IBM System z Technology Summit

DB2 10 – The Secrets of Scalability

Presenter Name

Title

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Agenda

- **Introduction**
- **The Need for Scalability**
- **DB2 10 Scalability Enhancements**
  - Virtual storage constraint relief
  - Latch contention reduction
  - Catalog concurrency enhancements
  - SMF compression
  - Other scalability enhancements
- **Summary & Questions**

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Speaker Introduction

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The Need for Scalability

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The Need for Scalability

- **IT volumes continue to increase**
  - More applications
  - More data
  - More transactions
- **Performance is ever more important**
  - Customers need to support workload growth without a drop-off in performance
- **Availability is ever more important**
  - Pressure to reduce both planned and unplanned outages
- **End result: each DB2 environment is being asked to work harder, with less downtime**
- **Every DB2 release attempts to push back these boundaries, but major progress has been made in DB2 10**

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DB2 10 for z/OS

- **Extensive beta program running throughout 2009/10, with customers from all around the world**
- **Generally available since October 2010**
- **Support for skip migration from V8 as well as DB2 9**
  - Will make cost case for upgrade even more compelling
- **Excellent uptake**
  - First customers now running DB2 10 in production
  - Compared to DB2 9 at 12 months after GA
    - 3 x number of customers running DB2 10
    - 4 x number of DB2 10 licences
    - 3 x total number of MSUs
  - Many customers are planning their DB2 10 upgrades now, with most intending to begin real work in the next 6-18 months

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Top New Features

- CPU/Performance Improvements
- Virtual Storage Enhancements
- Security Extensions
- Improved Catalog Concurrency
- Temporal Data
- Access Path Management
- pureXML enhancements
- Currently Committed semantics
- Automated statistics
- Dynamic schema change enhancements
- In-memory object support
- Optimiser enhancements
- MEMBER CLUSTER for UTS
- Backup and recovery enhancements
- Enhanced audit
- Include additional index columns
- Enhanced SQL OLAP functions
- Skip Migration (see later)
- And many more….

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DB2 10 Scalability Enhancements

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Overview

- Virtual storage constraint relief
- Latch contention reduction
- Catalog concurrency enhancements
- SMF compression
- Other scalability enhancements

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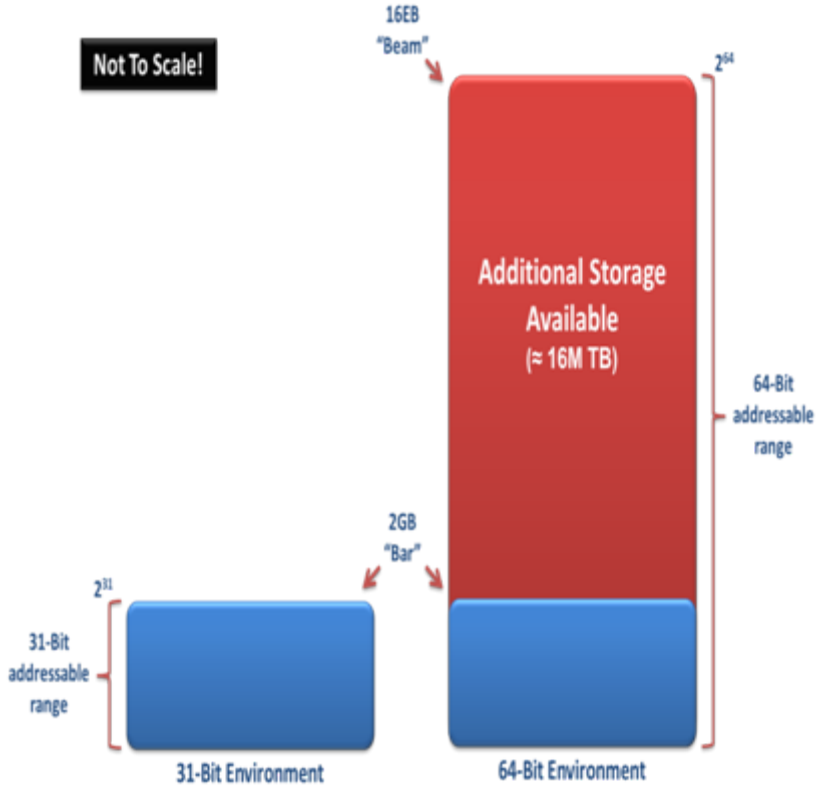
Virtual Storage Enhancements

