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C13

IDUG® 2006

The Perfect Combination: System z, z/OS, and DB2

North America

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IBM Sales and Distribution

West Region, Americas

Thursday, May 11, 2006 • 10:00 a.m. – 11:10 a.m.

GoFurther



IDUG® 2006 - North America

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The materials in this presentation are also subject to

- enhancements at some future date,
- a new release of DB2, or
- a Programming Temporary Fix (PTF)

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A Quick Overview

- ✓ **Why should you care?**
- ✓ **The Hardware**
- ✓ **The Operating System**
- ✓ **The Database**
- ✓ **The Applications**
- ✓ **The Conclusion**

The Perfect Combination



It's not just a database....



DB2 for z/OS

Floating out there alone!

It takes a lot to keep it going...

DB2 for z/OS

zSeries Processor

Storage

Tools

z/OS

Supporting Software
CICS, IMS,
Compilers,
Etc...

The Perfect Combination: System z, z/OS, and DB2

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First there is System z

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The Perfect Combination: System z, z/OS, and DB2

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So, what exactly is a “Mainframe”?

main-frame (mān'frām)¹ A large powerful computer, often serving many connected terminals and usually used by large complex organizations.

Mainframe² A state-of-the-art computer for mission critical tasks. In the "ancient" mid-1960s, all computers were mainframes, since the term referred to the main CPU cabinet. Today, it refers to a class of ultra-reliable medium and large-scale servers designed for enterprise-class and carrier-class operations.

The first mainframe vendors were Burroughs, Control Data, GE, Honeywell, IBM, NCR, RCA and Univac, otherwise known as "IBM and the Seven Dwarfs." After GE and RCA's computer divisions were absorbed by Honeywell and Univac respectively, the mainframers were known as "IBM and the BUNCH."

¹ "mainframe." The American Heritage® Dictionary of the English Language, Fourth Edition. Houghton Mifflin Company, 2004.
Answers.com 03 Mar. 2006.
<http://www.answers.com/topic/mainframe>

² "mainframe." Computer Desktop Encyclopedia. Computer Language Company Inc., 2005.
Answers.com 03 Mar. 2006.
<http://www.answers.com/topic/mainframe>

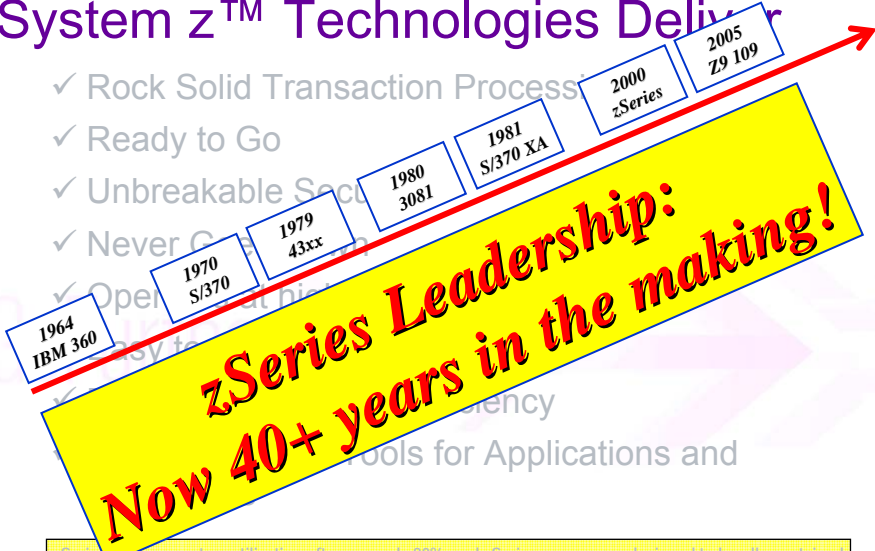
System z™ Technologies Deliver

- ✓ Rock Solid Transaction Processing
- ✓ Ready to Go
- ✓ Unbreakable Security
- ✓ Never Goes Down
- ✓ Operates at high levels of utilization
- ✓ Easy to Scale Up
- ✓ Extreme Processing Efficiency
- ✓ Comprehensive Tools for Applications and Operations

zSeries average system utilization often exceeds 80%, and zSeries servers are designed to handle sustained peak workload utilization of 100% without service level degradation to high priority workloads.

