Gates sees IBM not Google as top Microsoft rival" by Daisuke Wakabayashi

- Here are some recent examples of the press and reactions to DB2 9.

Key Message: Migrate

- **V7 end of service June 2008**
  - **On V7? Migrate to V8 now**
- **V9 general availability March 2007**
  - **Plan for DB2 9**
  - **Requires migration to V8 NFM**
- **IBM Tools V8 & V9 Ready at GA**
- **Partners ready: BMC, CA, CDB, Compuware, IBI, SEG, ESRI, …**

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- The primary messages for our customers today are about migration. V7 has been generally available for six years now, and will be out of service as of June 2008, so V7 and prior customers need to migrate now to stay in service. The formal end of service announcement has been made. V7 customers need to move to V8 as soon as possible. V8 has been generally available for three years. Tools are ready from all vendors for V8. IBM tools were ready for New Function Mode at General Availability for V8 and are ready for DB2 9. Many partners have already announced that they are ready for DB2 9. As customers move to V8, they can do some of the DB2 9 planning, to reduce the effort and stage out the process. DB2 9 migration is only from V8 NFM, and DB2 9 became generally available March 16, 2007.

- For detail on migration, see the presentation and resources it points to: ftp://ftp.software.ibm.com/software/data/db2zos/SHAREdb2zv9MigrationMiller.pdf

- IBM Information Management tools have been running with DB2 for the past three years. Some changes have been made to DB2 V8 in the service stream, but they are fairly small in number. The small number has helped to keep V8 quality and stability high. There is a lot of information in redbooks, in the library and on the web.

Where you put your data is vital to your business
Why Customers Choose DB2 on System z

- Delivers secure information services you can trust
  - Unmatched synergy with System z and z/OS
  - Offers the ideal platform for SOA
  - Cost effective choice for customers to scale up to an enterprise-wide solution
- Concurrent HW/SW upgrades provide the highest possible availability
- Better risk management that IT investments today will support future requirements
  - Helps address regulatory compliance with ability to establish centralized policies and procedures for privacy, security and audit
- Total Cost of Ownership advantages

Proven history, DB2 for z/OS in:
- **25 of the top 25 WW banks***
- **23 of the top 25 US retailers****
- **9 of the top 10 global life/ health insurance providers*****

Top companies as identified in: WW Banks from The Banker.com:
- http://www.thebanker.com/news/fullstory.php/aid/1699/Tio_1000_World_Banks.html
**US Retailers from National Retail Federation July 2005:
http://www.stores.org/pdf/TOP100printwithad.pdf
***Insurance - 2005 Ward's 50 Benchmark Group: www.memic.com/news/Wards50.asp
http://www.marketwire.com/mw/release_html_b1?release_id=213236

中国银行
BANK OF CHINA

DB2 delivered the world's largest core banking benchmark result delivering a record 9,445 business transactions per second in real-time based on more than 380 million accounts with 3 billion transaction histories[1]

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- Bank of China Online Workload Scalability: The customer's goal was 4,100 TPS according to their anticipated transaction volume. The benchmark reached this goal easily. IBM and Financial Network Services Deliver World's Largest Core Banking Benchmark Thursday February 8, 4:30 pm ET   FNS BANCS Application on IBM Mainframe Redefines Transaction Processing Performance in the Banking Industry   SYDNEY, AUSTRALIA and ARMONK, NY--(MARKET WIRE)--Feb 8, 2007 -- IBM (NYSE:IBM - News) and Financial Network Services (FNS), a subsidiary of Tata Consultancy Services, today announced the world's largest core banking benchmark result delivering a record 9,445 business transactions per second (tps) in real-time based on more than 380 million accounts with three billion transaction histories.   IBM and FNS worked with Bank of China, one of Asia's largest and most innovative banks, on the record-breaking scalability benchmark powered by an IBM System z9 Parallel Sysplex(TM) mainframe running DB2 database software and FNS's BANCS core banking application software. The benchmark, independently audited by InfoSizing, tops FNS's previous online transaction processing (OLTP) record. As a result, banks and financial services companies will be able to process key transactions faster, lower total cost of ownership and more easily manage growing transaction volumes with limited operational risk.   Tony Ward, CEO, Financial Network Services, states, "FNS and IBM have delivered an outstanding core banking benchmark result which highlights FNS's ability to deliver a core banking platform that will attain high levels of availability, scalability and robustness for the largest banks in the world. FNS has been developing core banking solutions for over two decades and has invested heavily in core banking technology to help our clients boost their bottom line and drive more value than from legacy systems."   The goal of the benchmark was to execute a range of tests that covered OLTP scalability, End-of-Day batch processing, and End-of-Month batch processing with a target of handling unprecedented transaction volumes. The transaction and account mix was based on real customer projected workload characteristics in their production environment including: Cash Deposit, Credit Transaction, Cash Withdrawal, Debit Transaction, Loan Account Inquiry, Deposit Account Inquiry, Loan Repayment Cash and Loan Repayment Credit Transaction.   "IBM mainframes scale to meet the most extreme transaction processing demands in the banking industry today," said Ian Hurst, IBM's Global Financial Sector General Manager. "The combination of FNS's BANCS application software and IBM's System z9 mainframe technology helps our clients lower their transaction processing response times and reduce transaction costs through world class performance, reliability and availability."
- System Details: The benchmark was performed at IBM's System z Customer Benchmark Center in Poughkeepsie, New York, from June to August 2006. The solution was based on FNS's BANCS core banking software package running on two IBM System z9 Enterprise Class Model 2094 (S54-754) machines and four DS8300 model 2107-922 storage subsystems. IBM System z9 was allocated with over 30,000 MIPS and 52 TB of DASD running on z/OS with DB2 relational database software and a CICS/TS Environment. The FNS BANCS solution only utilized 85 percent capacity of MIPS and 35 percent of DASD for application data processing, revealing massive scalability and optimum system performance. *
- About FNS: Founded in 1982, Financial Network Services (FNS), acquired by TATA Consultancy Services in October 2005, is a specialist banking software and services company which ranks highly amongst the world's top suppliers of banking solutions. From its beginnings producing component based retail banking solutions, FNS has enhanced its flagship solution, BANCS, to incorporate universal banking functionality spanning multi-delivery channels, treasury, trade and payments capabilities built on the same advanced technology foundation. FNS has implemented its BANCS solution in over 100 sites with variety of operational size and complexity across some 35 countries. IBM System z customers include: ChinaTrust Commercial Bank, Nova Ljubljanska Banka, KorAm Bank, Bank Keshavarsi and African Bank. For further information, visit www.fns.com.au.
- * Source: InfoSizing FNS BANCS Scalability on IBM System z - Report Date: September 20, 2006

Deep Synergy With System z Hardware and z/OS

DB2 inherits quality of service characteristics of System z

System z hardware and software capabilities:
- Compression   Sorting
- Data sharing (availability and scale out)
- Unicode conversion
- Encryption for data and TCP/IP communication (SSL)
- Fast and reliable I/O (MIDAW, FlashCopy)
- System z9 Integrated Information Processor (zIIP)
- 64-bit addressing and large memory
- Long displacement instructions
- Security Server (RACF)
- Policy based disk and tape management
- Workload management
- Decimal float hardware, IPSec, z/OS XML, …

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▪DB2 inherits all the quality of service characteristics of its System z host, augments them and add new ones through a tight integration with the underlying hardware and z/OS operating system and its own leading edge database technology features.

▪For the typical and frequently executed database functions special zSeries hardware assist capabilities are exploited resulting in superior performance, reliability, availability and serviceability

▪The latest System z9 processor improvements for DB2 are the zIIP and the new Business Class and Enterprise Class processors. DB2 V9 remote native SQL procedures are enabled for zIIP processing. V9 adds IPv6, SSL and decimal float and BIGINT data types, with enhancements for Parallel Sysplex, backup and restore, added security and encryption, more Unicode with collation, and uses the WLM in new ways. Channel enhancements (MIDAW) and improved DS8000 performance were included with the System z9 announcements. DB2 uses the latest improvements in hardware and operating system to provide better performance, improved value, more resilience and better function.

▪DB2 benefits from large real memory, faster processors, specialty engines, and better hardware compression. DB2 uses Parallel Access Volume and Multiple Allegiance features of the IBM DS8000 and Enterprise Storage Server™. FlashCopy® can be used for DB2 backup and restore. DB2 makes unique use of the z/Architecture™ instruction set, and recent instructions provide improvements in reliability, performance and availability. DB2 continues to deliver synergy with hardware data compression, FICON™ (fiber connector) channels, disk storage, advanced networking function, and Workload Manager (WLM).