- **V8 began a major project to transform DB2 into a 64-bit RDBMS**
  - Laid the groundwork and provided some scalability improvements but a lot of DBM1 objects remained below the 2GB bar
- **DB2 9 improved things a little, but only by another 10-15% for most customers**
  - Practical limit of 300-500 threads per DB2 subsystem
- **DB2 10 moves 80-90% of the remaining objects above the bar, resulting in 5-10x improvement in threads per subsystem (CM)**



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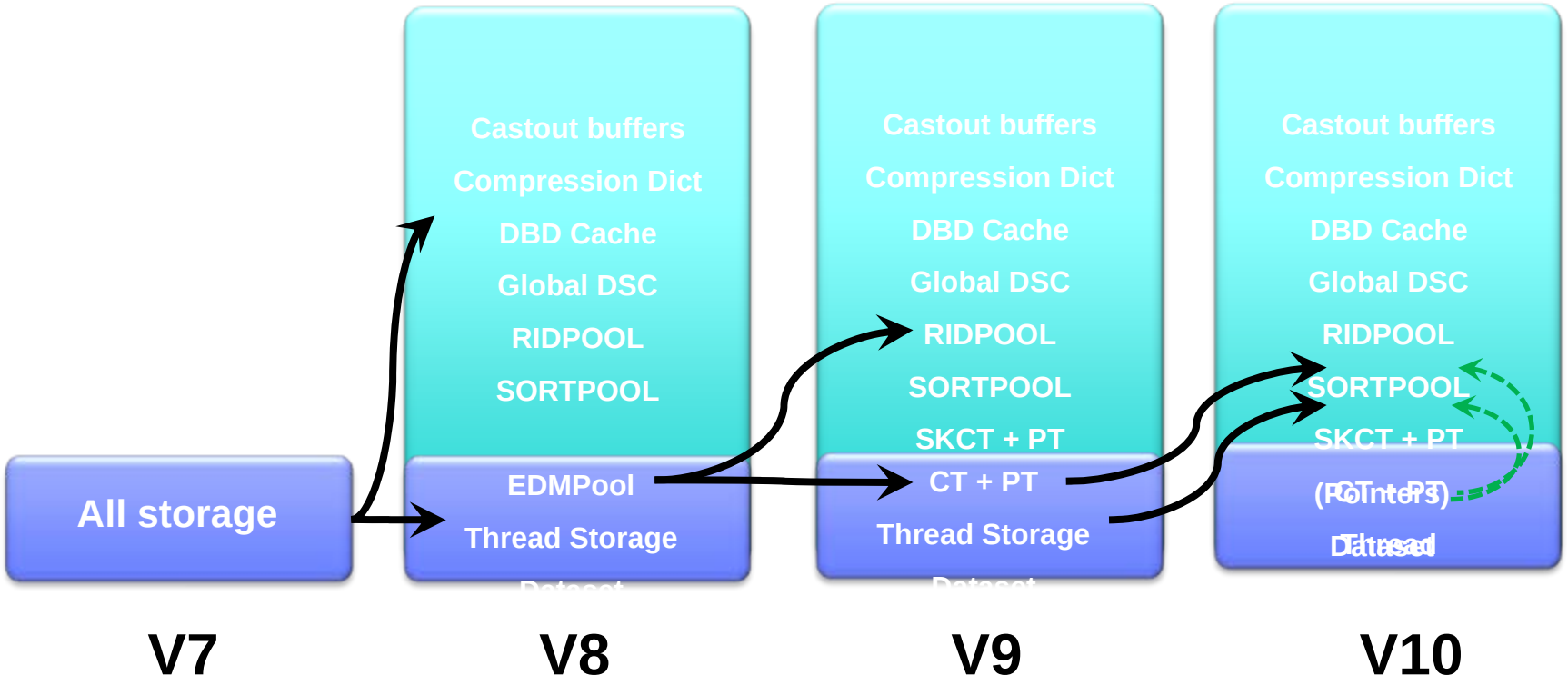
Virtual Storage Enhancements



