Use DB2 with BLU Acceleration for SAP

DB2 TechTalk

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DB2 Tech Talk series host and today's presenter:

Rick Swagerman, Host and Today's Presenter

DB2 Language Architect

Today's Technical Presenter . . .

Guersad Kuecuek, Client Technical Specialist Leader of DB2 for SAP

A few details ….

1. The presentation for this Tech Talk:
   http://bit.ly/ttfilejul14

2. Next steps and troubleshooting guide:
   click "Attachments" in this webcast window

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Agenda

- **Put things right**
  - **In-Memory**
  - **RDBMS**
  - **"classic database"**
  - **working from storage**

- **Requirements and settings to run DB2 with BLU Acceleration with SAP applications**

- **Important aspects to consider for optimal performance**

- **Customer experiences from POCs and production use of DB2 with BLU Acceleration**

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Put things right: In-Memory, RDBMS, "classic database", storage, SSD

- All databases running with SAP Business-Suite, BW and other applications are RDBMS
  - there is no difference for in-memory databases, which are running like Edgar F. Codd (IBM Almaden Research Center) has published in 1970

- Classic databases do not work on storage
  - they copy the required data during the run time in a very highly elaborative technique from storage to RAM and work always "in-memory" inside the RAM

- SSD and Flash-Storage for I/O intensive cases
  - DB2' BLU compression reduces the database size in average 8-10 times → very low I/O transfer between storage and RAM → <u>DB2 does not need SSD</u>

- Total run time consists of three major building blocks and the database is one piece of it
  - application run time (e.g. in the application server)
  - **database run time** (e.g. insert/update/delete/select)   100%
  - communication overhead (e.g. I/O, kernel, frontend)

- Customers should always consider
  - the end-to-end run time
  - the total capacity of cores, RAM and storage

RAM is fast, Cache is faster, Registry is fastest

Type of Memory	Size	Latency
L1 cache	64 KB	~4 cycles [2 ns]
L2 cache	256 KB	~10 cycles [5 ns]
L3 cache (shared)	8 MB	35–40+ cycles [20 ns]
Main memory	GBs up to terabytes	100–400 cycles
Solid state memory	GBs up to terabytes	5,000 cycles
Disk	Up to petabytes	1,000,000 cycles

Cache

RAM, storage

100

10 k

Without in-memory: approx. 99% of the application & database data **in RAM** during run time
With in-memory: approx. 100% of the application & database data **in RAM** during run time

Challenge: maximize usage of cache & register

Options for better cache&registry usage:
- Database partitioning
- In-memory technology

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DB2 with BLU Acceleration Sizing

- Sizing for SAP applications is done with the SAP Qucksizer, which is based on the official SAP SD benchmarks
  - SAPS is the key metric for implementing SAP systems

- For decades, DB2 has provided leading SAP benchmark results
  - Offering a very attractive "SAPS per core" ratio
  - DB2 has proven to be the fastest database on all operating systems

- Existing & established sizing and implementation methods can be used for DB2 with BLU Acceleration, too
  - SAPS, IOPS, throughput, virtualisation, consolidation

- Recommended minimum server configuration 8 cores and 64 GB RAM
  - DB2 with BLU Acceleration has no "must" (required) configuration or real physical limitation
  - DB2 with BLU Acceleration databases in production with up to 1-2 TB database size on 2-4 core server

- **Rough BLU sizing for „good" performance**: for each 1 TB uncompressed database size
  - 1-2 cores
  - 8-32 GB RAM
  - the higher the performance expectation, the higher capacity for core/RAM (like the accelerator pedal in the cars)
  - **Example**: DB2 with BLU Acceleration would run fast for 10 TB uncompressed database on 20 cores and 320 GB RAM

Use of DB2 with BLU Acceleration (1)

- **SAP Note 1819734 – DB6: Use of BLU Acceleration**
    - Supported SAP scenarios
        - SAP NetWeaver BW 7.0 and higher
        - DB2 Near-Line Storage for SAP NetWeaver BW

    - Requirements
        - Production use requires at least 64GB memory and 8 cores
          - Smaller configuration can be used for test and QA systems or near-line storage databases
        - OS: AIX, Linux on X86_64 platform
        - DB2 10.5 FP3aSAP
        - Unicode
        - DB2 automatic storage

    - Preparation
        - Adapt database configuration (SAP Note 1851832)
        - Upgrade your database interface shared library (DbSl) to a recent version with the following patch text: "DB6: DROP INDEX to DROP CONSTRAINT" (SAP Note 1911087)

Use of DB2 with BLU Acceleration (2)