System z™ Technologies Deliver

- ✓ Rock Solid Transaction Processing
- ✓ Ready to Go
- ✓ Unbreakable Security
- ✓ Never Goes Down



**zSeries Leadership:
Now 40+ years in the making!**

zSeries average system utilization often exceeds 80%, and zSeries servers are designed to handle sustained peak workload utilization of 100% without service level degradation to high priority workloads.

Never Goes Down

- Component Reliability
 - Use only the best components
 - Higher test and burn-in standards
- Built-in redundancy and sparing
- Hot pluggable replacement parts
- Remote Repair / Phone Home
- Failure Prediction – beyond reaction
- 99.999 Requires Redundancy AND Inherent Reliability
- Higher Reliability means Lower Cost and Lower Risk
- 99.999 Reliability means <5 minutes per year

Then you mix in some DB2 for z/OS

GoFurther



However, before going any farther...

GoFurther



Web references

- zSeries web starting point
 - <http://www.ibm.com/servers/eserver/zseries/>
- DB2 for z/OS starting point
 - <http://www.ibm.com/software/data/db2/zos>

Getting the Latest Information

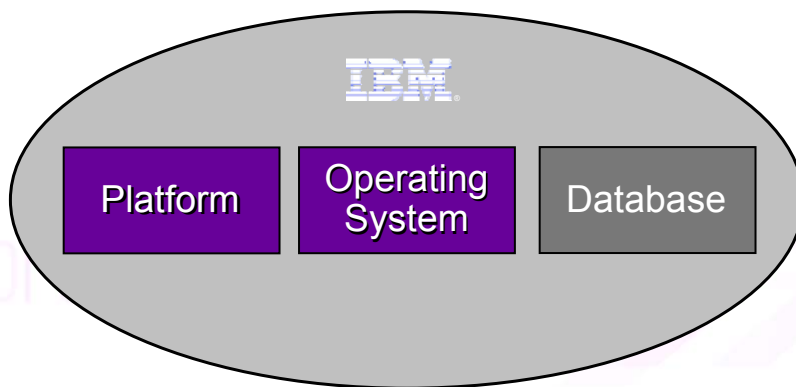
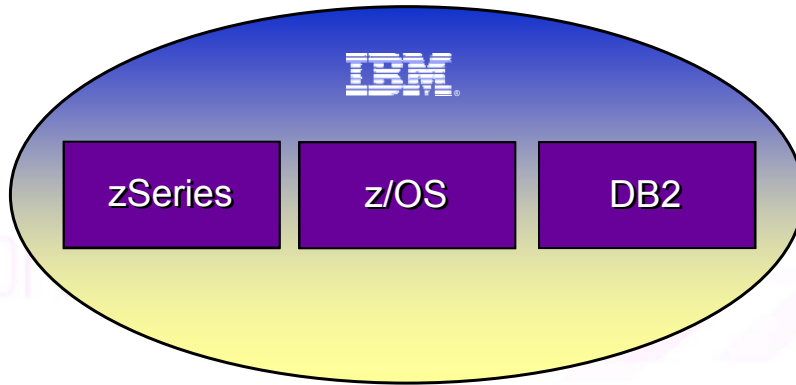
- SG24-6079 - DB2 UDB for z/OS Version 8: Everything You Ever Wanted to Know, ... and More
 - <http://publib-b.boulder.ibm.com/abstracts/sg246079.html?Open>
- SG24-6465 - DB2 UDB for z/OS Version 8 Performance Topics
 - <http://publib-b.boulder.ibm.com/abstracts/sg246465.html?Open>
- SG24-6763 - The Business Value of DB2 UDB for z/OS
 - <http://publib-b.boulder.ibm.com/abstracts/sg246763.html?Open>
- SG24-6480 - Multilevel Security and DB2 Row-Level Security Revealed
 - <http://publib-b.boulder.ibm.com/abstracts/sg246480.html?Open>