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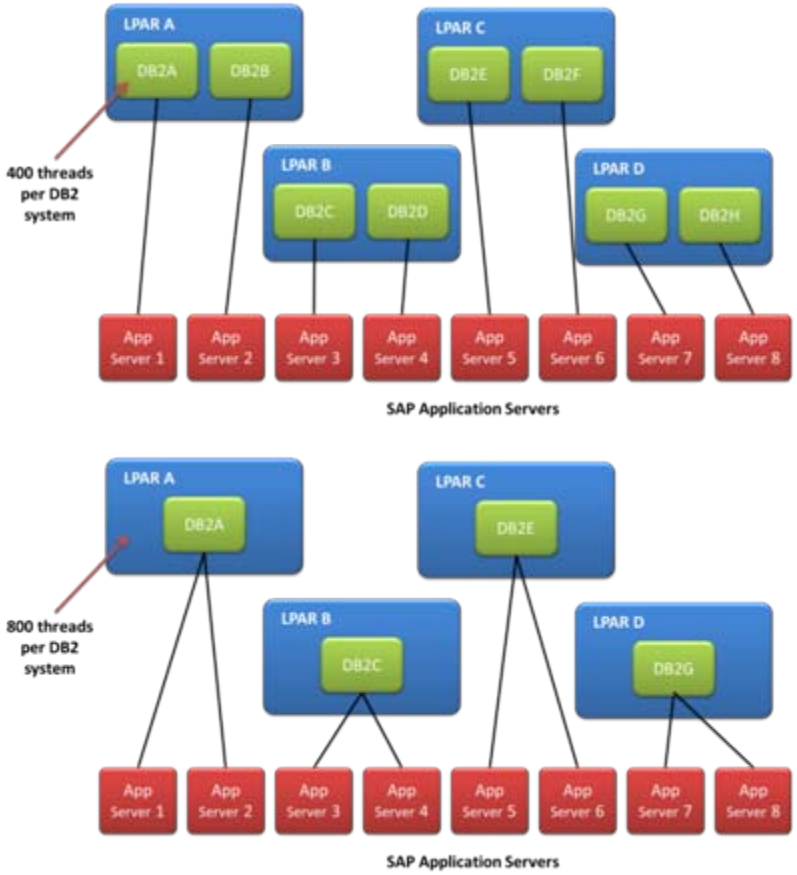
Virtual Storage Enhancements

- **Possibility for less DB2 subsystems (and possibly less LPARs) in a data sharing environment**
  - Lower data sharing overhead
  - Less systems to manage / maintain
  - Minimum of 4 members still recommended for true continuous availability



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Virtual Storage Enhancements

- **More space for performance critical storage objects such as dynamic statement cache**
- **Potential to reduce legacy OLTP CPU cost through**
  - More use of CICS protected entry threads
  - More use of RELEASE(DEALLOCATE) with persistent threads (with trade-off on concurrency)
  - DB2 10 High-Performance DBATs
- **Other limiting factors on vertical scalability still remain**
  - Real storage
  - ESQA/ECSA (31-bit) storage
  - Active log write and SMF volumes