- **SAP Note 1825340 – DB6: Use BLU Acceleration with SAP BW**

  Required SAP BW Support Packages:

Recommended

SAP BW Release	Support Package
7.00	32
7.01 (SAP BW 7.0 EHP1)	15
7.02 (SAP BW 7.0 EHP2)	15
7.11	13
7.30	11
7.31 (SAP BW 7.3 EHP1)	11
7.40	6

Minimum Support Packages
+ Corrections from SAP Note (1889656)

SAP BW Release	Support Package
7.00	31
7.01 (SAP BW 7.0 EHP1)	14
7.02 (SAP BW 7.0 EHP2)	14
7.11	12
7.30	10
7.31 (SAP BW 7.3 EHP1)	9
7.40	5

- Supported BW Objects:
  - InfoCubes, Aggregates, Dimensions
  - BW Temporary tables (/BI0/06..., /BI0/02..., /BI0/0P, ..., ...);
    Set RSADMIN parameter DB6_TMP_USE_CDE to YES
- Run db6_update_db_script to enable WLM concurrency threshold for BLU after you have created the first column-organized table (SAP Note 1365982)

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Use of DB2 with BLU Acceleration (3)

- **SAP Note 1834310 - DB6: Use of DB2 with BLU Acceleration with DB2 Near-Line Storage**

  Required SAP BW Support Packages:

Recommended

SAP BW Release	Support Package
7.01 (SAP BW 7.0 EHP1)	15
7.02 (SAP BW 7.0 EHP2)	15
7.30	11
7.31 (SAP BW 7.3 EHP1)	10
7.40	5

Minimum Support Packages
+ Corrections from SAP Note (1834310)

SAP BW Release	Support Package
7.01 (SAP BW 7.0 EHP1)	06
7.02 (SAP BW 7.0 EHP2)	03
7.30	01
7.31 (SAP BW 7.3 EHP1)	01
7.40	GA

- Supported BW Objects:
  - NLS InfoCubes
  - NLS DataStore Objects (DSOs)
- Set RSADMIN=DB6_NLS_USE_CDE to create NLS objects as column-organized tables

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DB2 with BLU Integration into SAP BW

- Integration into SAP BW Workbench

- SAP ABAP Dictionary extension to support BLU tables as new table type

- BLU conversion of existing BW objects

- DBA Cockpit support: Monitoring and Administration

- Configuration for BLU feature is part of SAP's DB2 parameter setting

- SAP BW ETL processing adaptation

- SAP BW Migration to DB2 10.5 BLU

- **New BW objects supported with DB2 10.5 FP4**

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Primary HW Aspects to improve BLU Performance

- **Core-friendly parallelism**
  - **KIWI**: Kill It With Iron. Uniquely leverage multi-core
  - Careful attention maximizes CPU cache, cacheline efficiency
  - Intel: 2 threads per core
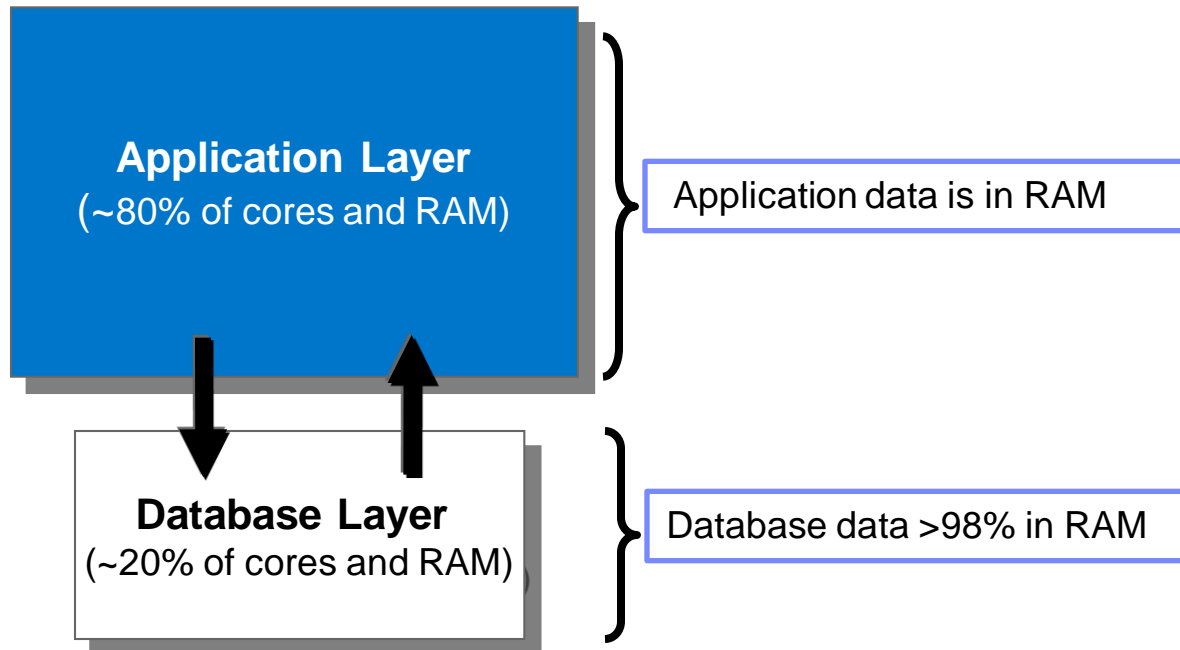 - Power7: 4 threads per core
  - Power8: 8 threads per core