DB2 for z/OS V8 field update

- **More than half of the world wide MIPS and customers are on V8**
  - More than 84% of the top 100 Customers have moved to DB2 for z/OS V8
- **How's the quality (comparis...**
  - **Lower** overall PMR volume
  - **Less** Sev 1 APARs
  - **Quicker** APAR closure time
  - **Lower** PE rate
  - **Less** multisystem outages
- It's better than v7 !!!

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- Many customers are still migrating to DB2 for z/OS Version 8. The largest DB2 customers have moved to Version 8. 84 of the largest 100 customers are running Version 8, and some customers are implementing DB2 9 development.

- Now that DB2 V8 has been generally available in the field for over three years, let's compare with V7 at the same point. For almost all of the key quality measures, V8 is better. The most important issue for many customers is PTFs in Error (PEs), and the rate is lower on V8. The PMR volume is lower and the number of field severity 1 problems is lower. V7 was widely regarded as a high quality version, and DB2 V8 total field experience is better than V7.

- Part of the improvement in overall quality measures is due to more rigorous testing. Some of the improvement is due to the reduced amount of new function added in the service stream. Still these numbers represent the averages, and we know that our customers are not average. Individual customer results are highly skewed, so the average numbers might not reflect your experience.

- The average, median and mode customer submits 0 new APARs that have never been encountered before. We anticipate that the average customer will submit fewer than 10 problems in a year, with questions and some problems that are diagnosed with an existing fix. Note the smile on the face of the support person.

Service Best Practice

Use Consolidated Service Test

Service Update (SUP)
    June 15, 2007

Recommended Service

Cross product tested levels

Best practice for service:
    two or three per year

http://www.ibm.com/servers/eserver/zseries/zos/servicetst/mission.html

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▪The Consolidated Service Test provides a way to leverage more IBM testing and experience from many customers across a much broader set of products, including z/OS, IMS, CICS, DB2, WebSphere and many tools. This technique is working for very large, very small and in between customers. If you don't have an extensive test suite - like most customers, then this technique can help a lot in reducing research and finding a stable service level.

▪Effective June 15, 2007, the DB2 for z/OS Version 8 SUP tape is available world-wide for new customer orders. This SUP tape was built differently than prior SUPs, such that its build in May integrated PTFs COR-closed through December 2006, which had also completed a Consolidated Service Test (CST) cycle.   Once PTFs complete a CST cycle, they are assigned a Recommended Service Upgrade (RSU) status. Our DB2 for z/OS Version 8 SUP tape contains CST tested PTFs which were marked "RSU 0703" (they completed CST testing in March 2007). This SUP build integrated a total of 964 PTFs (the delta since our December 2005 SUP), which is nearly 1,000 fewer PTFs our new customers need to deal with during their DB2 V8 installation experience. For additional information on CST and RSU, please see: http://www.ibm.com/servers/eserver/zseries/zos/servicetst/mission.html

▪Installing two or three CST levels a year means more current service, but not too current. If you want a process that has proven track record for success and can reduce your work, then look at the CST. Use current CST recommended service level: all service plus a two to four month later level for hipers & PE fixes. Stage that level through development systems & production. Match your levels with CST, across operating system & key subsystems. Enhanced HoldData provides a much faster way to discover missing hipers and PEs without fixes.

DB2 9 for z/OS Business Value

Delivering Secure Information You Can Trust

- **Extending the lead on availability, scalability, resiliency**
  - *Integration with the latest advancements from System z, Parallel Sysplex, and z/OS*
  - *Further advancements to allow for continuous availability*
- **Streamlined compliance with "bet your business" security**
  - *Unparalleled innovations driving efficiency with enhanced auditing and control.*
- **Easier application development for SOA and other modern applications**
  - *PureXML for On Demand & SOA applications and cost effective business data integration*
  - *Improved SQL capabilities with greater consistency across the DB2 family*
- **Dynamic data server for SAP, ERP, CRM and data warehousing workloads**
  - *Superior performance and lower cost through a strategic partnership with SAP*
  - *Improved query optimization and SQL capabilities for high performance warehousing*
- ***Reduce cost of ownership and System z-specific skill needs***
  - *DB2 Utilities performance and usability improvements*
  - *Index compression, and enhanced zIIP usage*

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▪**Better performance** Complex applications include both transactions and reporting. Performing both transactions and reporting well is imperative to running an enterprise efficiently. V9.1 delivers a number of enhancements that boost transaction performance and help reduce your total cost of ownership through reduced CPU time, improved query performance, faster disk access, and improved logging and insert performance. Most utilities and varying-length data have reduced CPU time. Queries written in native SQL procedural language are zIIP eligible. Improvements in disk access can reduce the time for sequential disk access. Key improvements for reporting include optimization enhancements that improve query and reporting performance and ease of use. **Regulatory compliance** DB2 9 improves regulatory compliance, security and auditing to improve security, to assure integrity, and to comply with regulations. Improved access control with network trusted context and roles allows more precise control of security. Improved filtering makes auditing more usable. Secure Socket Layer (SSL) data encryption on networks is more secure. **Increased synergy with System z™** As in V8, DB2 9 takes advantage of the latest improvements in System z9 hardware and software to provide better performance, improved value, more resilience, and better function. For example, remote native SQL procedures are now enabled for processing on the IBM System z9 Integrated Information Processor (zIIP). DB2 synergy with System z9 continues with a range of I/O improvements in channels, in disks, and in DB2. One performance test for sequential performance achieved 183 MB per second. V9.1 also takes advantage of new System z9 hardware support with a new decimal floating-point data type that lets you use decimal floating-point numbers with greater precision. Flashcopy can be used for DB2 database backup and restore operations. Other improvements for V9.1 on System z9 include added security and encryption and Unicode collation.

DB2 9 Availability & Scalability Improvements
New features enhance availability & scalability of the DB2 9 environment to manage your 7x24 infrastructure easily

- New and improved DB2 capabilities
  - Improved INSERT performance
  - New universal table space
  - Partition by growth
  - Not logged table space
  - Online schema change enhancements
  - Clone tables
  - Data sharing enhancements
- More online utilities
  - Online REORG enhancements
  - Online CHECK DATA, Check LOB
  - Online REBUILD INDEX
  - Memory improvements 64 bit++

1 - Winter Corporation's "2005 Top Ten" awards - http://www.wintercorp.com/index.html

Land Registry
Cymraeg

UK government Land Registry runs DB2 for z/OS to maintain the world's largest known transaction processing (OLTP) database – 23.1 TB! [1]

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▪DB2 9 offers a broad range of improvements in both availability and scalability. INSERT, UPDATE and DELETE performance is improved substantially with faster logging, and reduced index page splitting. The Universal Table Space (UTS) provides a structure that is both partitioned and segmented for better performance. UTS includes both Partitioned by Range and Partitioned by Growth table spaces. PBR is range partitioning, but using the improved segmented page structure. Partitioned by Growth helps in situations where the data is large or might become large, but there is no good partitioning key. As the table grows, partitions are added. PBG has most of the utility benefits of partitioning. The not logged table space is for situations where there are massive, parallel inserts and recovery is not needed. Be careful, you can dig yourself a very deep hole.

▪DB2 9 adds to the list of attributes which can be altered, rather than requiring the table space to be dropped and recreated. Now we can rename columns and indexes, alter a column to set a default, alter logging, and change STOGROUP SMS constructs. Clone tables allows us to have two similar tables and then to exchange one for the other very quickly. Customers asked for an online LOAD REPLACE technique, but often the LOAD utility is not used, so the capability is implemented with ALTER.

▪Online reorganization for a few partitions is much more online, with no BUILD2 phase. Check data, Check LOB and REBUILD INDEX utilities now have an online option. More memory is moved above the 2 GB bar, giving some VSCR help. More memory is moved above the 2 GB bar, giving some VSCR help.

Streamlined Compliance in DB2 9 for z/OS

- Building on the security features of DB2 for z/OS V8, DB2 9 provides even greater control, flexibility and audit
- DB2 9 provides more flexible authorization assignment & control
  - Database Roles and Trusted Context
- Improved audit selectivity ensures security performance, improved problem isolation and performance monitoring
- Extend encryption to tape controller (now) and disk storage (future direction)

Common Criteria security certification: DB2 for z/OS V8 in evaluation at EAL3+ level.

