DB2 UDB for OS/390 and z/OS News, Version 7 and Beyond

March 2, 2001

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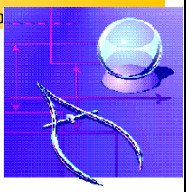

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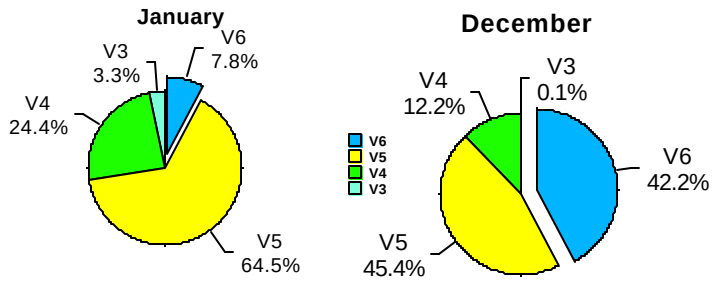
- This is the March 2001 update for the Gold Group, just as we are ready for V7 to become generally available. These foils are primarily a delta from what we talked about in August 2000.

- Some parts of this presentation are more like looking into a crystal ball than at measurements. This crystal ball is cloudy, and gets fuzzier the farther we look into the future. Our plans include much more change and much more risk than ever before.
- The only near certainty is that there will be changes. My best guess is that fewer than 10% of the items will change their delivery time. I would expect some new items to come in, some to come early, and others to deliver in stages. More will have major changes in their design.

News

Version 6 up 316% in license count
DB2 for OS/390 WW Revenue in 2000



- Growing:
- Version 4 is declining fast
  - Version 4 end of marketing was 1 December 2000
    - V3 customers need to move now, start migrating ASAP, then keep migrating ...
  - V4 end of service 31 December 2001
    - V4 customers need to start migrating (less than a year to get it done).
- Version 6 is increasing fast: showing January & December 2000 percentages of the world wide revenue. In January, V6 was only 7.8%, but the percentage is more than five times larger in December. The US numbers for V6 were 14.7% and 58%,

IBM @server zSeries

What's improved for DB2 Customers?

- ✓64 bit real memory
  - ✓V6 data spaces now
- ✓Performance: scalability, parallel, compression, connectivity
- ✓Application flexibility
- ✓Availability & automation

- The most important change for DB2 customers is the increased memory in a single image. One LPAR or z/OS image can have more than 2GB of central memory. More memory can help every large DB2 customer. DB2 V6 is 64 bit real enabled today. DB2 V6 data spaces were designed for the zSeries and z/OS memory or z/Architecture. You can have larger buffer pools and more space for dynamic statement cache, with much more room in the address space. See the 64 bit evolution foil later.
- The new zSeries processors have more powerful processors and more processors. The increased power will translate directly into faster processor and more capacity. When this power is used for parallel processing, the elapsed times will be reduced. The compression on this machine is about 2x faster than the prior generation, so customers will be able to use compression more. The OSA Express connections have much higher performance.
- There are many new options for applications and interfaces in z/OS and Linux on this machine. Unicode is included in the z/Architecture.
- The substantial improvements in continuous availability and in automation help with productivity for managing the complex. For example, there are some recent GDPS changes which provide better availability.