Getting the Latest Information

- SG24-6489 - Best Practices for SAP Business Information Warehouse on DB2 for z/OS V8
 - <http://publib-b.boulder.ibm.com/abstracts/sg246489.html?Open>
- SG24-6319 - DB2 for z/OS and WebSphere: The Perfect Couple
 - <http://www.redbooks.ibm.com/abstracts/sg246319.html?Open>
- SG24-6370 - Disaster Recovery with DB2 UDB for z/OS
 - <http://publib-b.boulder.ibm.com/abstracts/sg246370.html?Open>
- SG24-7088 - DB2 UDB for z/OS V8: Through the Looking Glass and What SAP Found There
 - <http://publib-b.boulder.ibm.com/abstracts/sg247088.html?Open>

Shameless Self-promotion

- My DB2 for z/OS external blog
blogs.ittoolbox.com/database/db2zos



IBM System z

<p>IBM eServer zSeries 900 z900 (2064)</p>  <ul style="list-style-type: none"> Announced 10/00 - first 64-bit zSeries 42 models – Up to 16-way Specialty Engines <ul style="list-style-type: none"> CP, IFL, ICF On Demand Capabilities <ul style="list-style-type: none"> CUoD, CIU, CBU Memory – up to 64 GB Channels <ul style="list-style-type: none"> Up to 256 ESCON® channels FICON® Express, Parallel Token-Ring, FDDI, Ethernet, ATM Coupling Links Crypto coprocessors, accelerators Parallel Sysplex clustering HiperSockets™ – up to 4 Up to 15 logical partitions Operating Systems <ul style="list-style-type: none"> OS/390®, z/OS®, VM/ESA®, z/VM®, VSE/ESA®, z/VSE™, TPF/ESA, z/TPF, Linux® on zSeries 	<p>IBM eServer zSeries 800 z800 (2066)</p>  <ul style="list-style-type: none"> Announced 2/02 - first 64-bit zSeries for mid market 10 models – Up to 4-way Specialty Engines <ul style="list-style-type: none"> CP, IFL, ICF On Demand Capabilities <ul style="list-style-type: none"> CUoD, CIU, CBU Memory – up to 32 GB Channel <ul style="list-style-type: none"> Up to 240 ESCON Channels FICON Express Networking Adapters (OSA) Coupling Links Cryptographic Coprocessors Parallel Sysplex clustering HiperSockets – up to 4 Up to 15 partitions Operating Systems <ul style="list-style-type: none"> OS/390, z/OS, VM/ESA, z/VM, VSE/ESA, z/VSE, TPF/ESA, z/TPF, Linux on zSeries 	<p>IBM eServer zSeries 990 z990 (2084)</p>  <ul style="list-style-type: none"> Announced 5/03 – First zSeries Superscalar Server 4 models – Up to 32-way Specialty Engines <ul style="list-style-type: none"> CP, IFL, ICF, zAAP On Demand Capabilities <ul style="list-style-type: none"> CUoD, CIU, CBU, On/Off CoD Memory – up to 256 GB Channels <ul style="list-style-type: none"> Four LCSSs Up to 1024 ESCON channels Up to 240 FICON Express2 channels Token-Ring, GbE, 1000BASE-T Ethernet Coupling Links Crypto Express2 Parallel Sysplex clustering HiperSockets - up to 16 Up to 30 logical partitions Operating Systems <ul style="list-style-type: none"> OS/390, z/OS, z/VM, VSE/ESA, z/VSE, TPF/ESA, z/TPF, Linux on zSeries 	<p>IBM eServer zSeries 890 z890 (2086)</p>  <ul style="list-style-type: none"> Announced 4/04 – zSeries Superscalar Server for mid market 1 model – Up to 4-way 28 capacity settings Specialty Engines <ul style="list-style-type: none"> CP, IFL, ICF, zAAP On Demand Capabilities <ul style="list-style-type: none"> CUoD, CIU, CBU, On/Off CoD Memory – up to 32 GB Channel <ul style="list-style-type: none"> Two LCSSs Up to 420 ESCON channels Up to 80 FICON Express2 channels Networking Adapters (OSA) Coupling Links Cryptographic Coprocessors Parallel Sysplex clustering HiperSockets - up to 16 Up to 30 partitions Operating Systems <ul style="list-style-type: none"> z/OS, z/VM, VSE/ESA, z/VSE, TPF/ESA, z/TPF, Linux on zSeries 	<p>IBM System z9 109 z9-EC (2094)</p>  <ul style="list-style-type: none"> Announced 7/05 Superscalar Server 5 models – Up to 54-way Specialty Engines <ul style="list-style-type: none"> CP, IFL, ICF, zAAP On Demand Capabilities <ul style="list-style-type: none"> CUoD, CIU, CBU, On/Off CoD Memory – up to 512 GB Channels <ul style="list-style-type: none"> Four LCSSs Multiple Subchannel Sets MIDAW facility 63.75 subchannels Up to 1024 ESCON Express2 channels Up to 336 FICON Express2 channels 10 GbE, GbE, 1000BASE-T Coupling Links Configurable Crypto Express2 Parallel Sysplex clustering HiperSockets - up to 16 Up to 60 partitions Enhanced Availability Operating Systems <ul style="list-style-type: none"> z/OS, z/VM, VSE/ESA, z/VSE, TPF/ESA, z/TPF, Linux on System z9
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The Perfect Combination: System z, z/OS, and DB2