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- While DB2 for z/OS V8 provides many enhancements for security, there are still many more needs and much more work to do. DB2 9 roles are used to provide a more flexible technique than groups or users in assigning and controlling authorization, while improving consistency with the industry. A network trusted context provides a technique to work with other environments more easily, improving flexibility. The instead of trigger is an SQL technique that allows a trigger to be used in place of a view, consistent with DB2 for LUW. Improved audit selectivity is needed for being able to see that security is functioning.   Secure Socket Layer or SSL implementation provides encryption of data on the wire. Some additional techniques for data encryption will help protect data at rest and in backups – now for tapes and in the future for disks.
- Common Criteria: z/OS V1.7 with the RACF optional feature has achieved EAL4+ for Controlled Access Protection Profile (CAPP) and Labeled Security Protection Profile (LSPP). z/OS and DB2 are evaluated for the Common Criteria EAL4 evaluation. DB2 for z/OS Version 8 is in-evaluation under the Common Criteria for CAPP and LSPP with a conformance claim of EAL3+. See: http://www.ibm.com/systems/z/security/
- http://www.ibm.com/systems/z/security/mls.html
- http://www.ibm.com/systems/z/security/ccs_certification.html
- http://www.ibm.com/security/standards/st_evaluations.shtml

Leverage Existing Application Development Skills

- **New Converged SQL & Developer Workbench**
- **Key Database Technologies**
  - XML, SQL, SQL Procedures
  - SOA, Web Services
- **Developer Communities**
  - COBOL, PL/I, C, C++
  - REXX, APL2, Assembler, Fortran
  - Java (JDBC / SQLJ)
  - .NET (C#, VB .NET)
  - Open Source
    - PHP
    - Perl
    - Python
    - Ruby on Rails
    - Toad for DB2
    - …

People who haven't been around the mainframe in awhile think of Cobol, JCL, Clist, TSO. Yet these other things, Java, .net, are the fastest growing ways that people access the mf. Db2 ships a .net provider for LUW and Z, >50% of the .net access is actually to Z. PHP, Perl, etc. So if you're a developer who wants to access a backend DB, it's transparent to you that it happens to be on Z. So if you think about skills, going back 10 yrs one of the big needed skills was Cobal, assembler, JCL, etc. In this era, the app developers don't have to know it's z because the langs we support are fully portable.

Unleash Existing Information for New Applications – Application Development Environment

SQL enhancements..

▪XML – DB2 V9 – hybrid Data Server… supporting both relational and pure XML storage

▪SOA, XML integration, integration with WebSphere

▪Web Services and DB2

▪Develop anywhere deploy on z, leverage existing dev skills, deploy on z

▪Integrate existing and new appl.

▪Default databases and table spaces: Automatic unique indexes to support primary key

Business Benefits of DB2 9 with pureXML technology

- **Lower Development Costs**
  - Reduced code and development complexity
  - Improved developer productivity
  - → *Accelerate solution development and gain cost savings*
- **Greater Business Agility**
  - Easily accommodate changes to data and schemas
  - Update applications rapidly and reduce maintenance costs
  - → *Respond quickly to dynamic conditions and get faster time to value*
- **Improved Business Insight**
  - Unprecedented application performance
  - Access to more documents
  - → *Gain competitive advantage through better and quicker information*

UNIVAR

"This is not a bolt-on or band-aid approach, DB2 9 for z/OS is XML without compromise"
Kevin Campbell, Application Architect, Univar USA

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▪Integrating XML is a key to SOA development based on strong client & partner feedback. It now provides the ability to work in both worlds with the performance, integrity, protection and scale from a proven DB2 infrastructure. IBM patented pureXML overcomes the complexity & limitations of prior models such as shredding, CLOB, or XML only.

▪But another XML methodology isn't necessary unless it provides real value to customers. With pureXML, customers can accelerate application and solution development with a cost savings over previous approaches. They also have the ability to respond quickly to dynamic conditions and get faster time to value. They will also gain a competitive advantage thru faster and improved information.

▪In 2006 IBM introduced a new generation data server with the availability of DB2 9. The explosive growth of XML based data standards in all industries means competitive advantage for those businesses that use it most effectively and efficiently. Client, policy and claims processing in Insurance; supply chain management in Retail; financial transactions and asset management in Banking; patient care in Healthcare; citizen service in Government; implementing Service Oriented Architectures (SOA) in Computing Software and Services - and many other processes across all industries - increasingly rely on information captured and exchanged in XML form. Our clients are increasingly managing XML format text documents in a content management system for proper governance and efficient use in the business process workflow. But few are realizing the full value of all the business data they possess that are in XML format. For more information about Univar and their video case study, visit:
http://www.ibm.com/software/os/zseries/testimonials/univar.html
▪Beta Customer Feedback – industry: insurance, geo: AM (production: massive data warehouse, data sharing, zIIPs). Applications on AIX & Windows needed higher availability Key interests in XML and Eclipse-based development & debugging. DB2 9 GA project starts one month after GA: "Need for new functionality will drive DB2 9 across our enterprise"

Capabilities Inside the Engine pureXML^tm

→Session 4

Performance, Performance, Performance

SERVER

CLIENT

SQL/XML

Data Management Client

Customer Client Application

SOA

Relational Interface

Relational Storage

DB2 Server

XML Interface

XML Storage

Native storage Schema Index Functions Utilities

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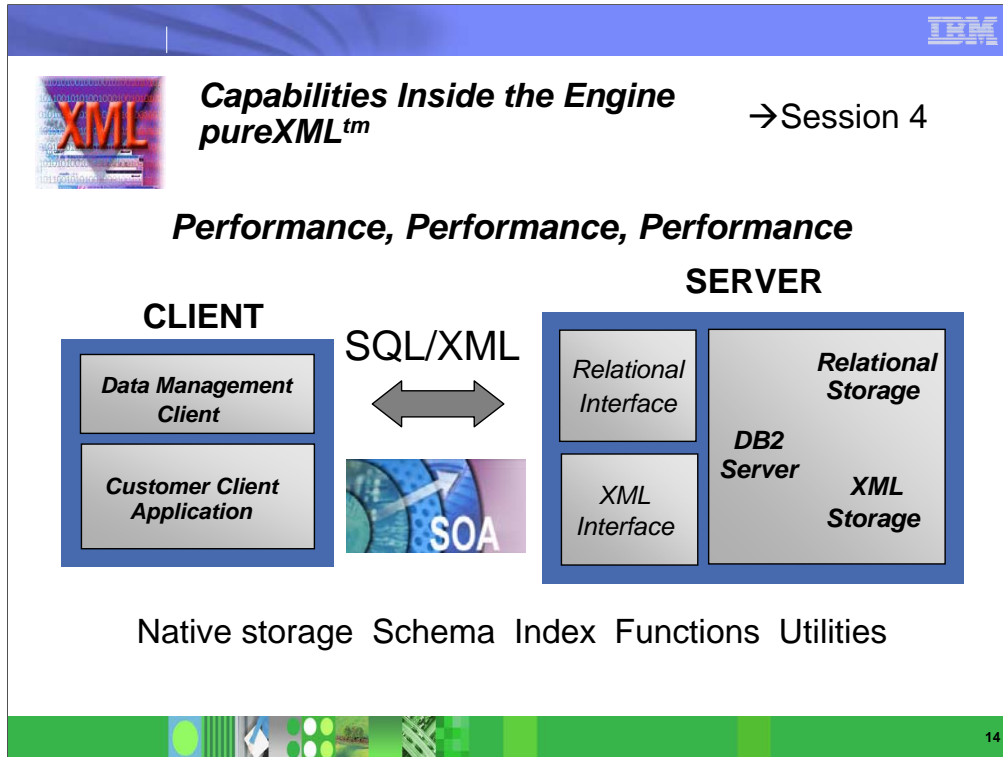
- The largest single item in DB2 9 for z/OS is the XML work, bringing pureXML^tm for native storage and integrating XML with object-relational and DB2.

- Powerful querying and transformation capabilities are included with XPath. Querying is not merely finding a document that matches a certain criteria. For e.gexample, find all purchase orders with a certain order id. More often than not, users want to transform the data into something more relevant. For example, they may want to not return all purchase orders as-is, but instead return documents that only contain the purchase order id, and the amount of the order.

- DB2 already provides great support for the two paradigms of storing LOBs or shredding XML. In fact, with our XML extender, we were the first ones in the industry to support XML. We're working on completing the picture, across the DB2 family, with XPath. DB2 9 for Linux, UNIX and Windows delivers this picture, and adds an XQuery interface to the data.

DB2 9 Easier Application Development

Simplify development process

Improve performance

Numerous SQL enhancements

- – Merge / Truncate
- – Select from update, delete & merge
- – Instead of triggers
- – BIGINT & DECIMAL FLOAT
- – New Built-in functions e.g. SOUNDEX
- – DDL porting improvements
- – Optimistic locking
- Developer Workbench
- Spatial or geographic data
- Text Search server coming
- Native SQL Stored Procedures

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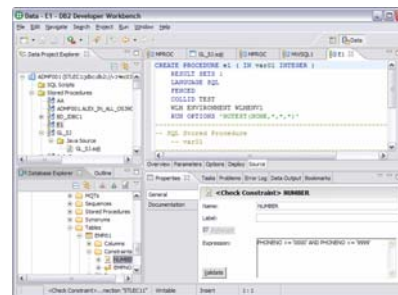
A tremendous number of enhancements helps application developers to simplify the development process and gain performance improvements when accessing DB2 data. As the DB2 SQL is more consistent with use across the industry, porting an application to DB2 9 for z/OS is much simpler. The learning process is also much faster for those who know only some other DBMS or platform. The additional function delivered in DB2 9 means that applications can use what is provided, rather than delivering this level.