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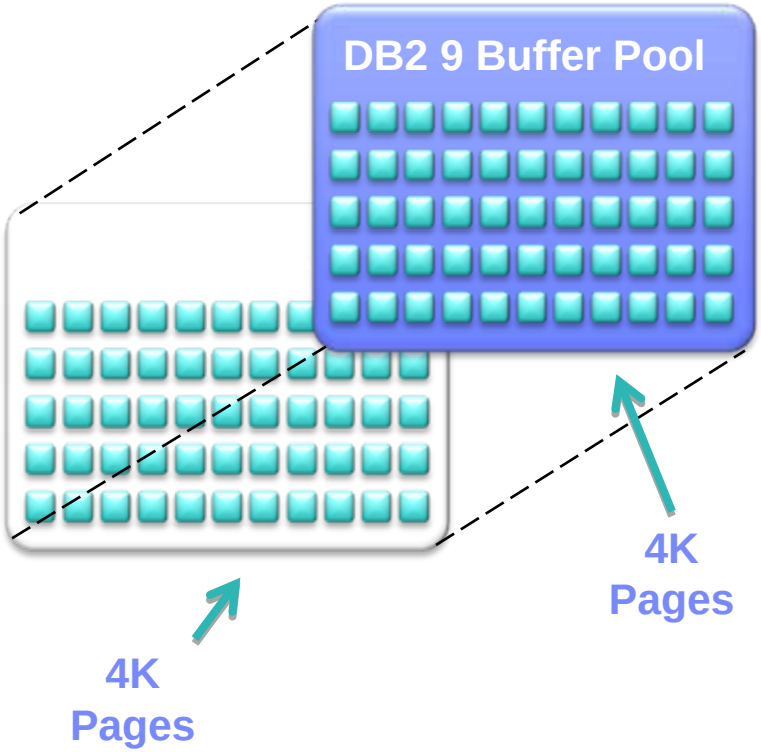
Real Storage Enhancements

- **For prior releases, z/OS always managed DB2 bufferpool pages as 4K frames**
- **Move to 64-bit architecture made much larger buffer pools viable**
  - Bufferpools can use many millions of pages
  - Increased z/OS overheads for page management



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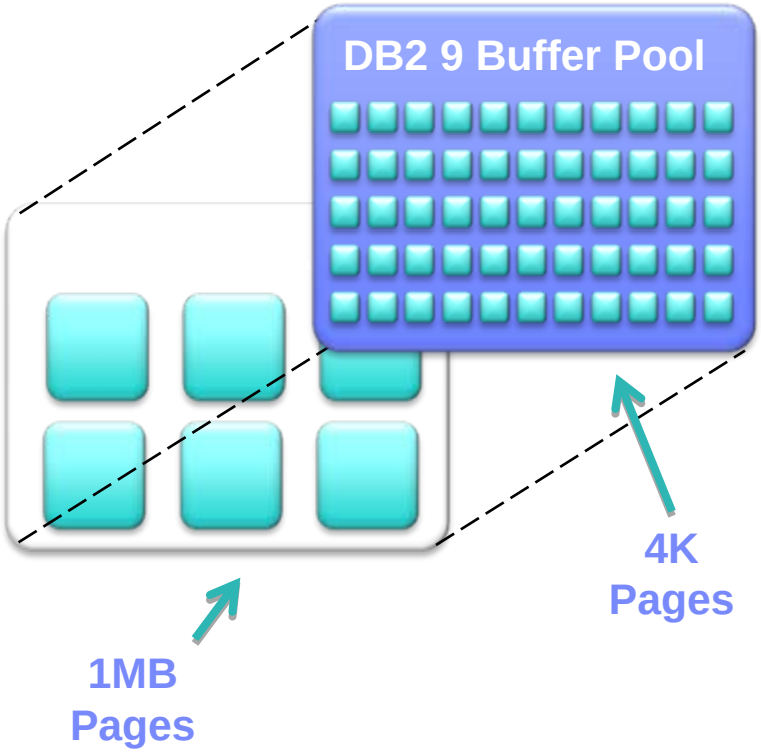
Real Storage Enhancements

- **DB2 10 introduces support for 1MB pages to reduce z/OS page management overheads**
  - Needs z10 or newer z196 server
  - Needs bufferpool to be defined with PGFIX=YES
  - z/OS sysprogs must partition real storage between 1K and 1MB frames (IESYSnn in PARMLIB)
- **Customer testing during beta program showed CPU reductions of 0-6% with this feature enabled**



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Storage Enhancements

- **Remains critical to ensure that there is no paging in DB2 address spaces**
  - Plan on additional 10-30% real memory following migration
- **Focus changes from virtual memory constraints & monitoring to real memory constraints & monitoring**
  - See (PM24723) for real storage monitoring and contraction enhancements – advised not to go into production without this!
- **Ensure use of PGFIX=YES to exploit 1MB real storage frames**
  - Many customers still haven't exploited this feature in their DB2 8 and DB2 9 systems – significant CPU savings!
  - Support for 1MB non page-fixed bufferpools in future release
- **Ensure you are up to date on z/OS maintenance before using 1MB pages**