POWER7
BUILT ON
7
Power™
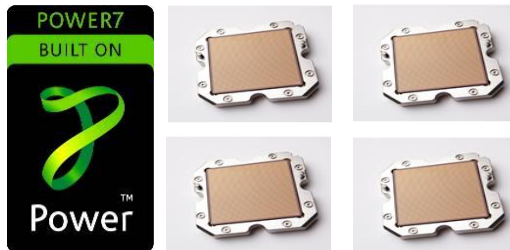
- **Multiply the power of the CPU**
  - Single Instruction Multiple Data (SIMD)
  - Compute with 1 instruction what may have taken >4
  - CPU vector processing
  - Scanning, joins, grouping

Instructions   Data

SIMD

Results

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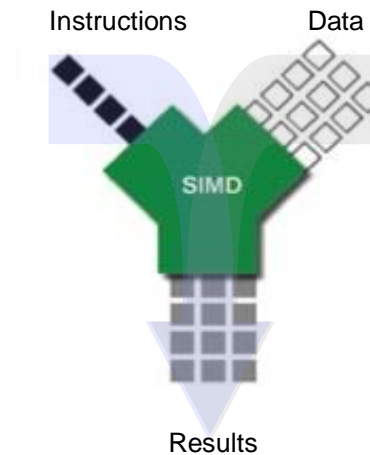
Workload shift from application to database layer ?

Application Layer
(~80% of cores and RAM)

Application data is in RAM

Database Layer
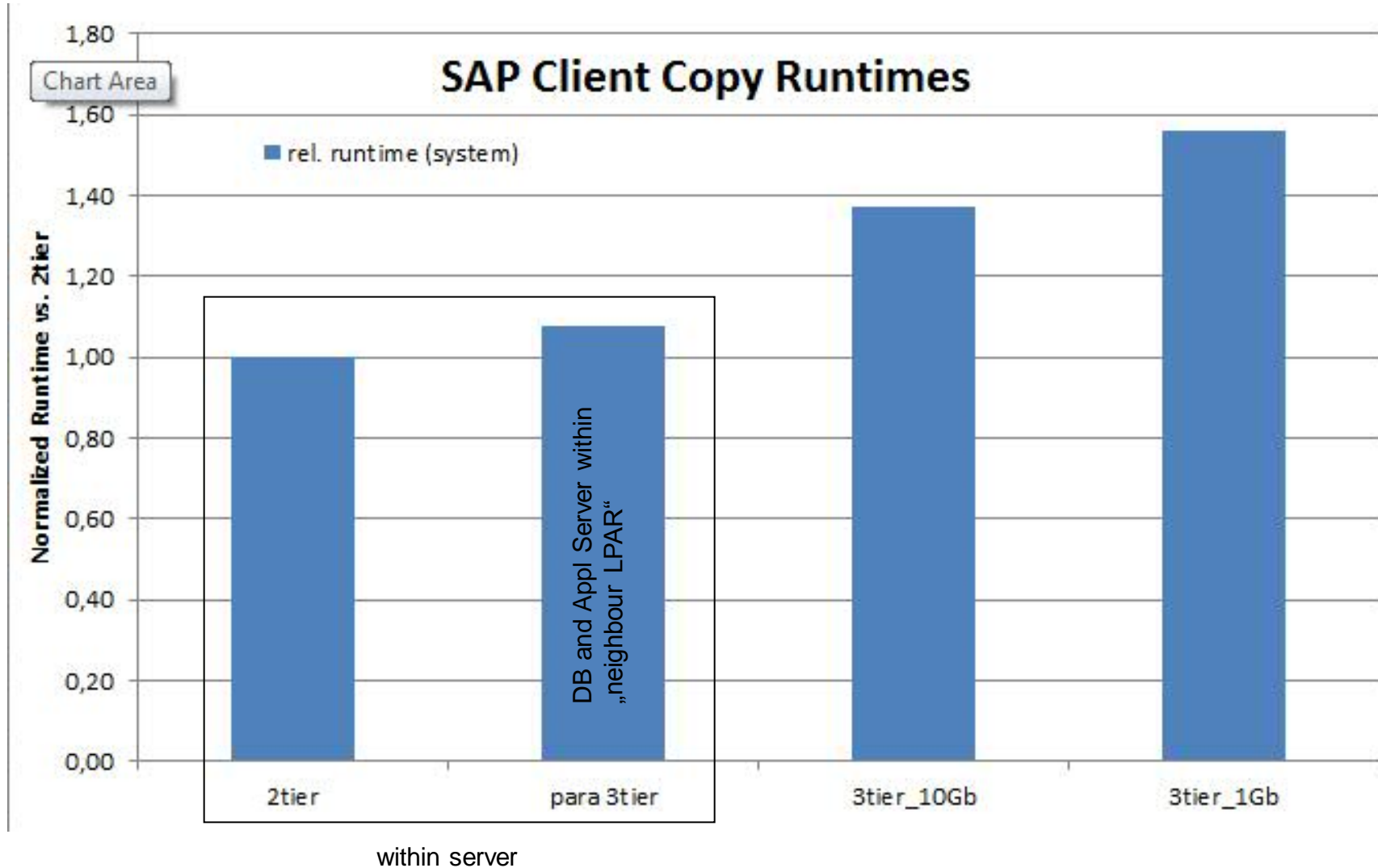(~20% of cores and RAM)