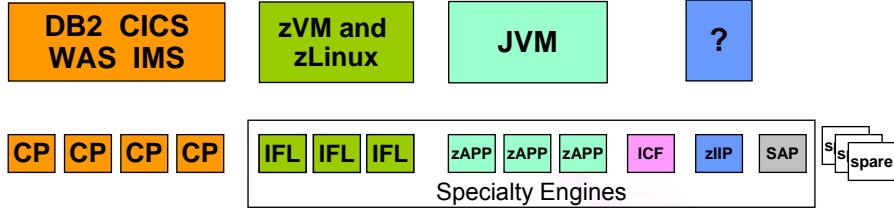
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Specialty Engines

- Internal Coupling Facility (ICF) - 1997**
 - Provides additional processing capacity used for coupling to other processors **IBM**
- Integrated Facility for Linux (IFL) - 2001**
 - Provides additional processing capacity exclusively for Linux workloads
 - Runs Linux native or as a guest of z/VM® V4 and V5
- System z9 Application Assist Processor (zAAP) - 2004**
 - zAAPs support Java code execution
 - z/OS Java Virtual Machines (JVMs) assist with the execution of code from standard processors to zAAPs
 - JVM executes the Java code on the zAAP
 - Designed to provide a Single Tier integrated application and database serving environment
 - Requires z/OS 1.6
- System z9 Integrated Information Processor (IBM zIIP) – 2006???**
 - Designed to improve resource optimization
 - Can help lower cost of computing for eligible workloads
 - Requires z/OS 1.6
 - DB2 for z/OS V8 will be first form IBM to exploit

System z



System z

ICF	Integrated Coupling Facility	1997		
IFL	Integrated Facility for Linux	2001		
zAAP	zSeries Application assist Processor	2004	z/OS 1.6	z990, z890, z9-109
zIIP	z9 Integrated Information Processor	2006	z/OS 1.6	z9-109
SAP	System Assist Processor			
CP	Central Processor			
spares				

Possible zIIP workloads

1. ERP or CRM application serving*

- For applications, running on z/OS, UNIX®, Linux, Intel®, or Linux on System z that access DB2 for z/OS V8 on a System z9 109, via DRDA over a TCP/IP connection. DB2 gives z/OS the necessary information to have portions of these SQL requests directed to the zIIP

2. Data warehousing applications*

- Requests that utilize DB2 for z/OS V8 complex star schema parallel queries may have portions of these SQL requests directed to the zIIP when DB2 gives z/OS the necessary information

3. Some DB2 for z/OS V8 utilities*

- A portion of DB2 utility functions used to maintain index maintenance structures (LOAD, REORG, and REBUILD INDEX) typically run during batch, can be redirected to zIIP.