Thes SQL enhancements are noted on prior slides, but they include new SQL statements, new data types, and many new functions.

SQL: Productivity, DB2 family & porting

- XML
- MERGE & TRUNCATE
- SELECT FROM UPDATE, DELETE, MERGE
- INSTEAD OF TRIGGER
- BIGINT, VARBINARY, BINARY, DECIMAL FLOAT
- Native SQL Procedure Language
- Nested compound
- Optimistic locking

- LOB File reference variable & FETCH CONTINUE
- FETCH FIRST & ORDER BY in subselect and fullselect
- INTERSECT & EXCEPT
- Text & Spatial
- Many new built-in functions, caseless comparisons
- Index on expression
- Improved DDL consistency
- CURRENT SCHEMA

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- As in Version 8, there are many improvements for SQL and for XML in V9. Improvements in the SQL have made migrating from other platforms, such as Unix and Windows much easier.

- V9 continues the progress in SQL, with many new functions, statements and clauses. The biggest changes are in XML on the prior slide. There are new SQL data manipulation statements in MERGE and TRUNCATE. There are new data types with XML, DECIMAL FLOAT, BIGINT, BINARY and VARBINARY types. Improvements in LOBs provides more consistent handling and improved performance. Intersect and Except set operations make some SQL operations simpler to specify. Security is improved with ROLEs and network trusted context. Data definition consistency and usability are improved. V9 is another big step in DB2 family consistency and in the ability to port applications to DB2 for z/OS.

DB2 SQL

z z/OS V8
common
luw Linux, Unix & Windows V8.2

SELECT FROM T1
INSERT INTO...
Portable SQL

z — Multi-row INSERT, FETCH & multi-row cursor UPDATE, Dynamic Scrollable Cursors, GET DIAGNOSTICS, Enhanced UNICODE for SQL, join across encoding schemes, IS NOT DISTINCT FROM, Session variables, range partitioning

c o m m o n — Inner and Outer Joins, Table Expressions, Subqueries, GROUP BY, Complex Correlation, Global Temporary Tables, CASE, 100+ Built-in Functions including SQL/XML, Limited Fetch, Insensitive Scroll Cursors, UNION Everywhere, MIN/MAX Single Index, Self Referencing Updates with Subqueries, Sort Avoidance for ORDER BY, and Row Expressions, 2M Statement Length, GROUP BY Expression, Sequences, Scalar Fullselect, Materialized Query Tables, Common Table Expressions, Recursive SQL, CURRENT PACKAGE PATH, VOLATILE Tables, Star Join Sparse Index, Qualified Column names, Multiple DISTINCT clauses, ON COMMIT DROP, Transparent ROWID Column, Call from trigger, statement isolation, FOR READ ONLY KEEP UPDATE LOCKS, SET CURRENT SCHEMA, Client special registers, long SQL object names, SELECT from INSERT

l u w — Updateable UNION in Views, ORDER BY/FETCH FIRST in subselects & table expressions, GROUPING SETS, ROLLUP, CUBE, INSTEAD OF TRIGGER, EXCEPT, INTERSECT, 16 Built-in Functions, MERGE, Native SQL Procedure Language, SET CURRENT ISOLATION, BIGINT data type, file reference variables, SELECT FROM UPDATE or DELETE, multi-site join, MDC

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- This text just shows the relationship of DB2 for Linux, Unix & Windows with DB2 for z/OS, comparing the z/OS Version 8 from March 2004 with the LUW version from October 2004.
- There are three sets of SQL noted above, with some that is unique to DB2 for z/OS in the first group, SQL that is common across DB2 for Linux, Unix, Windows and z/OS in the large group in the middle, then SQL that is unique to DB2 for Linux, Unix and Windows in the bottom group. Sheryl Larsen provided the base for this information, but the mistakes are probably mine.
- If you want to improve DB2 family consistency, then DB2 for z/OS Version 8 is a big step, changing the game from one of catch up to one of leapfrog.

DB2 SQL

z   z/OS V9
common
luw Linux, Unix & Windows V9

z Multi-row INSERT, FETCH & multi-row cursor UPDATE, Dynamic Scrollable Cursors, GET DIAGNOSTICS, Enhanced UNICODE for SQL, join across encoding schemes, IS NOT DISTINCT FROM, Session variables, **TRUNCATE, DECIMAL FLOAT, VARBINARY, optimistic locking, FETCH CONTINUE, ROLE, MERGE, SELECT from MERGE**

common Inner and Outer Joins, Table Expressions, Subqueries, GROUP BY, Complex Correlation, Global Temporary Tables, CASE, 100+ Built-in Functions including SQL/XML, Limited Fetch, Insensitive Scroll Cursors, UNION Everywhere, MIN/MAX Single Index, Self Referencing Updates with Subqueries, Sort Avoidance for ORDER BY, and Row Expressions, 2M Statement Length, GROUP BY Expression, Sequences, Scalar Fullselect, Materialized Query Tables, Common Table Expressions, Recursive SQL, CURRENT PACKAGE PATH, VOLATILE Tables, Star Join Sparse Index, Qualified Column names, Multiple DISTINCT clauses, ON COMMIT DROP, Transparent ROWID Column, Call from trigger, statement isolation, FOR READ ONLY KEEP UPDATE LOCKS, SET CURRENT SCHEMA, Client special registers, long SQL object names, SELECT from INSERT, **UPDATE or DELETE, INSTEAD OF TRIGGER, Native SQL Procedure Language, BIGINT, file reference variables, XML, FETCH FIRST & ORDER BY in subselect and fullselect, caseless comparisons, INTERSECT, EXCEPT, not logged tables**, range partitioning, compression

luw Updateable UNION in Views, GROUPING SETS, ROLLUP, CUBE, 16 Built-in Functions, SET CURRENT ISOLATION, multi-site join, MERGE, MDC, XQuery

18

- This text just shows the relationship of DB2 for Linux, Unix & Windows with DB2 for z/OS. This step in the process is DB2 V9 for z/OS, (V9 or DB2 9). V9 moves about half of the LUW unique items into the common set and adds a little more that is unique to the z platform. DB2 9 for LUW, code named Viper is already generally available. We are able to move more from the z list to the common list with DB2 9 for luw.
- There are three sets of SQL noted above, with some that is unique to DB2 for z/OS in the first group, SQL that is common across DB2 for Linux, Unix, Windows and z/OS in the large group in the middle, then SQL that is unique to DB2 for Linux, Unix and Windows in the bottom group. The changes in a specific version are not consistent. As we introduce new function, sometimes it will be on one platform first, but movement from unique lists into the common list continues to be the strongest trend.
- DB2 for luw has another release in open beta now. Several of the z unique functions move into the common set.
- Thanks to Sheryl Larsen, Gold consultant, who provided the base for this information.

System z Hub for Business Critical Data
Addresses key issues to realize the benefits of an SOA

- SOA challenges are principally performance, reliability and security: System z strengths
- DB2 provides the central, secure data server for a successful SOA strategy
  - Cost-effective enterprise performance
  - IT productivity and full use of resources
  - Leverages new security capabilities for data availability, integration and security.

InfoWorld 2006

Category	2006	2005
Does Not Meet Business Needs	55%	53%
Difficult to Manage Services	58%	53%
Lack of Security	60%	Not Asked in 2005
Poor Reliability	60%	65%
Performance or scalability issues	64%	62%

Fifth Third Bank
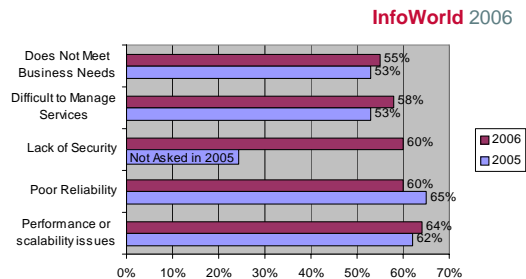
Saving tens of millions of dollars by optimizing transaction-processing resources to SOA solution that provides richer array of services. Go to market faster and more cost effectively, improving responsiveness and the bottom line.

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- As we read about challenges in an SOA environment, the technical issues are often about performance, reliability and security. These are the heart of the System z strengths.