Database data >98% in RAM

2-tier
architecture protects the
performance between
database+application

... DB2 supports 2-tier

- keep workload, where it fits best

- tailored building blocks for highest flexibility

- tailored performance on OS/DB/storge level

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SAP Client Copy Runtimes

SD Benchmark comparison

- **2-tier < 3-tier comparison** with different configuration patterns

- **Para 3-tier is almost the best compromise** for performance vs. operation and license cost optimization aspects.

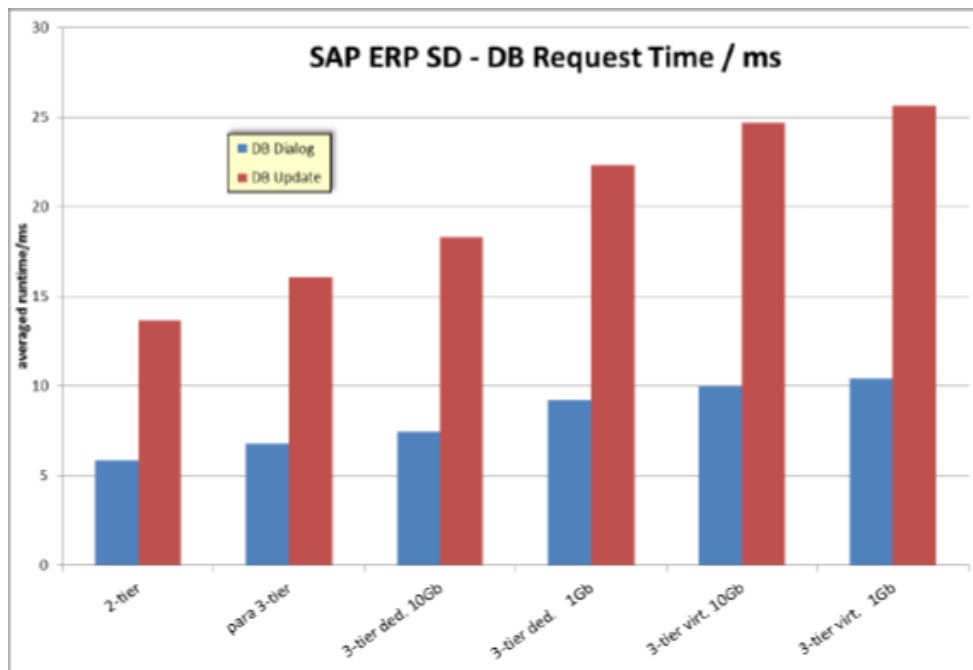| Incremental DB-Request times vs. 2-tier		
	Query	**Update**
para 3-tier	+16%	+18%
3-tier ded. 10Gb	+27%	+34%
3-tier ded. 1Gb	+57%	+64%
3-tier virt. 10Gb	+70%	+81%
3-tier virt. 1Gb	+78%	+88%