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Latch contention reduction

- **Latch: DB2 mechanism for controlling concurrent events or the use of system resources**
  - Reported in accounting and statistics traces
  - Latch wait time can be significant for high-volume environments
- **DB2 10 reduces latch contention for a large number of situations, including:**
  - LC12: Global Transaction ID serialization
  - LC14: Buffer Manager serialization
  - LC19: Log write in both data sharing and non data sharing
  - LC24: EDM thread storage serialization
  - LC24: Buffer Manager serialization
  - LC27: WLM serialization latch for stored procedures and UDF
  - LC32: Storage Manager serialization
  - IRLM: IRLM hash contention
  - CML: z/OS Cross Memory Local suspend lock
  - UTSERIAL: Utility serialization lock for SYSLGRNG (removed in NFM)

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Catalog Concurrency

- **Contention on DB2 catalog is a major ongoing pain for most large DB2 customers**
- **DB2 10 introduces UTS PBG format for catalog tablespaces in NFM**
  - Internal hashes and links are removed during ENFM processing
  - Use of row-level locking and reordered row format
  - Use of new currently committed semantics and other lock avoidance techniques
  - No changes to utility jobs are necessary, but some SMS pre-reqs for migration
- **Greatly improves access to catalog/directory**
  - REORG SHRLEVEL(CHANGE) for complete catalog/directory
  - BIND concurrency much improved, but more work required in future releases – especially with heavy parallel DDL against different databases

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Catalog Contention Issues

- **Be prepared for some short-term degradation on entry to CM for single-thread BIND/REBIND processes, until you get to NFM**
  - PLANMGMT=EXTENDED the default, so multiple copies of access plan kept in catalog
  - New indexes are defined, in preparation for hash links to be removed in NFM
  - No concurrency improvement until catalog restructure in ENFM
  - Redbook testing showed worst-case elapsed time increases of 100-200% and C2 CPU increases of 50-70%

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SMF compression

- **High transaction volume usually means high SMF volume, which can become a limiting factor**
- **Some customers forced to switch off useful accounting data, or resort to SMF rollup (via ACCUMACC ZPARM)**
- **New SMF compression feature can provide increased throughput due to I/O efficiency improvement**
  - Uses z/OS compression service to deliver approx. 60%-90% compression for 1% CPU cost

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SMF compression

- Enabled via new SMFCOMP DSNZPARM (member scope)
- All data after SMF header is compressed
- Needs vendor support to allow compressed SMF records to be processed
- New sample DSNTSMFD application to uncompress SMF data (via PM27872)
- Can be used in conjunction with accounting rollup to achieve up to 99% reduction

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Other scalability enhancements

- **Others enhancements in DB2 10**
  - SPT01 restructured: split into several pieces with LOBs used for larger package sections
  - Workfile enhancements: support for spanned records to increase maximum record length, better use of in-memory workfiles, use of PBG tablespaces
  - Support for Extended Address Volumes: EAVs theoretically allow up to 221TB per volume (223GB in z/OS 1.10)
  - Decrease dataset allocation/deallocation times: using new function in z/OS 1.12 DB2 startup/shutdown times can be improved (can be retrofitted to V8 and DB2 9 via APAR)

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Summary & Questions

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Summary

- **DB2 10 delivers some very significant enhancements for increasing throughput, supporting more users and reducing planned downtime**
  - Many of these enhancements available in Conversion Mode (CM)
- **Remember that sufficient real storage is needed to back any increase in virtual**
- **If you are still on DB2 V8, remember that support ends in April 2012**

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Useful URLs

- **DB2 10 Launch Website** http://bit.ly/DB210Launch
- **DB2 for z/OS Website** http://www-01.ibm.com/software/data/db2/zos/
- **DB2 Product Library** http://www.ibm.com/software/data/db2/zos/library.html
- **DB2 Newsletter** http://www.ibm.com/vrm/newsletter/11065
- **Latest Whitepapers**
  - **Gaining the Financial Benefits of DB2 10 for z/OS**
  - **Business Value of DB2 10 – Julian Stuhler**
  - **A Matter of Time: Temporal Data Management**
  - **Why DB2 for z/OS is BETTER than Oracle RAC ?**
- **DB2 for z/OS e-Kit** http://bit.ly/DB210e-Kit