* The zIIP is designed so that a program can work with z/OS to have all or a portion of its Service Request Block (SRB) enclave work directed to the zIIP. The above types of DB2 V8 work are those executing in SRB enclaves, portions of which can be sent to the zIIP.

DB2's Synergy with System z & z/OS



- **Parallel Sysplex (Data sharing)**
 - Coupling Facilities for high performance multi-system data sharing
 - Provides scalability and availability
- **Workload Manager™ (WLM)**
 - Business importance honored in mixed workloads
 - Improve utilization
- **Hardware-assists**
 - Data compression- Reduce storage and CPU, faster backup and recovery, possible performance boost, excellent TCO
 - Encryption – secure data
 - Sort Assist
 - Unicode Translation
- **IBM Total Storage**
 - Parallel Access Volumes (PAV)

DB2 for z/OS Uses...

- **Improved storage utilization**
 - zSeries, 64-bit z/Architecture and z/OS V1.3 or later
- **System-level point-in-time backup and recovery**
 - z/OS V1.5
 - DFSMSHsm
 - DFSMSdss
 - FlashCopy® V1 (FlashCopy V2 is recommended)
 - RESTORE SYSTEM LOGONLY option has no dependency on z/OS V1.5
- **Multilevel security with row granularity**
 - z/OS V1.5
 - z/OS V1.5 Security Server (RACF)
 - RACF Access Control Module required for multilevel security on objects other than rows

DB2 for z/OS Uses...

- Encryption and decryption functions
 - Built-in functions for encryption and decryption require z/OS Cryptographic Services Integrated Cryptographic Service Facility (ICSF).
- Group Bufferpool (GBP) Batching z/OS
 - z/OS V1.4
 - Coupling Facility (CF) level 12
- More secure port of entry mechanism
 - z/OS V1.5
- TCP/IP performance
 - TCP/IP performance is improved when running on z/OS V1.5
- DRDA Data Stream Encryption
 - DRDA Data Stream Encryption can optionally use z/OS Cryptographic Services Integrated Cryptographic Services Facility (ICSF).

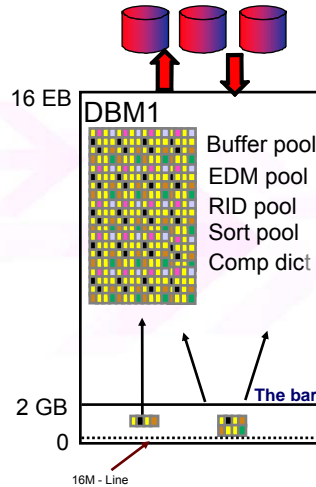
Incremental Scalability

- Add more applications and users than ever:
System constraints expanded
- Use more storage, more effectively, with less complexity: 64-bit virtual addressing
- Better performance for frequently-used operations:
 - Reduce overhead for repeated operations
 - Return the right data faster
 - Provide pre-calculated summary data quickly

Better Storage Use

with Less Complexity, Greater Performance

- **zSeries, z/OS, z/Architecture & large real storage**
- **64 bit virtual storage DB2 V8**
 - Improve scalability, availability, ease of use
 - Move above the bar
 - Use more memory, more effectively
- **Fixes leading performance inhibitors**



Unmatched Secured Infrastructure

Security by design (Isolation)

- ✓ z/OS provides each user with a unique address space
- ✓ Private areas in user address spaces isolated from one another
- ✓ In-memory data can be shared between processes in both Unix and z/OS
- ✓ In z/OS, a user can access another user's address spaces with special authorization for cross-memory services
- ✓ An address space includes both system code and data, as well as user code and data managed automatically by z/OS
- ✓ Dynamic address translation (DAT) is used to translate a virtual address during a storage reference into a physical location in real storage
- ✓ Because of workload isolation, storage protect keys, user buffer overflows do not crash systems software code