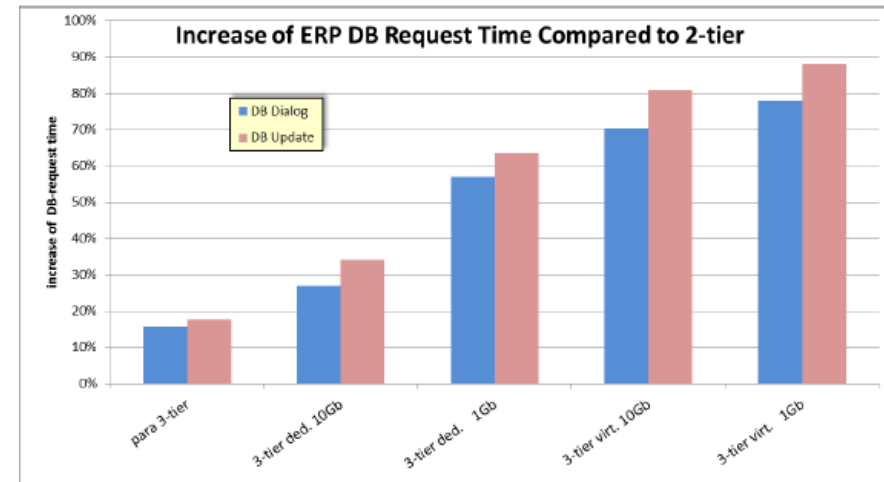Table 4 Incremental DB-Request time vs. 2-tier

Figure 6 SAP ERP DB-Dialog times

Figure 7 Increase of SAP ERP SD DB-Request times vs. 2-tier

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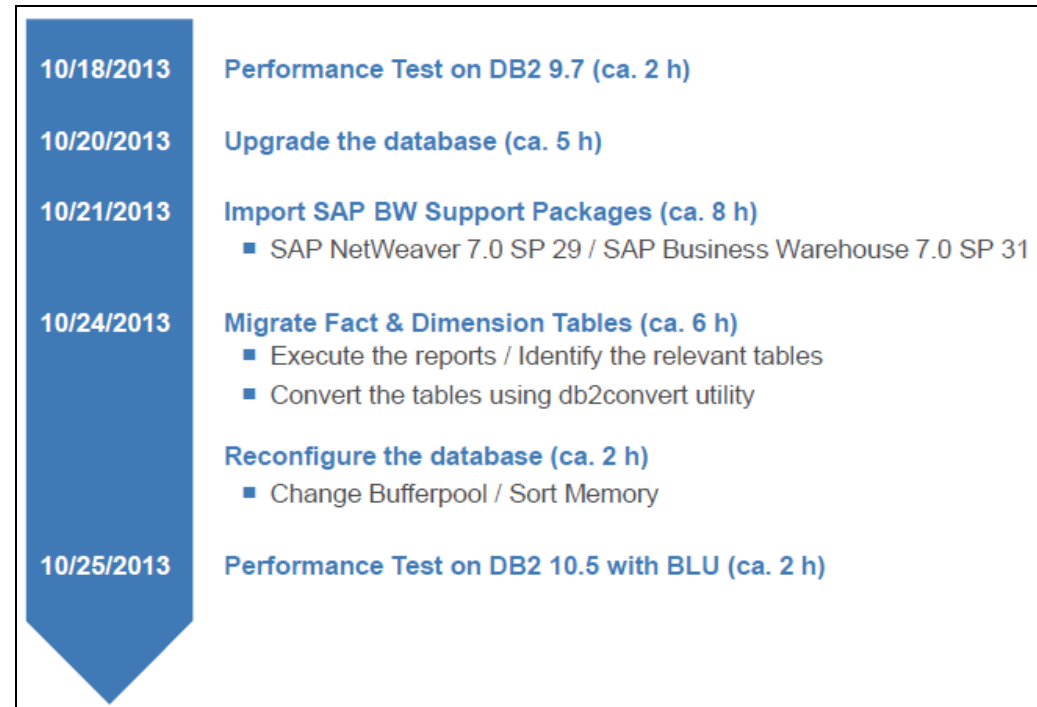
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DB2 with BLU Acceleration Result @ Knorr-Bremse - 1