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Top DB2 for z/OS Communities

- **World of DB2 for z/OS** http://db2forzos.ning.com/
- **DB2 10 LinkedIn** http://linkd.in/IBMDB210
- **DB2 for z/OS What's On LinkedIn** http://linkd.in/kd05LH
- **DB2 for z/OS YouTube** http://www.youtube.com/user/IBMDB2forzOS
- **WW IDUG LinkedIn Group** http://linkd.in/IDUGLinkedIn
- **IDUG.ORG** http://www.idug.org
- **IBM developerWorks** http://www.ibm.com/developerworks/data/community/

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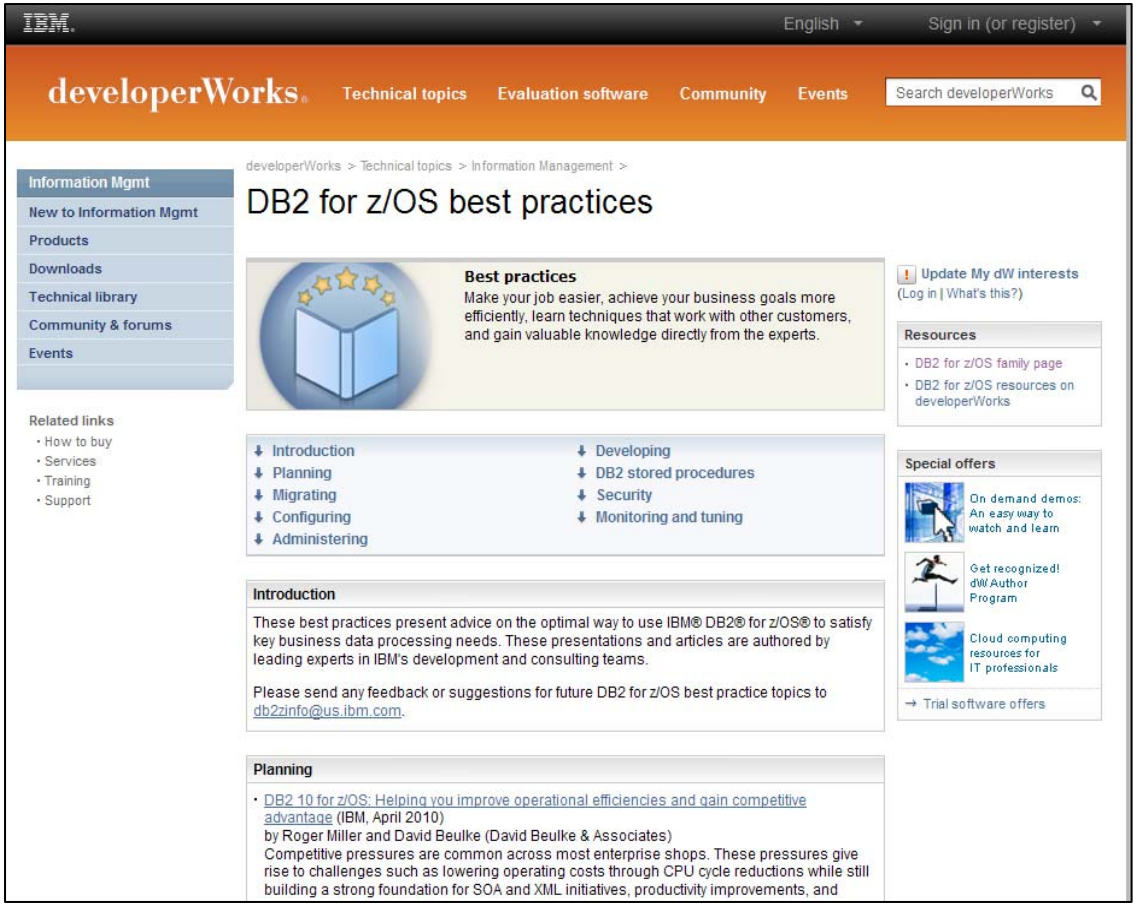
DB2 for z/OS Best Practices