Security is preserved through a combination of software and microcode—preventing malware, viruses and worms

Unmatched Secured Infrastructure

Security by design (continued)

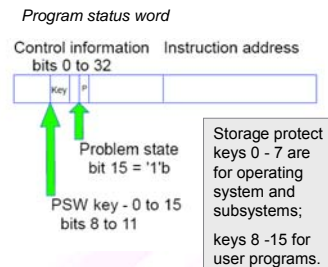
- ✓ z/OS cross-memory services require programs to have special granted authority, authorized program facility (APF), to securely access data owned by others
- ✓ All authorized programs are store-protected
 - Programs in supervisor state or system programs can't be modified by non system state programs
 - Register save areas and work areas store protected
- ✓ APF Authorized programs
 - APF-authorized programs reside in authorized libraries.
 - Authorized programs pass control to unauthorized programs only by disabling authorization
- ✓ Control blocks for system resources reside in system key designated areas
- ✓ Controls blocks and tables used for serialization reside in protected storage



You can't clobber system code

Storage Protection Built in

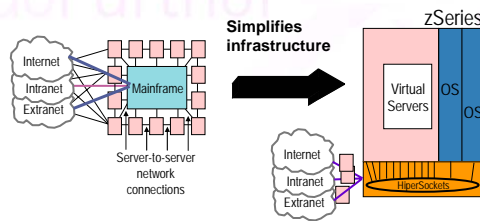
- ✓ Storage protect keys provide additional integrity, built into the hardware. (A key is associated with each 4K frame of real storage)
- ✓ Checks built into software to validate processing
- ✓ Storage & fetch protection bits are not accessible by user programs
- ✓ Information in real storage is protected from unauthorized use
- ✓ If a request is made to read or modify real storage, the key of the requestor is compared to the key in storage
- ✓ User programs are store-protected and data is fetch-protected from other jobs
- ✓ Invalid requests result in a program exception interrupt



IBM storage protection maintains processing integrity

Hipersockets: Secured LAN in a Box

- ✓ Data networked via Hipersockets never need travel outside the box!
- ✓ Very secure connection – no need for extra encryption
- ✓ Communication is through system memory - the virtual servers connected form a “virtual LAN”
- ✓ Enables a “Data Center” in a box with a mixture of z/OS and Linux images
- ✓ Hipersockets provides an integrated TCP/IP network for consolidation of complex workloads into a single system image
- ✓ Hipersockets works transparently to applications
- ✓ Virtual network has the benefits of a network without the extra infrastructure



Data in the box travels securely to reduce risk, encryption and network costs.

Trusted Computing Base - Common Criteria

- **zSeries is the only server platform that has earned Common Criteria EAL5 certification for logical partitions**
 - PR/SM LPAR for zSeries 890 and 990, evaluated at Common Criteria EAL 5 and EAL 4
- **z/OS 1.7 and RACF in evaluation at EAL 4**
- **z/OS 1.6 and RACF IBM EAL3+ certification**
- **z/VM V5.1 in evaluation for EAL3**
- **DB2 UDB also under evaluation at EAL3**
- **Many IBM products have been evaluated or are in process**

Common Criteria program developed by NIST and NSA establishes an organizational and technical framework to evaluate trustworthiness of IT Products & protection profiles

For updates see www.CCEVS.com site

1	Examines if product functions as per documented.
2	Tests the product structure; evaluation includes product design history & testing
3	Evaluates product design by verifying test results.
4	In-depth analysis of product development & implementation – at potentially high costs.
5-7	Requires even more formality in the design process and implementation, analysis of the product's ability to handle attacks & prevent covert channels, for high-risk environments. <i>Ratings at this level are country specific</i>
+	Means maintenance is included



Our multiple certified products provide evidence of a deep commitment to security