- **SAP environment**
  - 60 SAP systems
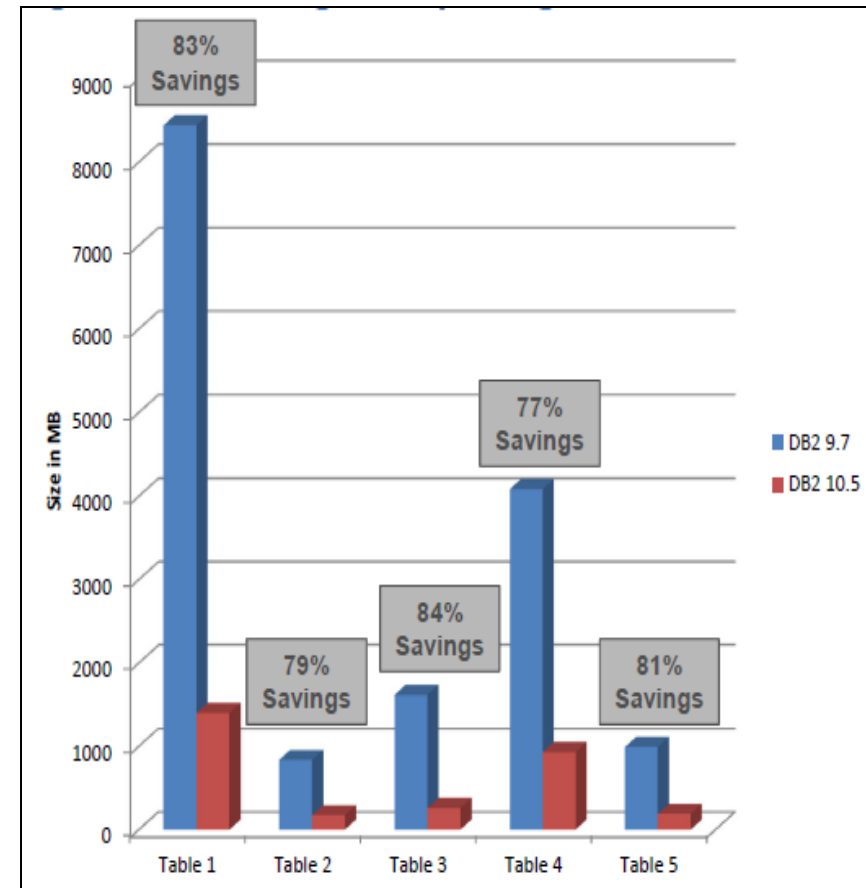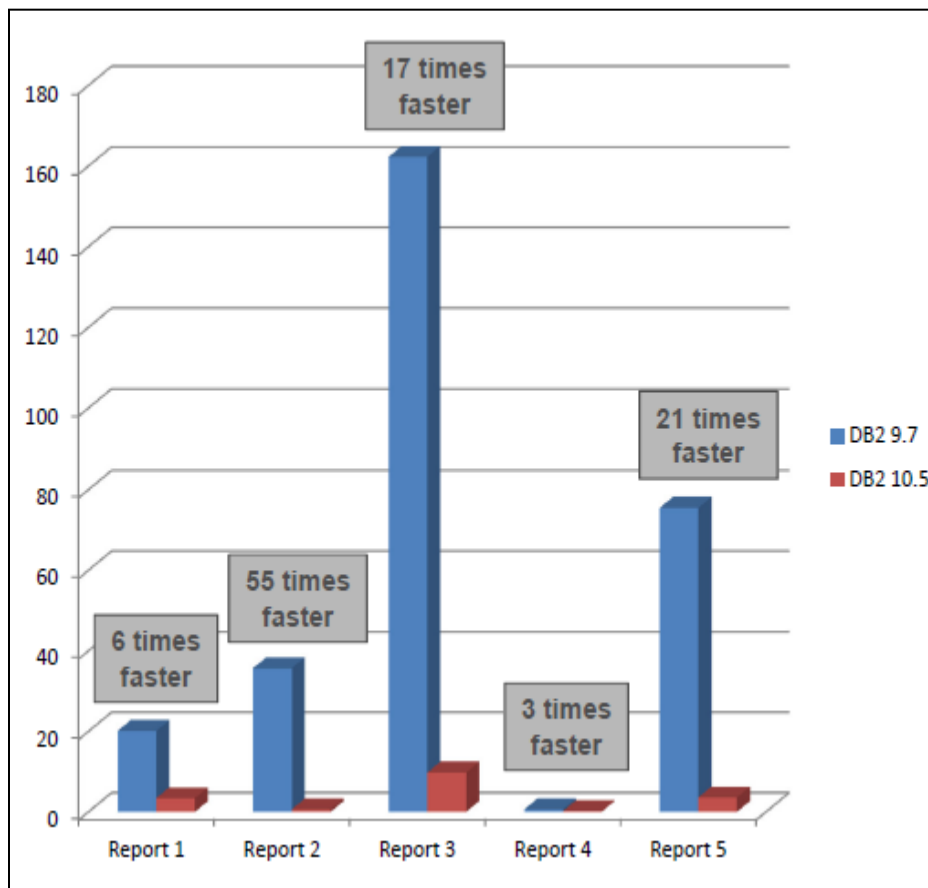 - 130+ servers with 360+ vCPUs
  - 250 TB storage
  - 7 TB RAM