IBM COBOL for OS/390 V2R2

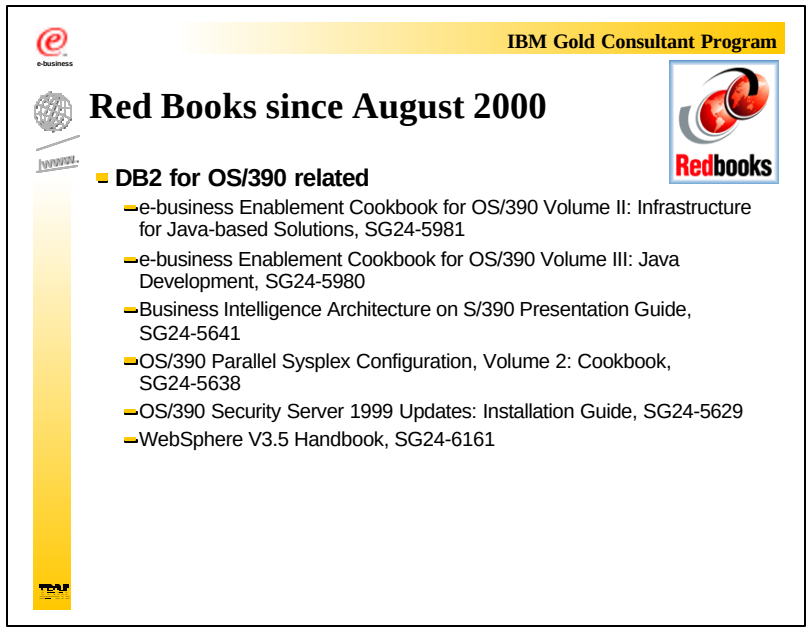
- **New 31-Digit Decimal Data Support**
  - Supported by DB2 V5 with PTF
- **New COMP-5 Data Type**
  - Also in same DB2 V5 PTF
- **DB2 Coprocessor Integration**
  - Precompiler services DB2 V7

- COBOL is still the primary language for many of our customers. A new release of IBM COBOL was announced and delivered in September 2000.
- See APAR PQ35280 for changes to reflect the new COBOL support for 31-digit decimal data and COMP-5 or COMPUTATIONAL-5 data.
- The changes to use DB2 V7 precompiler services are part of this new IBM COBOL V2R2.

Red Books since August 2000

- **DB2 for OS/390 related**
  - New Tools for DB2 for OS/390 and z/OS Presentation Guide, SG24-6139
  - Siebel 2000 Database Implementation on OS/390 Using NT Siebel Servers, SG24-5953
  - DB2 Java Stored Procedures Learning by Example , SG24-5945
  - Integrating XML with DB2 XML Extender and DB2 Text Extender, SG24-6130
  - SAP R/3 on DB2 for OS/390: Database Availability Considerations, SG24-5690
  - Migrating to the IBM Replication Solution, SG24-6140
  - SAP Business Information Warehouse on OS/390, SG24-5681
  - Prepare OS/390 for WebSphere Enterprise Edition, SG24-5685
  - Capacity Planning for Business Intelligence Applications: Approaches and Methodologies, SG24-5689

- You can check for all of these on the web:
  - www.ibm.com/redbooks
  - Put DB2 in the Search and click Go.
  - The books come up with the latest first in each category.
- Residencies are the invitations for new books.
- The red pieces are the newest red books, drafts that are being reviewed. They will be red books when finished.
- Red papers will not become red books.
- Red books are the completed books.



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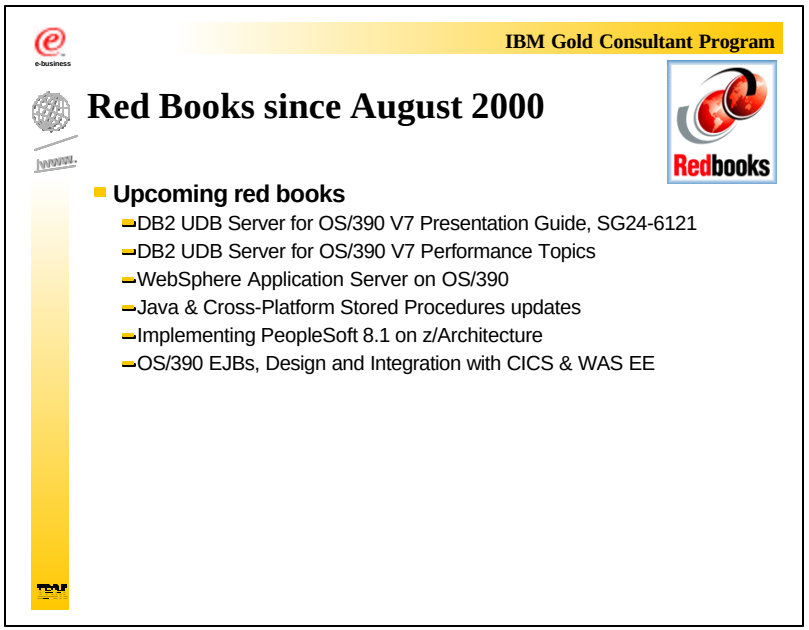