And Don't Forget About Storage

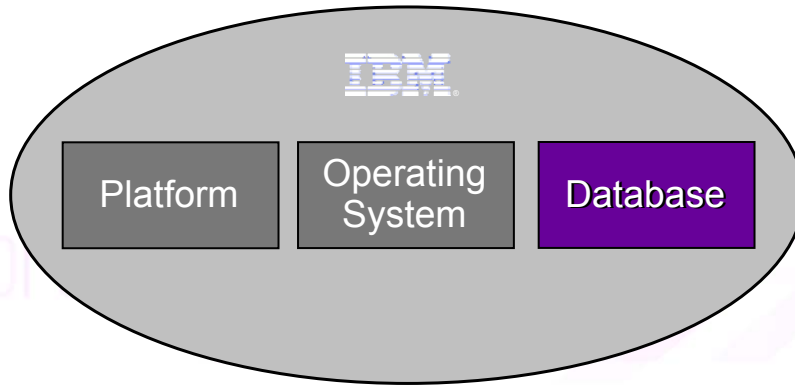
- PAV – Parallel Access Volume
- MIDAW - Modified Indirect Data Address Word
 - Z9 and z/OS 1.7
- FICON

- Get to know your storage people
 - Well...

So, in Review...

What System z™ features and functions does [DB2 for z/OS](#) take advantage of?

[Just about ALL of them!](#)



As time permits →

DB2 UDB for z/OS V8

- ✓ Integration
- ✓ High Availability
- ✓ Flexible Growth
- ✓ Incremental Scalability

↪ Total cost of ownership



Image of Earth from Moon,
Source: NASA (Public Domain)

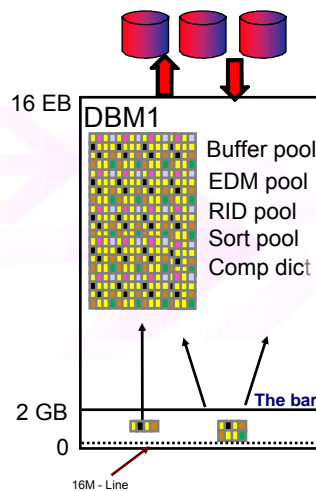
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with Less Complexity, Greater Performance

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- **Fixes leading performance inhibitors**



Room to Grow

Breaking through limitations



Image of Earth from Moon, Source: NASA (Public Domain)

Table name sizes	18 to 128
VIEW & ALIAS names	18 to 128
Column name sizes	18 to 30
SQL statement length	32K to 2MB
Tables in a join	15 to 225
Character Literals	255 to 32704
Index key	255 to 2000
...	...

More To Use

Breaking through limitations: scaling



Image of Earth from Moon, Source: NASA (Public Domain)

Virtual Storage 2 GB	2³¹ to 2⁶⁴
Partitions	254 to 4096
Active logs	31 to 93
Archive logs	1000 to 10,000
Maximum table size	16 TB to 128 TB (partitioned, 32K page)
Maximum data sets	32K to 100K

Support Future Standards

Unicode Enhancements

- **More flexibility**
 - Able to join Unicode with EBCDIC or ASCII
 - SQL statements & literals – Unicode or EBCDIC
 - Most DB2 character catalog columns in Unicode (Unicode catalog)
 - Collating sequence change
 - Lengths and maximum lengths can change



Continuous Availability



- Schema Evolution: database changes
 - ALTER instead of DROP / CREATE
- Data Partitioned Secondary Indexes (DPSI)
- System-Level Point in Time Recovery
- Improved LPL Recovery
- Additional DSNZPARMS
- Additional online DSNZPARMS
- Sliding scale algorithm for SQT

Data Sharing Enhancements

- Batching of GBP writes and castouts
 - Write/castout multiple pages in a single CF operation
 - Improved data sharing performance, especially for batch updates
 - Requires z/OS V1R4, CFLEVEL=12
- Reduced global contention for table space L-locks
 - Reduced XES-level contention across members
 - Improved data sharing performance, especially for OLTP
 - RELEASE(DEALLOCATE) may not be needed