- DB2 provides the central, secure data server for a successful SOA strategy, with

  ▶ Cost-effective enterprise performance

  ▶ IT productivity and full use of resources

  ▶ Leverages new security capabilities for data availability, integration and security

DB2 9: Another features rich release …
Most relevant to SAP, many other vendors & customers

- SHRLEVEL(REFERENCE) for REORG of LOB table spaces
- Online RENAME COLUMN
- Online RENAME INDEX
- Online CHECK DATA & CHECK LOB
- Faster REORG by intra-REORG parallelism
- More online REORG by eliminating BUILD2 phase
- LOB Locks reduction
- Online REBUILD INDEX
- Renaming SCHEMA
- Renaming VCAT
- Tape support for BACKUP and RESTORE SYSTEM utilities
- Recovery of individual table spaces and indexes from volume-level backups
- Enhanced STOGROUP definition
- Preserving consistency when recovering individual objects to a prior point in time

- Global query optimization
- Generalizing sparse index and in-memory data caching method
- Autonomic reoptimization
- Logging enhancements
- LOBs Network Flow Optimization
- Faster operations for variable-length rows
- NOT LOGGED table spaces
- Index on expressions
- Universal table spaces
- Partition-by-growth table spaces
- APPEND option at insert
- Autonomic index page split
- Different index page sizes
- Faster and more automatic DB2 restart
- MODIFY RECOVERY enhancements
- RLF improvements for remote application servers such as SAP
- Thin DB2 Connect client

- Index compression
- DECIMAL FLOAT
- BIGINT
- VARBINARY & BINARY
- MERGE statement
- FETCH CONTINUE
- SELECT FROM UPDATE / DELETE / MERGE
- Enhanced CURRENT SCHEMA
- Automatic creation of database objects
- Modify early code without requiring an IPL
- Utilities CPU reduction
- Temporary space consolidation
- Removing more reasons for 'soft' outages
- Conditional restart enhancement: automatic search for the appropriate checkpoint
- ALTER column default
- . . .

TCO Reduction   **Performance**   **SQL XML**
          Continuous Availability   **Scalability**   **Portability**

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▪Most of the key items in this version help our key enterprise application partners: SAP, PeopleSoft and Siebel, but also improve many other applications and customers. Customers working on the web and Service Oriented Architecture (SOA) see most of these benefits too. SQL flexibility improvements allow DB2 to be efficient in performance and in productivity for our partners. There are more than 50 items for each partner, improving the performance, scalability, continuous availability, SQL and portability. So the net is an improvement in the total cost of ownership.

Optimize Infrastructure, Skills & Cost
SAP Certified on DB2 9 for z/OS   13 July 2007
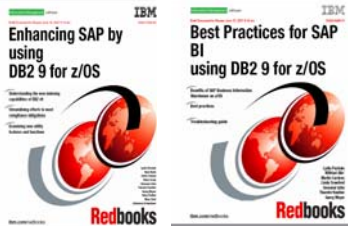*Enables growth of System z9 SAP workloads through resource optimization*

"Enhancements in DB2 for z/OS, along with the new zIIP processor, will increase total value for our System z clients.

We look forward to certifying DB2 for z/OS as it becomes available so our clients may benefit from these new values and the unique System z qualities of service."

Dr. Torsten Wittkugel, Vice President
DB/OS Platform Development, SAP AG

SAP ®
New!

Enhancing SAP by using DB2 9 for z/OS

Best Practices for SAP BI using DB2 9 for z/OS

een successfully certified to support SAP systems

After a formal verification process of the functionality and quality of the new DB2 database release with regard to SAP environments and its products SAP solutions are now supported on DB2 for z/OS V9.

Redbooks

Redbooks

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▪**IBM DB2 for z/OS V9 has been successfully certified to support SAP systems:** https://www.sdn.sap.com/irj/sdn/db2?prtmode=print

▪After a formal verification process of the functionality and quality of the new DB2 database release with regard to SAP environments and its products SAP solutions are now supported on DB2 for z/OS V9.
The new database version has well passed SAP's validation tests on SAP R/3 4.6, SAP NetWeaver '04, SAP NetWeaver 7.0 and SAP ABAP stack 7.1. SAP releases DB2 for z/OS V9 for all SAP solutions based on the current SAP technologies.
For migration to DB2 V9 and prerequisites please refer to the SAP note 1043951 and the BestPractices document in the Knowledge Center.
New IBM Redbooks are available (see IBM Information Sources page).

▪Enhancing SAP - DB2 9, SG24-7239,
http://www.redbooks.ibm.com/abstracts/SG247239.html
▪Best practices SAP BI - DB2 9, SG24-6489-01,
http://www.redbooks.ibm.com/redpieces/abstracts/sg246489.html

Dynamic Warehousing
A New Approach to Leveraging Information

Information On Demand
to Optimize Real-Time Processes

Dynamic Warehousing

Dynamic Warehousing Requires:

1. Real-time access – in context
2. Analytics – as part of a business process
3. Unstructured information – extracted knowledge
4. Extended capabilities – tightly integrated

OLAP

Query &

Reporting

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▪Traditional warehousing focused on query and reporting to understand what happened, and evolved to enable OLAP and data mining to understand the why those things happened and recommend future action. [click]

▪Dynamic warehousing is a new approach to address the primary business challenges that organizations face today, which requires the ability to deliver the right information to the right people at the right time to more effectively leverage information and enable more effective business decisions. It's about information on demand to optimize real-time processes. I think of dynamic warehousing as the business intelligence analog of Service Oriented Architecture (SOA). [click]

▪Dynamic Warehousing includes four key abilities:

▪*1. Support for real-time access to aggregated, cleansed information, which can be delivered in the context of the activities and processes being performed;*

▪*2. Embedded analytics that can be leveraged as part of a business process;*
3. The ability to incorporate knowledge from unstructured information; and
4. A complete set of integrated capabilities that extend beyond the warehouse to enable Information on Demand

▪*The distinction between data warehousing and online transaction processing is blurring. Data warehousing and analytic applications are accessing operational or near-real-time data. Transactions have become more complex to provide better interaction and productivity for people. Dynamic warehousing has capabilities and strengths on all IBM platforms. The traditional mainframe strengths for consistency with operational data, high security, and continuous availability match well with dynamic warehousing.*

Dynamic Warehousing with System z
Mission-critical analysis of operational data

Rapid and secure user-access to data analysis
- *Interactive executive dashboards & information portals*

Improved query and reporting optimizations
- *Parallel queries & SQL Procedures may run on zIIP*
- *Improved SQL & optimization*

Up to 50% reduction of storage for indexes
- *Index compression added to data compression*

Up to 50% reduction of CPU utilization
- *Across many queries & most utilities*

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- DB2 9 provides more functionality in the Data Warehouse area. Today's complex applications include both transactions and reporting, so performing both well is imperative. The key improvements for reporting are optimization enhancements to improve query and reporting performance and ease of use. More queries can be expressed in SQL with new SQL enhancements. Accompanying DB2 9 is a new product, IBM DataQuant, which has the critical mass of features that allow it to be positioned as a viable BI and data analytics offering with support for both graphical reports and interactive visual dashboards. It provides a sophisticated graphics engine, supporting dozens of charts and layouts and over 100 built in functions. DataQuant provides very granular security- limit information on a per user/group, also tailor look and feel for users. It also provides a rich client or web-based development/runtime environment.
- IBM DataQuant is ideally suited to the rapid fulfillment of 'everyday' dashboard and reporting requirements. It is simple to develop and deploy – quick turnaround at low development cost. It also allows IT groups / analysts to quickly respond to custom requirements. Where IBM DataQuant fits: Where there's a need to distribute data using straightforward graphical reports and information dashboards Where quick prototyping and rapid development is more important than complex analytical features In QMF and/or z-based environments where tracking, governing and z-based deployment are valued factors For customers that find competitor solutions too complex and costly
- Index compression and data compression provide a significant reduction in storage. The index compression relies upon page level compression instead of row-level compression (technique used for tables).   Indexes with 32K page sizes can save up to 8x on disk space with the compression feature turned on.   Improved index compression with minimal overhead resulting in Beta customers reporting 50% or more savings in disk space
- The key performance improvements in V9 are reduced cpu time in the utilities, improved LOB performance and scalability, improved optimization for SQL, the zIIP processing for remote native SQL procedures, reduced cpu time for data with varying length and better sequential access.
- Significant CPU time reduction in most utilities: 10% - 20% in Copy, Recover Table Space
    - 5% - 30% in Load, Reorg, Rebuild   20% - 60% in Check Index
    - 35% in Load Partition   40% - 50% in Reorg Index
- Additional 10% to 15% improvement in virtual storage. Remote Native SQL stored procedures can take advantage of zIIP. Improved data is provided for the optimizer, with improved algorithms. New optimizer techniques and more SQL functions enhance DB2 for z/OS as a DWH platform. New OmniFind text search functions provide efficient communication interactions with DB2 for z/OS. OmniFind text indexes are persisted into DB2 tables for backup/recovery purposes.
- 1 - Winter Corporation's "2005 Top Ten" awards - http://www.wintercorp.com/index.html

Query Enhancements

- SQL enhancements: INTERSECT, EXCEPT, cultural sort, caseless comparisons, FETCH FIRST in fullselect, OLAP specifications: RANK, ROW_NUMBER, …
- pureXML integration and text improvements
- Index improvements
  - Index on expression   Larger index pages
  - Index compression   Improved page split
- Improved Optimization statistics: Histogram
- Optimization techniques
  - Cross query block optimization
  - Generalize sparse index & in-memory data cache method
  - Dynamic Index ANDing for Star Schema
- Analysis: instrumentation & Optimization Service Center

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- Improving data warehousing and reporting: Today's complex applications include both transactions and reporting, so performing both well is imperative. The key improvements for reporting are optimization enhancements to improve query and reporting performance and ease of use. Improved data is provided for the optimizer, with improved algorithms and a rewritten approach to handling performance exceptions.