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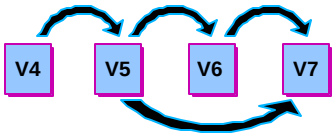
Migration Paths



Most customers expected to go to V6

Migration direct from V5 to V7 possible

- Primarily for later migrations (e.g. 2002)
- Includes fallback & Data Sharing Coexistence
  - Maximum of two releases
- V7 SPE PQ34467 required for fallback, data sharing, and strongly recommended for all

What functions do you need? When?

IDUG Solutions Journal www.idug.org

- Migration, fallback and coexistence with the ability to skip a release allows many possibilities.
- Some customers need the capabilities of Version 6 as soon as possible. They will want to go to Version 6.
- Other customers may be running on Version 3 or 4 now. They can plan their Version 5 migration in 2001, then skip over Version 6 to Version 7 in 2002 or 2003.
- For many customers, the decision is in the details and the timing. If your objective is to save time, then be sure to factor in the items that are harder for skipping releases, the items that are the same, and increased migration work if you migrate earlier than your usual timing.
- Customers often need some specific functions. The timing of the need and the timing when a customer considers migration to a new release will often determine the choice. If you have unique use or migrate to a new version soon after release, you will have more work to do. See the IDUG Solutions Journal article for more: www.idug.org, then click Solutions Journal, Summer 2000, then Developer's Corner.

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DB2 UDB for OS/390 Version 7 Highlights

- **Application: Scrollable cursors, Union everywhere, Row Expressions, Limited Fetch, Unicode, XML**
- **Scalability: Unload utility, Improved optimization & parallelism**
- **Availability: Online utility improvements, Online parameters, more consistent restart, data sharing enhancements, Copy to Copy**
- **Management: Utility lists, patterns & dynamic allocation, Skip release migration**
- **Access: Improved DB2 Connect, JDBC & ODBC, stored procedure COMMIT & ROLLBACK**

Are you ready for e-business?

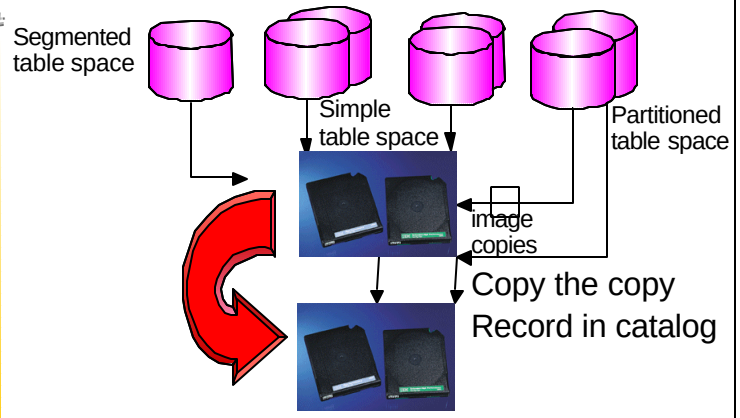
- DB2 UDB for OS/390 Version 7
- Here are the new V7 enhancements shown in the context of the DB2 Universals that are the themes from prior DB2 for OS/390 versions as well as the entire DB2 family. These themes are:
  - Improving the power of SQL, DB2 family compatibility and standards
  - More performance and parallel processing for SQL and DB2 utilities
  - Continuous availability, ease of use and enhanced data access
- The biggest business drivers for our work continue to be e-business, enterprise applications with our partners like SAP, PeopleSoft and Siebel, Business Intelligence and Content Management. This new version will allow you to migrate to it from either V5 or V6 and this ability to skip a version may help your work load.