https://www.ibm.com/developerworks/data/bestpractices/db2zos/

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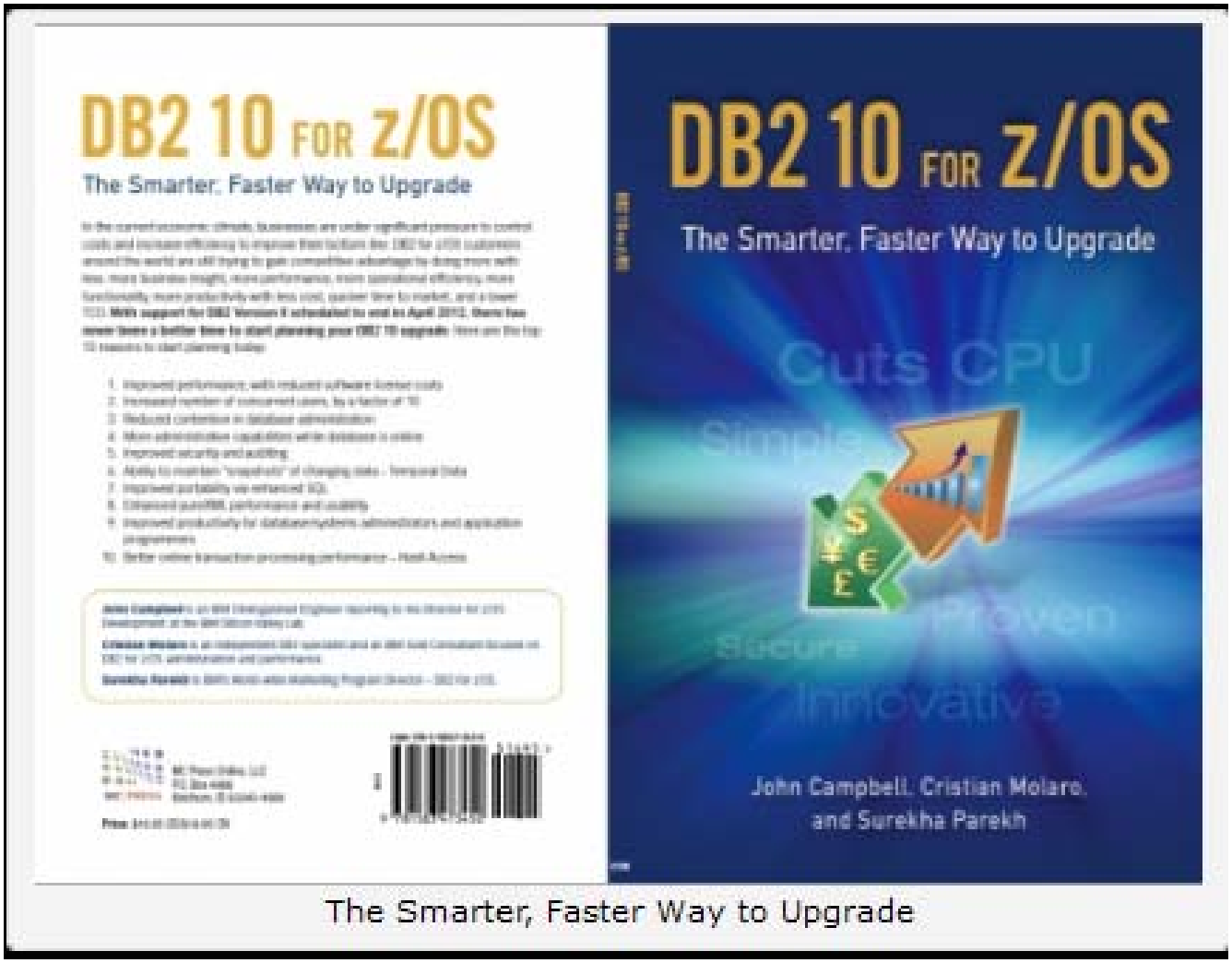
Enjoy your complimentary DB2 10 Book The Smarter Faster Way to Upgrade !



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