- **SAP BW 7.0 in production**
  - DB2 9.7 FixPak7
  - Suse Linux 11 SP2 vSphere 5
  - 128 GB RAM, 16 Intel Cores
  - DB size: 3,6 TB
  - User: 1000

Date	Activity
10/18/2013	Performance Test on DB2 9.7 (ca. 2 h)
10/20/2013	Upgrade the database (ca. 5 h)
10/21/2013	Import SAP BW Support Packages (ca. 8 h) ■ SAP NetWeaver 7.0 SP 29 / SAP Business Warehouse 7.0 SP 31
10/24/2013	Migrate Fact & Dimension Tables (ca. 6 h) ■ Execute the reports / Identify the relevant tables ■ Convert the tables using db2convert utility Reconfigure the database (ca. 2 h) ■ Change Bufferpool / Sort Memory
10/25/2013	Performance Test on DB2 10.5 with BLU (ca. 2 h)

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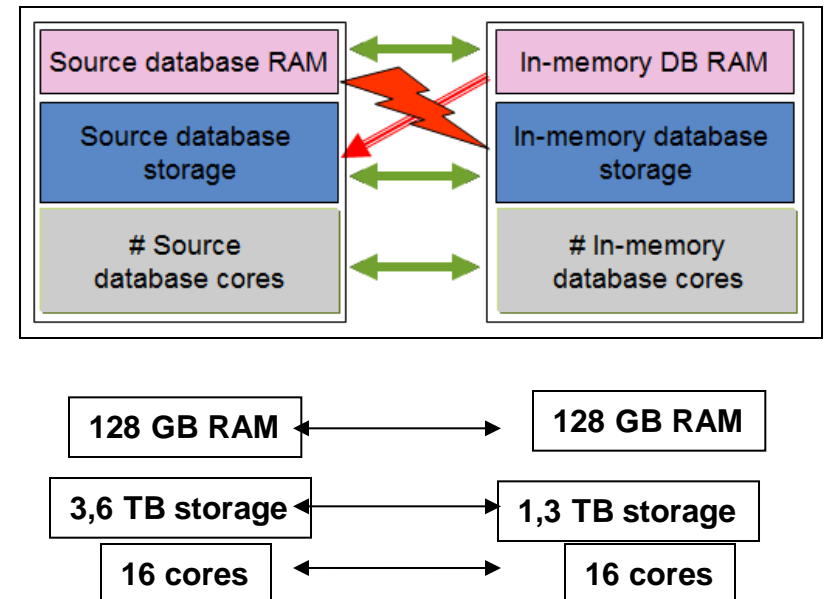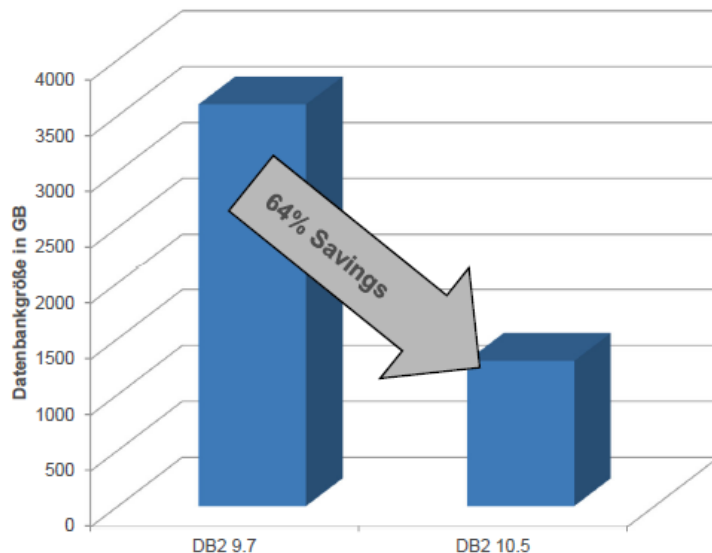
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DB2 with BLU Acceleration Result @ Knorr-Bremse - 2