V7 Performance Highlights

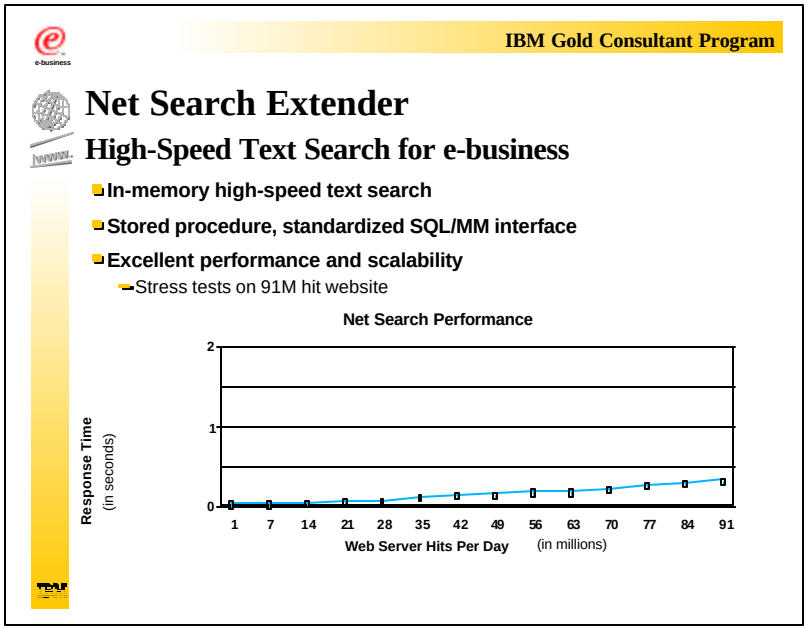
UNLOAD utility compared to REORG UNLOAD EXTERNAL	15% to 18% CPU time reduction
Parallel Partition LOAD compared to loading whole table	30% elapsed time reduction
Online REORG with and without FASTSWITCH option	12 times reduction on switch phase
UPDATE, DELETE & SELECT with IN, =ANY, or EXISTS correlated predicate compared to V6	Up to 90 times reduction in elapsed and CPU time
IN list index access for single table	3 times elapsed time improvement
IN list index access for outer table of join	9 times elapsed time improvement

- Here are some initial highlight performance points. The UNLOAD utility improved 15% to 18% CPU time reduction when compared to REORG UNLOAD EXTERNAL. A Parallel Partition LOAD provided a 30% elapsed time reduction when compared to loading the whole table. Online REORG with the FASTSWITCH option was reduced 12 times on the SWITCH phase when compared to not using the FASTSWITCH. UPDATE, DELETE and SELECT with IN, =ANY, or EXISTS correlated predicate was reduced up to 90 times in elapsed and CPU time when compared to Version 6. Parallelism for an IN list index access for single table provided a 3 times elapsed time improvement. Parallelism for an IN list index access for outer table of join resulted in a 9 times improvement in elapsed time. Specifics and details of the tests will be provided later. (in the red book, presentations, ...)