- More queries can be expressed in SQL with new SQL enhancements. The set operators INTERSECT and EXCEPT clauses make SQL easier to write. OLAP extensions for RANK, DENSE_RANK and ROW_NUMBER add new capabilities. Other SQL statements improve consistency with the DBMS industry. V9 continues the progress in SQL, with many new functions, statements and clauses. The biggest changes are in XML on a prior slide. New SQL data manipulation statements are MERGE and TRUNCATE. New data types with DECIMAL FLOAT, BIGINT, BINARY and VARBINARY. Improvements in LOBs provide new function, more consistent handling and improved performance. Security is improved with ROLEs and network trusted context. Data definition consistency and usability are improved. V9 is another big step in DB2 family consistency and in the ability to port applications to DB2 for z/OS.

When is System z the Preferred Platform?

- **Real-time Operational Data Store (ODS)**
  - Data must be in synch with operational data
  - Availability, resiliency, and security are important
  - Operational data is on System z
- **Existing marts or warehouses are on System z**
- **System z and SAP: operational and warehouse**
  - Using SAP BW when SAP R/3 is on System z
- **Existing skills and investments on System z**

- Data warehousing has become more real time, with more connections to operational data and more security concerns. These changes make the key System z advantages even more applicable. Today's complex applications include both transactions and reporting, so performing both well is imperative. Operational data stores are often kept on z/OS, since that is the source of most of the information, and synchronization across platforms is more challenging. When availability, resiliency and security are very important, many of the robust, unique characteristics of System z and DB2 for z/OS provide an advantage.

- Another common situation is having the operational and warehouse on the same platform. For example, if the SAP operational systems are on z/OS, then having the warehouse there too makes the integration simpler.

- If customers have existing skills and investments on System z, they know the advantages. Sharing and virtualization is extensive and standard. More improvements like the zIIP and the latest versions of DB2 for z/OS can make System z the best total cost of ownership choice. The key DB2 9 improvements for reporting are optimization enhancements to improve query and reporting performance and ease of use. Improved data is provided for the optimizer, with improved algorithms and a rewritten approach to handling performance exceptions. http://www.db2mag.com/story/showArticle.jhtml?articleID=201201182

- ftp://ftp.software.ibm.com/software/data/db2bi/data_warehousing_whitepaper.pdf

- http://www.ibm.com/software/swnews/swnews.nsf/n/cres74ek7g

Reduced TCO and Administration Requirements

- DB2 9 further reduces cost of ownership and System z-specific skill needs
- Improved productivity with increased consistency with DB2 family and other relational databases
- Cost reductions through processing reductions, use of zIIP, disk compression and improved memory use

IDC: Since 2000, Labor Costs Have Exceeded the Cost of All Servers … and are Still Growing
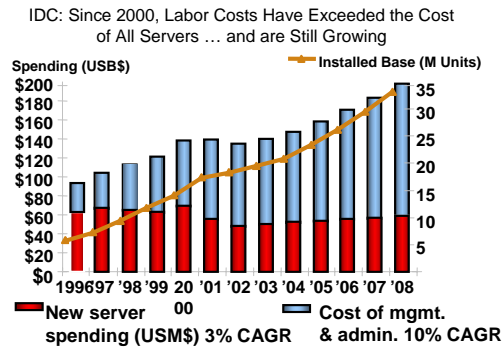
Decreasing cost of IT?
After consolidating SAP & DB2 on System z, IT expenses as a percentage of sales decreased from over 2% of sales to .9%!
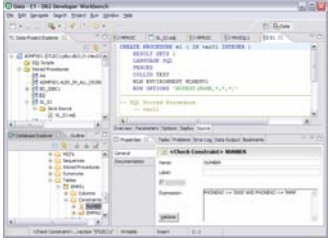
26

- The key performance improvements in V9 are reduced cpu time in the utilities, improved LOB performance and scalability, improved optimization for SQL, the zIIP processing for remote native SQL procedures, reduced cpu time for data with varying length and better sequential access.

- I'll discuss the optimization improvements on the query slide. V8 SQL procedures were not eligible to run on the zIIP, but changing to use the native SQL Procedure Language on V9 will make the work eligible for zIIP processing. Varying length data can improve substantially if there are large numbers of varying length columns. Several improvements in disk access can reduce the time for sequential disk access.

- EXCEPT and INTERSECT

- RANK, DENSE_RANK, and ROW_NUMBER

- Many other SQL improvements

Simplifying DB2 Management

- Data definition On Demand, Cloned tables, Partition by Growth, Converged space
- Improved LOB handling, integrated XML
- Integrated health monitor task
- Developer WorkBench
- Volume level Backup & Restore enhancements
- Optimization Service Center
- Many utility enhancements
- Next: Data Servers Administration Console

Go to **ibm.com**/software/db2zos/db2zosv91.html

zOSSUM_750   27

▪DB2 9 helps database administrators to simplify their daily work through new features and productivity enhancements:

▪Data definition On Demand, Cloned tables, Partition by Growth, Converged space help with adding and modifying database definitions, making the process simpler and more on line.

▪Improved LOB handling, integrated XML take on more of the task within DB2, rather than having the work done separately.

▪Integrated health monitor task provides some insight into DB2's health.

▪Developer WorkBench is the next generation of application building and debugging, adding XML to the functions.

▪Volume level Backup & Restore enhancements extend V8 BACKUP and RESTORE utilities with the ability to restore part of the subsystem and to use tapes with FlashCopy.

▪Optimization Service Center & Optimization Expert help with SQL tuning.

▪Many utility enhancements provide a wide range of enhanced function with improved performance.

▪The next step in making administration simpler is the IBM Data Servers Administration Console, making many tasks common across the DB2 family.

DB2 9 Cost savings

Selected features that save CPU or storage cost

- Index compression
- zIIP and SQL native stored procedures
- CPU reductions in most utilities: LOAD, REORG, RUNSTATS, RECOVER, CHECK, …
- INSERT performance enhancements
- Improved performance for VARCHAR
- Improve LOB performance and manageability
- DDF 64-bit shared memory
- 10 to 15% improvement in virtual storage
- Improved query performance
- Enhanced index split, larger pages and sequential key insert
- See much more in the DB2 9 Performance Topics redbook, SG24-7473
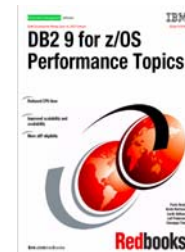
- Index compression can save around half of the disk space used for indexes. This is especially helpful in a data warehousing environment.
- Utility cpu time reductions:
- 10% to 20% in Copy, Recover table space / index*
- 5% to 30% in Load*, Reorg*, Rebuild Index*
- 20% to 60% in Check Index*
- 35% in Load Partition*
- 30% to 40% in Runstats Index*
- 40% to 50% in Reorg Index*
- 70% in Load Replace Partition with dummy input
- * Indicates that the savings are in the index processing.
- See much more in DB2 9 Performance Topics redbook, SG24-7473

DB2 9 for z/OS *Performance Improvements*

- Significant CPU time reduction in most utilities
- Performance / Scalability Enhancements
  - Especially Insert, Update & Delete
- Query / Access Path Performance Enhancements
- Other Performance Enhancements
  - Native SQL procedure, index compression
  - LOBs, Varchar
- Improved virtual storage usage Below 2GB DBM1
- Synergy with new hardware: zIIP, MIDAW, DS8000, …

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- The key performance improvements in V9 are reduced cpu time in many utilities, improved LOB performance and scalability, improved performance and scalability for updating, improved optimization for SQL, zIIP processing for remote native SQL procedures, reduced cpu time for data with varying length columns and better sequential access. This version appears to have minimal performance regression in the lab for current hardware (z9, z990 and z890).