Data Sharing Enhancements

- Changed pages written to GBP at Phase1 instead of Phase2
 - Transactions invoking other transactions at syncpoint for same data
 - Unusual "record not found" from another member
 - Easier to manage
 - Equivalent performance
- More efficient index split processing for data sharing

What's Coming in DB2 Version 9 for z/OS

These topics are covered
in more detail in other
presentations this week

High-Volume OLTP

- Extend WebSphere Integration
 - Optimistic Locking Support
- Expand XML Capabilities
 - Data type
 - Indexing
 - Search
- Continue DB2 Family / DBMS Compatibility Improvements
 - DECIMAL FLOAT
 - BIGINT
 - VARBINARY

DB2 Family SQL

Z: z/OS V7

common

Luw: Linux, Unix & Windows V8.2



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Inner and Outer Joins, Table Expressions, Subqueries, GROUP BY, Complex Correlation, Global Temporary Tables, CASE, 100+ Built-in Functions, Limited Fetch, Insensitive Scroll Cursors, UNION Everywhere, MIN/MAX Single Index Support, Self Referencing Updates with Subqueries, Sort Avoidance for ORDER BY, and Row Expressions, Call from trigger, statement isolation

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, DELETE & MERGE, multi-site join, 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, FOR READ ONLY KEEP UPDATE LOCKS, SET CURRENT SCHEMA, Client special registers, long SQL object names, SELECT from INSERT

DB2 Family SQL

Z: z/OS V8

common

Luw: Linux, Unix & Windows V8.2



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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

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 Support, 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

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, DELETE & MERGE, multi-site join

DB2 Family SQL

Z: z/OS V8 vNext

common

L/U/W: Linux, Unix & Windows V8.2



- 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**
- C** { 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 Support, 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, DELETE & MERGE, 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**
- L** {
- U** { Updateable UNION in Views, GROUPING SETS, ROLLUP, CUBE, 16 Built-in Functions, SET
- W** { CURRENT ISOLATION, multi-site join, MERGE

DDF Improvements

- 64-bit exploitation by DDF
 - Special “shared private” with xxxDBM1 to eliminate many of the data moves on SQL operations
- Support for IPv6 and SSL
- VTAM definition is now optional
- Elimination of PRIVATE protocol requester
 - Includes tools for identifying which packages need to be bound at remote servers

TCO & Skills Reduction

- Reduce Hardware Cost
 - Compression for indexes, LOBs
- Reduce Overall CPU Requirements
 - Converge Temp Space Management
 - Optimization Across Query Blocks
- Reduce DBA / System Programmer Costs
 - SQL Enhancements / Compatibility
 - Simplify Compliance & Security
 - Auto-generated Tablespace/Database
 - Exploit real-time statistics in Optimizer and Utilities
 - Volume-based Copy/Recover
 - DDL Porting Improvements
 - Continued integration with DB2 Tools
 - New / Improved DBA Tools

Compliance/Auditing Pressure

- Regulatory compliance initiatives are impacting IT organizations in most countries/industries, and changing fast
 - Sarbanes-Oxley
 - Basel II
 - FDA: Food and Drug Administration 21 CFR Part 11
 - COPPA: Children's Online Privacy Protection Act of 2000
 - DPA: Data Protection Act (UK)
 - HIPAA: Health Insurance Portability and Accountability Act of 1996
 - PIPEDA: Personal Information Protection and Electronic Documents Act (Canada)
 - SEC Rule 17a-4: Records to be preserved by certain exchange members, brokers, dealers
 - USA Patriot Act: Uniting and Strengthening America by Providing Tools Required to Intercept and Obstruct Terrorism of 2001
- Focus is on both external threats (hackers) and internal employees

Compliance, Auditing & Security

- Simplified

- Some Key Capabilities
 - Roles
 - Network Trusted Contexts
 - Instead of Triggers
 - Improved auditing
 - Secure Socket Layer
 - Data Encryption



Protecting Data On Disk

- We will allow encryption for the key disk resources used by DB2:
 - Tables
 - LOBs
 - Indexes
 - Image copies
 - Logs
 - Archive logs

**Thank You
for Attending!
Willie**

C13

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