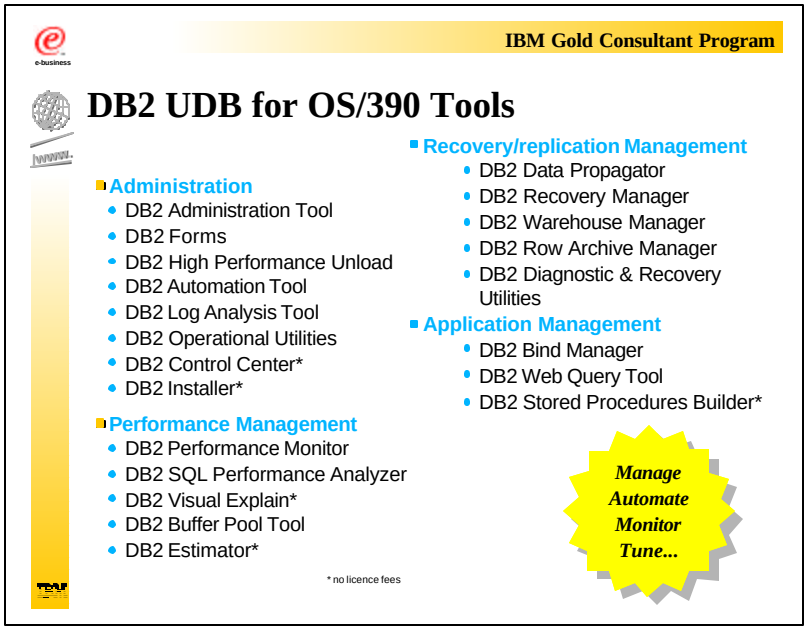
Copy To Copy



- While the COPY, LOAD, and REORG utilities can make two local and two remote site backup copies of data, you might want to make a single copy and then clone that copy at a more convenient time. The COPYTOCOPY utility makes up to three additional backup copies asynchronously from an existing copy and registers the copies in the DB2 catalog for recovery purposes. You can use object wildcarding and dynamic allocation capabilities with the COPYTOCOPY utility.



- Net Search Extender provides an In-memory high-speed search (With word or phrase, fuzzy & wildcard search). It works seamlessly with text data contained in DB2. It is able to handle heavy text search demands of larger websites and was designed to rapidly search and index data without locking database tables.
- It is implemented as a stored procedure which uses the standardized SQL/MM search interface. We have seen excellent performance and scalability (Stress tests on 91M hit website).



- There are many changes in the area of tools for DB2.

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Any Questions?

- This page took half an hour last time, so it's farther back.

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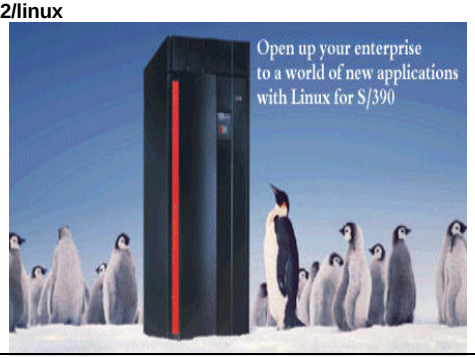
DB2 UDB for Linux & DB2 Connect on System/390

- **DB2 Connect on Linux: Connect to DB2 family**
- **DB2 UDB on Linux for S/390**
  - SQL consistent with UNIX, Windows, OS/2
- **ibm.com/software/db2/linux**
- **ibm.com/s390/linux**
- **ibm.com/linux**



- Linux for S/390 - It's Cool! The strengths of S/390 are well known. Rock solid reliability, the ability to run multiple diverse workloads and highly scaleable technology make S/390 an ideal choice for hosting key e-business applications. Now Linux has joined the S/390 family of operating systems bringing a wealth of open source applications, middleware and trained talented developers to help you respond to your business challenges quicker than ever before.
- More details are on
  - www.s390.ibm.com/linux/linuxfaq.html

Projected JDBC and SQLJ Deliverables in DB2 for OS/390 and z/OS

JDBC 1.2 support for JDK 1.3	Sept 2000 (DB2 V5, V6)
JDBC and SQLJ performance improvements	1H2001 (DB2 V7)
initial JDBC 2.0 support (DataSource, JTA, connection pooling)	1H2001 (DB2 V7)
core JDBC 2.0 plus optional package	2H2001 (DB2 V7)
type 4 JDBC driver	2H2001 (DB2 V7)

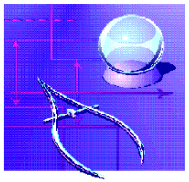
Subject to change.

- While we are working very hard to avoid changes to V7 that will pose problems, we think that we can make some changes outside of the engine.