- I'll discuss the optimization improvements on the query slide. V8 SQL procedures were ineligible to run on the zIIP for the most part, but changing to use remote native SQL Procedure Language on V9 will make the work eligible for zIIP processing. Varying length data can improve substantially if there are large numbers of varying length columns. Several improvements in disk access can reduce the time for sequential disk access.

- We expect to have an additional 10% to 15% improvement in virtual storage below the line, so the 200 MB to 300 MB will be welcome to most customers. Synergy with System z is extensive, as you will see on the next slide.

- For more details on the performance improvements, see
- ftp://ftp.software.ibm.com/software/data/db2zos/SHAREdb2zPerformanceShibamiya.pdf

Scalability

- Insert performance APPEND INDEX LOG
  - INDEX on expression, 8K, 16K, 32K, split
  - Randomized index key, larger preformat
  - Log Latch contention & spin relief, archiving
  - Not logged table space
- Partitioned table with segmented space
- Memory improvements 64 bit address space

- Performance for inserting is expected to increase substantially, through a wide range of improvements. Logging performance is improved substantially, with latching improvements and archiving. The newer disk and channel changes (DS8000 Turbo, 4 Gb per second channels, MIDAW), combined with larger preformat, prefetch and deferred write quantities, improve data rates substantially. Indexes are improved, with larger page sizes to reduce the number of page splits and also a better page split. Where performance should be optimized for inserts, rather than for later retrieval, the append option can be used. If the data need to be randomized to avoid insert hot spots, the new randomized index key is useful. Avoiding logging can help sometimes.

- The segmented space structure is more efficient, so adding that space structure for the large partitioned table spaces helps DB2 scale, even when there is no partitioning key.

- Memory improvements continue the work from V8, with shared memory above the bar for DDF and DBM1 and moving more data structures above the bar, providing roughly 200 to 300 MB of relief.

Reduced Cost of Administration
DB2 and Information Management Tools

Agility
- SQL and XML improvements
- DataQuant
- Query Management Facility
- WebSphere Replication Server

Performance
- DB2 Utilities & System z
- DB2 Optimization Service Center & Optimization Expert
- OMEGAMON XE for DB2
- DB2 Query Monitor

Compliance
- Trusted Context, Roles & Audit
- DB2 Audit Management Expert
- DB2 Archive Expert
- DB2 Test Database Generator
- IBM Encryption Tool for DB2 and IMS Databases

Efficiency
- Dynamic change & autonomics
- DB2 Utilities Suite
- DB2 Storage Management Utility
- DB2 Recovery Expert
- DB2 Automation Tool

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- Throughout the presentation we have highlighted some of newest offerings added to the DB2 Tools portfolio including IBM DataQuant, a business analytics tool that features dashboards and data visualization and DB2 Optimization Expert, which offers index and statistics advisors to help improve performance and lower TCO. Plus, in 2006 we announced several other new tools as well including DB2 Audit Management Expert, DB2 Storage Management Utility, DB2 Recovery Expert for z/OS, and WebSphere Replication Server, a tool which represents a new generation in q replication. Part of a portfolio of over 80 DB2, IMS and WebSphere Information Integration tools this comprehensive portfolio of tools continue to reduce TCO by improving DBA efficiency and accuracy.

- IBM continues to enhance and expand both DB2 and tool offerings to deliver the value customers need to get the most out of their database environment.

Online Schema Evolution →
Database Definition On Demand

- Online reorganization with no BUILD2 phase
- Fast replacement of one table with another
- Table space that can add partitions, for growth
- Ability to rebuild an index online
- Rename column and index
- Modify early code without requiring an IPL
- Alter table space and index logging
- Create & alter STOGROUP SMS constructs
- Alter column set default

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- One of the key initiatives of V8 was online schema evolution. Online schema evolution is expanding and changing to be data definition on demand.

- Online table space reorganization for a few partitions is improved a lot, removing the BUILD2 phase for all types of secondary indexes. One of the important changes is to be able to replace one table quickly with another. Another is to be able to rename a column or an index. A new type of table space combines the attributes of segmented and partitioned, without a partitioning key. Rebuild index can be run with much less disruption. Table space and index logging can be altered. A new ability to change the DB2 early code does not require an IPL. SMS constructs MGMTCLAS, DATACLASS and STORCLAS can be defined on a STOGROUP and can be altered. The column default can now be altered.

DB2 9 for z/OS Partners Ready
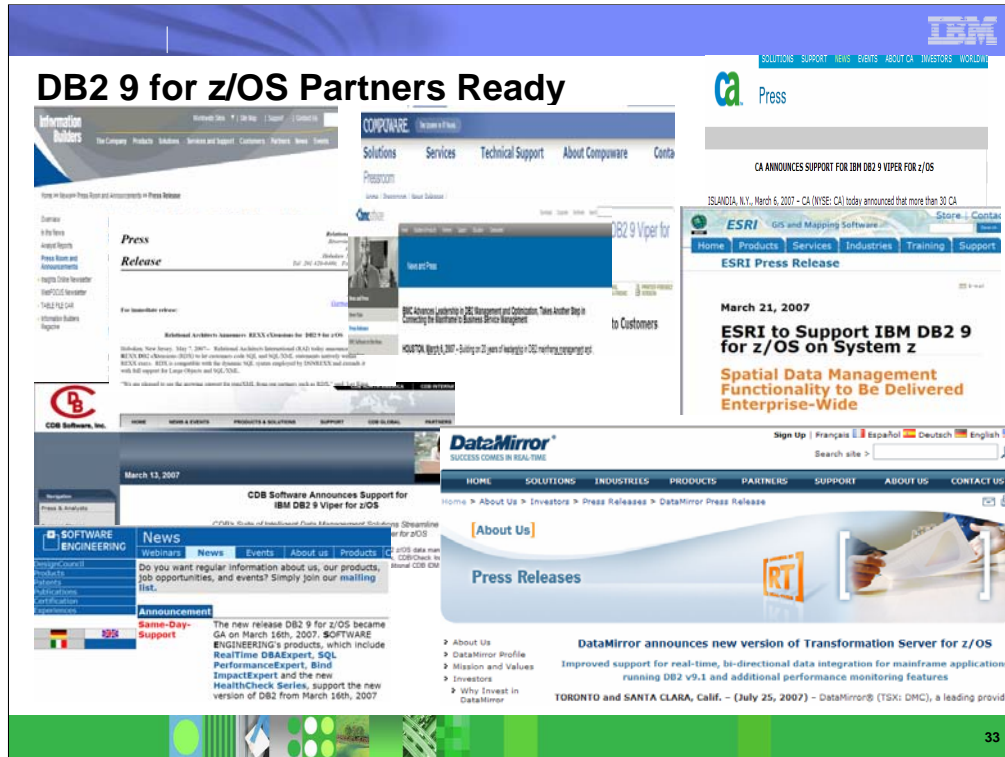
- Here are just a few of the DB2 partners that have announced that they are ready to run with DB2 9 for z/OS. These are images of the web pages from IBI, BMC, CA, ESRI, Compuware, CDB, Software Engineering, SoftBase and DataMirror. Talk to your vendors about DB2 9.

Why Migrate to DB2 9 for z/OS?

- Business needs
  - Reduce CPU time
  - Improve business agility
  - Service Oriented Architecture
- Application developers need
  - Powerful new SQL enhancements
  - Portability with SQL and data definition compatibility
  - PureXML for a powerful SQL and XML interface to XML data

- Database Administrators need
  - Improve availability and performance
  - More flexible security and easier regulatory compliance
  - Better web application & data warehouse function and performance
  - LOB function, performance, usability

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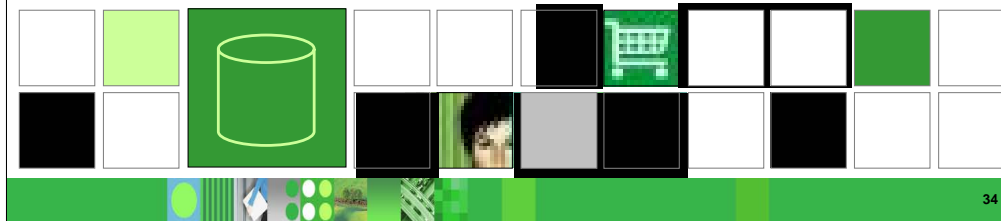
- DB2 9 has a lot for everyone. Here are just a few of the highlights.
- The business needs include CPU cycle reductions that deliver in most utilities, improved query optimization, improved business agility via faster implementation cycles, and new pureXML™ that builds a strong foundation for SOA and XML initiatives. Kevin Campbell, an Application Architect at Univar USA said it better than I can, "This is not a bolt-on or band-aid approach, DB2 9 for z/OS is XML without compromise."
- Database Administrators (DBAs) need improved database availability and performance including LOBs, reorganization, backup and recovery, and partitioning enhancements. DBAs also get more flexible trusted network context and role-based security to help with regulatory compliance. A wide range of enhancements improve ERP application and data warehouse functionality and performance. Large object (LOB) function is added with file reference variables and REORG, while performance is improved.
- Application developers are most excited by PureXML, which adds a powerful SQL and XML interface to access XML data stored in a native format. Application developers need powerful new SQL enhancements including MERGE and TRUNCATE statements, INTERSECT and EXCEPT set operations, and spatial support for geographical data. Text handling is improved with the XML changes, many new built-in functions, and an upcoming text server. Improved SQL and data definition compatibility with other DB2 platforms makes porting much easier.