DB2 9.7 compressed with Deep Compression
Savings are derived from deleting indexes and
DB2 10.5 BLU compression

Total run time incl SAP BW

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DB2 with BLU Acceleration Result @ Knorr-Bremse - 3

- DB2 with BLU Acceleration storage reduction: 64% (~87% versus uncompressed)
  - Source database compressed with DB2 9.7: 3,6 TB (uncompressed ~10 TB)
  - Target database compressed with DB2 10.5 BLU: 1,3 TB

	Source database RAM		In-memory DB RAM
	Source database storage		In-memory database storage
	# Source database cores		# In-memory database cores

128 GB RAM	←→	128 GB RAM
3,6 TB storage	←→	1,3 TB storage
16 cores	←→	16 cores

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Conclusions based on DB2 with BLU Acceleration implementations

DB2 with BLU Acceleration vs SAP BW Accelerator

- **Less hardware** (cores, RAM) to deliver similar or better performance
- **Landscape simplification**
    - no separate appliance required
    - no data load to BWA required
- **High performance out of the box**
    - No secondary indexes and no tuning required

DB2 with BLU Acceleration vs SAP HANA

- **Less hardware** (cores, RAM) to deliver similar or better performance
- **Virtualisation and 2-tier fully supported** → Cloud ready with Grenn IT
- **Less storage needed** (check SAP sizing guidelines for HANA)
- **Mature and proven DB2 technology**: no frequent patching required
- **Supports also older BW releases** (BW 7.00 and higher)

<u>DB2 with BLU Acceleration provides much lower TCO and much faster time-to-deliver</u>

DB2 with BLU Acceleration Experiences

- DB2 with BLU Acceleration used between 50%-90% less cores than SAP BWA/HANA and was in average still 20% faster
  - DB2 with BLU Acceleration *KIWI (kill it with iron)* feature helps to reduce the number of cores
  - DB2 wuth BLU Acceleration SIMD (single intruction multiple data) feature helps to have a better througput and better performance

- DB2 with BLU Acceleration can replace the expensive and complex SAP BWA appliances

- DB2 with BLU Acceleration improves the performance of the NLS (near-line storage) database
  - DB2 with BLU Acceleration offers for online and NLS database outstanding performance with only one database engine

- Backup, recovery, HA and DR similar for Business-Suite, BW and NLS solution

- DB2 with BLU Acceleration is transparent for the application users and DBAs

DB2 Tech Talk: Use DB2 with BLU Acceleration for SAP
Next Steps Roadmap

Step One

Visit SAP pages on www.ibmbluhub.com

- Introduction to BLU Acceleration for SAP
  goo.gl/O7AE4c

- DB2 with BLU Acceleration certifies for SAP
  goo.gl/hqUdsn

Step Two

Access the SAP technical notes mentioned in this presentation
Links and references here: goo.gl/hqUdsn (SAP login required)

Step Three

Explore BLU Acceleration – SAP BW Technical materials
- 5 things to know about BLU Acceleration for SAP BW
  goo.gl/yNiA5h
- IBM Redbook: Architecting and deploying IBM DB2 in your Analytical Environment
  goo.gl/4iJT9p

Step Four

Participate in the community: Read and share!

- Chris Eaton's blog on BLU Acceleration for SAP BW
  goo.gl/FJRlpc
- Sam Lightstone's blog on BLU Acceleration for SAP BW
  goo.gl/hLi5Ya
- James Kobielus blog on BLU Acceleration for SAP BW
  goo.gl/2FjzXv

Reference

Call IBM to schedule a demo or learn more

- 1 800 966-9875 (U.S)
- 1-888-746-7426 (Canada)
- 1800-425-3333 (India)
- Or visit
  http://www.ibm.com/planetwide/ for contact information worldwide

IBM DB2 10.5 product page
Ibm.com/db2

DB2 with BLU Acceleration Microsite
www/ibmBLUhub.com

Tech forum on developerWorks
bit.ly/db2forumluw

SQL Tips Blog:
www.sqltips4db2.com

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- August 28, 2014 at 12:30 PM ET
- Soloman Barghouthi,
  WebSphere Portfolio Architect and Strategist
- Registration: bit.ly/tt2014aug

IDUG DB2 Tech Conferences Australasia and EMEA
- In-person conferences sponsored by IDUG
- Austrailasia in Sydney: September 10 – 12, 2014
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  www.idug.org, select events

IBM Insight Conference
- October 26 - 30, 2014
- Las Vegas, Nevada
- Information and Registration:
- http://www-01.ibm.com/software/events/insight

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