DB2 Future

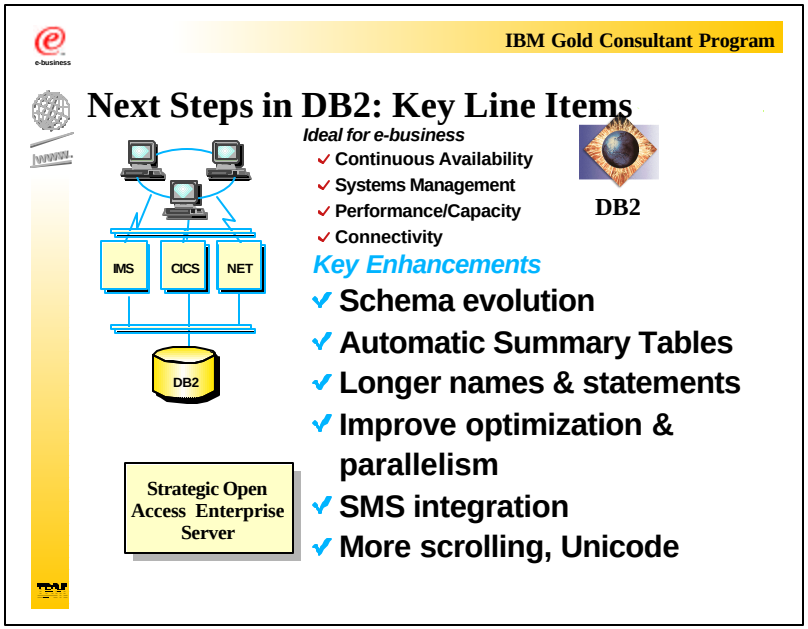
Transactions, ERP, e-business

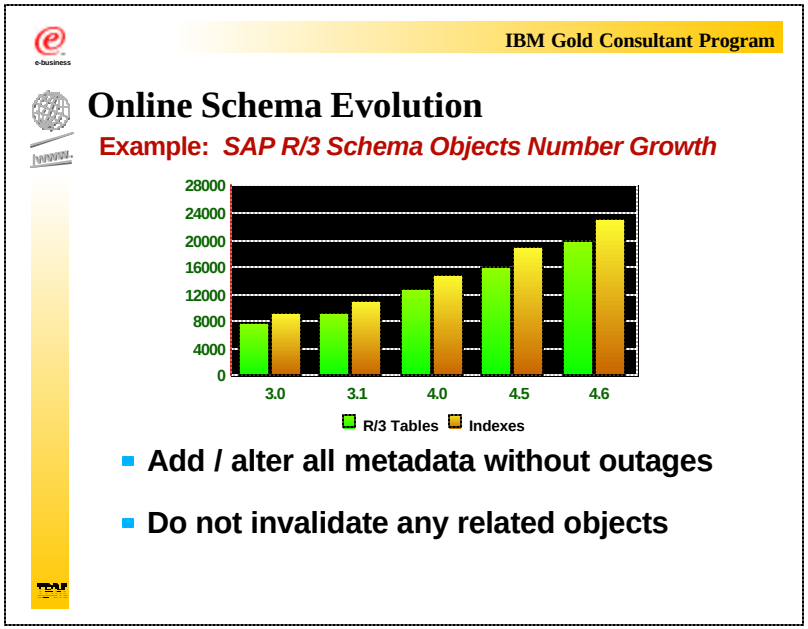
Warehouse, Business Intelligence



The crystal ball gets cloudier as we proceed into the future.

- This is the future beyond the year 2000 and beyond Version 7. Some of the work is useful in more than one category.
- Once again, we will show the driving areas. Transactions have evolved to support much more of the major ERP vendor applications and the shift to e-business.
- Our work on queries and decision support from the early DB2 years has moved into building the large warehouses and into more and more intelligence in the engine and surrounding products.
- Note that we are moving farther into the future, so the picture is a little cloudier. There will probably be more differences in timing and deliveries.



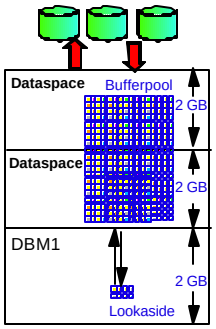


- The most important change for many customers is the ability to use ALTER in many places instead of needing to drop and redefine. We call this schema evolution.
- Summary tables are crucial to business intelligence performance and provide consistency across the DB2 family. Standards and DB2 family consistency drive the application items. As in other DB2 family members, longer names for tables, columns and longer SQL statements will help application portability. We will continue with more work on cursor scrolling and Unicode.
- Multi-row fetch & insert reduce cpu time, especially when there are many rows & columns. We will improve optimization and parallel processing in every release.
- We will continue to enhance online reorganization. We will be helping with the process for disaster recovery. Allowing more partitions is important for customers who need to have a partition for each day and keep the data for years.
- Storage Area Network (SAN) and System Managed Storage (SMS) integration will be improved by allowing definition of the data class, management class and storage class in DDL.