Possible late V9 additions after GA

- XML extensions XMLTABLE and XMLCAST
- Provide a text index server
  - Text search CHAR, VARCHAR, CLOB & XML columns
  - Efficient communication interaction with DB2 for z/OS
  - Text indexes kept in DB2 tables for backup & recovery
- Client for application development and administration

DB2 / DB2 / Parallel Sysplex / DB2 / DB2 / TCP/IP / Text Server / Text Server

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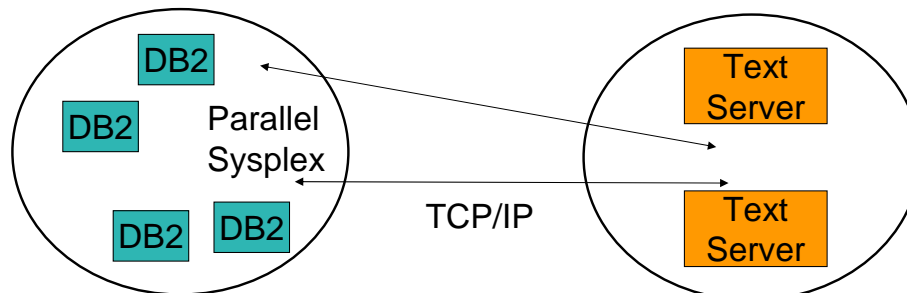
- As with V8, we expect have very few enhancements after general availability, working diligently to avoid changes that might affect existing customers. If we are confident that these items can deliver without impacting customers, these might be possible.

- Some improvements with new functions for XML, an XMLTABLE and XMLCAST are likely to come after general availability.

- A specialized text search engine on a separate server is expected to come in V9, but will deliver after general availability. While the server is separate, the text indexes are saved into DB2 tables to provide improved backup and recovery and consistency with DB2 data.

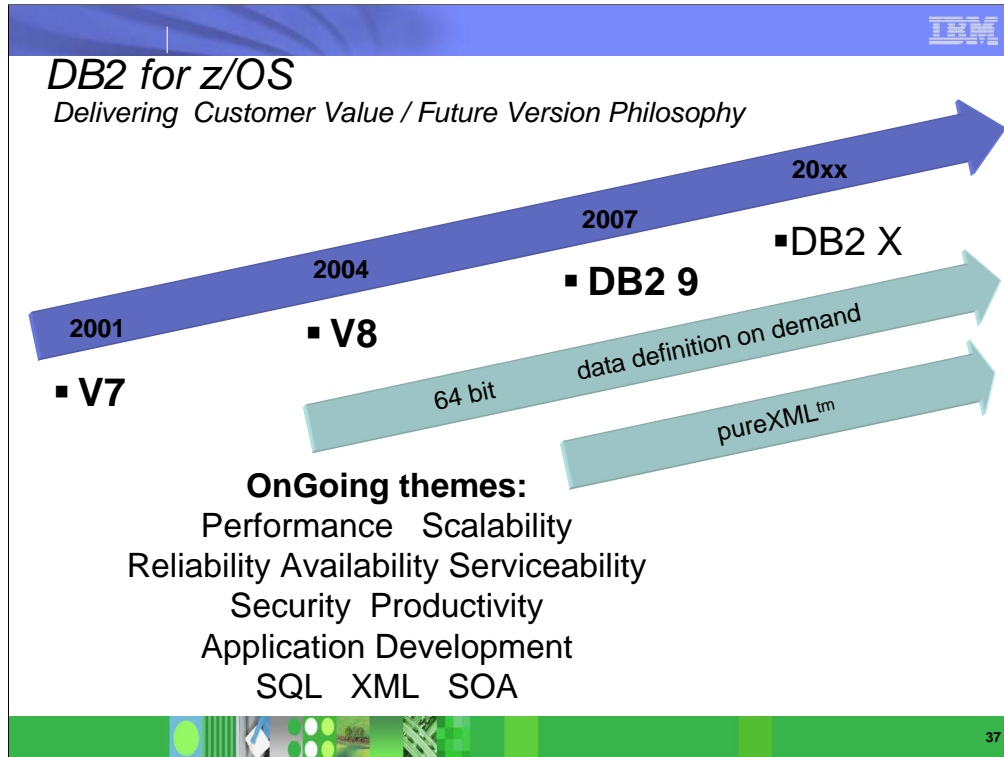- The common work for application development and administration is shown next.

Application Development & Administration Client

- API support
  - Java programming JLinQ
  - Open Source (PHP, Python, Ruby, etc.)
  - .NET, EGL, and other technologies
- SOA / Web Services / Web Access
  - Data Server Web Services
- AD tooling
  - .NET, DWB, RAD
- Administration tooling
  - Rational Data Architect (RDA)
  - IBM Data Servers Administration Console

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▪This slide shows the scope and mission for IBM's Common Application Development and Administration organization. A wide range of administration and application development function delivers for IBM relational database: Informix Dynamic Server, DB2 for Linux, UNIX and Windows, DB2 Connect and DB2 for z/OS. The new IBM Data Servers organization is changing the face of IBM relational database as it provides the client for Informix and DB2 for Linux, UNIX, Windows, i5/OS and z/OS.

▪The new IBM Data Servers offering consolidates database administration and application development (APIs, developer tools) across IBM's relational databases. You will see names of some components changing to ones which include IBM Data Server, for instance IBM Data Server Administration Console and IBM Data Server Developer Workbench. Other Data Server deliveries include the Client, Runtime Client, and Drivers for ODBC, CLI, .NET, JDBC, SQLJ, Ruby, PHP, Perl, and Python. Application Development APIs strategy includes new support for PHP and Ruby on Rails, dramatic improvements in Java with JLinQ and keeping Microsoft support very current. The next generation of SOA web services comes from Data Server.

▪Recent improvements in application development tooling for both DB2 and Rational make the application life cycle more productive with better quality. The new Web-based administration console project provides a much improved, more productive way to administer IBM relational databases.

DB2 for z/OS
Delivering Customer Value / Future Version Philosophy

20xx

2007
▪DB2 X

2004
▪ **DB2 9**

2001
▪ **V8**

▪ **V7**

64 bit   data definition on demand

pureXML^tm

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

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▪DB2 for z/OS V7 became generally available (GA) March 2001, and V8 delivered three years later. DB2 9 became generally available in March 2007, three more years. We expect the next version will be 2.5 to 3 years from V9 GA to DB2 10 or DB2 X or whatever the name becomes.

▪The themes for future versions will continue to focus on core platform strengths of performance, scalability, reliability, stability, availability, resilience, and security. PureXML and Schema evolution or data definition on demand will be ongoing for a long time. In contrast, most of the 64 bit evolution should be completed in DB2 X.

▪The key interfaces for customers and vendors expand for both XML and for SQL. Information is a key leg of the SOA platform, and DB2 for z/OS provides many advantages for data management in SOA.

▪Standards, interoperability, portability and security along with secure access using the latest technologies are key touch points. Productivity improvements for application developers and for database administrators are very important as data grows in scale and complexity.

Beyond DB2 9 Improvement Focus Areas

- **Performance: OLTP, Query, Index & LOBs**
- **Scalability & 64 Bit Memory**
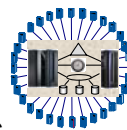- **SQL & SQL Procedures**
- **XML**
- **SOA**
- **Security**
- **Availability**
- **Autonomics**
  Administration
  Security

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▪Beyond DB2 9, many of the focus areas are ones we have seen in the past. We need to have substantial improvements in performance, so that transactions and queries can improve, as well as improvements in LOBs and XML.

▪More work is needed in scalability, so that more threads can be run, with less work to manage and tune virtual storage.

▪SQL and SQL procedure language continue to need enhancements to improve programmer productivity and make porting from other DBMS much faster and easier.

▪XML made a huge stride in DB2 9, and customer usage will show many improvements needed.

▪Service Oriented Architecture requires many other changes to complement the SQL and XML changes.

▪Availability improvements continue, reducing planned outages with more changes that do not need an outage.

▪Autonomics help with productivity, even as they improve performance and availability by reducing or eliminating tasks in administration and security.

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