- Online schema evolution is the attempt to eliminate the downtime from application changes. Today, many changes require stopping the application, dropping and redefining the table space and table, then copying the data back. Many of the short cuts make the process more error-prone.
- We want to alter almost anything without incurring an outage or invalidating the plans, packages, views, ...
- This is a big job, so you can expect the improvements to be staged in. Some that we think are very important include the ability to add partitions at the end, to rotate the partitions, and to extend character and numeric data types.

64 bit evolution

- **zSeries, Z/OS & large real storage**
- **Real storage for performance**
  - Improve all versions
  - V6 data space advantages
- **64 bit virtual**
- **...**



- The biggest impact of the zSeries architecture on DB2 is the ability to have large real memory support up to 64 GB. Prior to the zSeries, customers were limited to only 2 GB for real storage due to the 31-bit addressing limitations of the ESA/390 architecture. This real storage limitation of 2 GB is a leading performance inhibitor for many high end customers. Another leading performance inhibitor is the 2 GB virtual storage limit for the main DB2 (DBM1) address space. Moving virtual pool buffers to hiperpools offers some relief, but many customers still need substantial virtual pool size.
- DB2 Version 6 provided support for 64 bit real with buffer pools in data spaces. Customers who do not have a zSeries with OS/390 V2R10 or z/OS are recommended NOT to use buffer pools in data spaces.
- There will be many more steps as real and virtual memory sizes increase.

UNICODE evolution

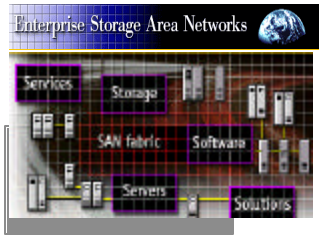
- **UNICODE encoding scheme that can represent the codepoints of characters of many different geographies and languages**
  - more than one byte to represent many characters
  - different languages in the same table
  - CCSID UNICODE
- **V5 ASCII data**
- **V7 UNICODE data storage and manipulation**
- **OS/390, z/OS, z/Architecture and zSeries**
- **UNICODE for SQL, enhanced performance, extended function, ...**

- Multinational companies that engage in international trade often store data from more than one country. Some countries use different coded character set identifiers.
- Previous releases of DB2 have offered support for numerous code sets of data in either ASCII or EBCDIC format. However, there was a limitation of one code set per system.
- Version 7 of DB2 for OS/390 and z/OS delivers support for Unicode encoded data. The encoding scheme can represent the code points of many different geographies and languages. You can easily store multilingual data within the same table or on the same DB2 subsystem.
- These changes are supported by new function in OS/390, z/OS, the z/Architecture and the zSeries machines.

Self-Tuning & Maintaining Databases

Optimization / system handles 90% of database tuning. It takes experts to handle the remaining 10% ... too hard!

- **Combine data & database administration**
  - **backup, recovery, reorganization, space management, quality of service, ...**
  - **Automate in SAN / NAS**



- Today's answer for administration is to make some of the processes easier, using graphic interfaces.
- The longer term answer is to tell the DBMS, "Heal thyself. Tune yourself."
- Many of the task require coordination and often need to be done once for data administration and again for database administration. Moving to storage area networks promises much more integration and automation.
- This work is being done across the DB2 family.

Get the Latest DB2 Information on the Web

IBM Data Management: White Papers, Product Information
ibm.com/software/data
DB2 Family **ibm.com/software/db2**
DB2 for OS/390 **ibm.com/software/db2os390**
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DB2 for AS/400 **ibm.com/as400/db2**
DB2 Family Performance
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