IBM’s Recommended Database Approaches for Optimizing Varying SAP Workloads

IBM DB2 10.5 Optimized for SAP Software

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All customer examples described are presented as illustrations of how those customers have used IBM products and the results they may have achieved. Actual environmental costs and performance characteristics may vary by customer. Nothing contained in these materials is intended to, nor shall have the effect of, stating or implying that any activities undertaken by you will result in any specific sales, revenue growth or other results.
Agenda

• SAP and IBM relationship on high level
• Overview of IBM DB2 for SAP solutions
• Elements of Total Cost of Ownership in SAP Infra
• Customer experiences
• DB2 Performance & Compression Examples
IBM - SAP Alliance is strong and exists on several areas and levels

1. Services

Consulting, go-to-market and hosting services:
- Application, Systems and HANA Consulting
- Architecture designs and best practices
- Joint sales and go-to-market offerings
- SAP Hosting and Cloud services, Migration services

2. Systems and Technology

Servers and hardware technologies:
- Power and x86 servers, IBM mainframe platform
- HANA Appliances: x86 and Power
- Storage and Flash

3. Software

Database offerings – DB2 for SAP:
- IBM DB2 on Linux, Unix and Windows
- IBM DB2 on mainframe
- Database administration, monitoring and security tools
DB2 Optimized for SAP - Roadmap

NW 7.x
- Multi-temporature management
- Deep integration of DB2 pureScale
- Seamless space reclamation
- Identity Management with DB2
- Cloud readiness

NW 7.x
- Optimized DSO activation for DB2 DPF
- Enhanced near-line storage
- Separation of duties
- ERP partitioning engine
- Integrated IHA for SAP
- Graceful maintenance

NW 7.0 SR3
- Turn-key HA solution
- Turn-key compression
- Integrated MDC advisor
- Deferred Table Creation

NW 7.0
- Embedded database
- Reduced storage costs
- Self tuning
- Minimal admin
- Enhanced DBA Cockpit

NW 2004
- Streamlined install
- Streamlined admin

2005
Version 9.1
- Storage limits removed
- Autonomic / TCO features
- Compression

2006
Version 9.2.2
- Automatic storage
- Deployment optimized for SAP

2007
Version 9.5
- Integrated & automatic HA+DR
- Integrated Flash Copy
- Threaded Architecture
- DPF Scaling Improvements

2008
Version 9.7
- Deeper Deep Compression
- 4x4x reduction in I/O latency
- 4x4x reduction in TCOs
- Compressed LOBs
- Near-0 Storage Admin
- Spaces MDC tables for single space reclaim
- Easy table space reclaim
- Ease the path to Automatic Storage
- Extending Online Operations
- Change schema definitions online
- Reorganization improvements
- Full 360° Monitoring

2009
Version 9.8 pureScale
- Continuous availability
- Seamless OS and hardware maintenance
- OLTP scale out

2010
DB2 9.8 pureScale
- Multiple temperature storage
- Multiple standby with time delay
- Extended transparent fail over

2011
DB2 10.0
- 2X warehouse performance improvement
- Adaptive compression
- Extended multi core support
- In touch space reclamation
- Geographically dispersed pureScale cluster
- Multiple temperature storage
- Multiple standby with time delay
- Extended transparent fail over

2012
DB2 10.1
- Factors improvement in performance and columnar
- compression with BLU acceleration
- Online rolling updates
- Comprehensive DR solution pureScale
- REORG-free database

2013
DB2 10.5
- Factors improvement in performance and columnar
- compression with BLU acceleration
- Online rolling updates
- Comprehensive DR solution pureScale
- REORG-free database

2014

2015

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IBM DB2 10.5 – Highlights for SAP

**Extreme Performance**
- Column-organized Tables
- DB2 BLU (feature)

**Low Operational Cost**
- Reorg Avoidance
- DB2 ACS Script Interface
- STMM Member Individual Tuning

**Reliability / Availability**
- Rolling DB2 FixPak update
- Comprehensive DR solution
- Online add member

**SAP Integration**
- SAP BW,
- DB2 Near-Line Storage for SAP BW,
- SAP OLTP,
- DBA Cockpit
- ABAP Dictionary
- Installation, Upgrade, Migration,
- DB6Conv, R3Load, db6_update_db
DB2 integration with SAP is fast, has less patching, and has longer support for each version

<table>
<thead>
<tr>
<th>Database version</th>
<th>Database GA</th>
<th>SAP DB GA</th>
<th>Delay between database and SAP GA (in months)</th>
<th>SAP DB support until</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB2 8.2</td>
<td>29th April 2005</td>
<td>3rd June 2005</td>
<td>1</td>
<td>31.12.2015</td>
</tr>
<tr>
<td>DB2 10.1</td>
<td>4th April 2012</td>
<td>16th July 2012</td>
<td>3</td>
<td>31.12.2027</td>
</tr>
<tr>
<td>DB2 10.5</td>
<td>26th June 2013</td>
<td>12th Aug 2013</td>
<td>2</td>
<td>31.12.2027</td>
</tr>
<tr>
<td>Oracle 11g</td>
<td>July 2007</td>
<td>Q2/2010</td>
<td>33</td>
<td>January 2015</td>
</tr>
<tr>
<td>Oracle 12c</td>
<td>June 2013</td>
<td>Q1/2015(?)</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>

Joint DB2 & SAP development: Early tests during the implementation in Toronto + Walldorf

- DB2 between 1-3 months delay supported by SAP
- DB2 supports existing database version for a long time (DB2 8.2 support ends after Oracle 11.2g de-support)

-> Relaxed long-term project planning combined with usage of most current DB2 technology
IBM DB2 Evolution of Compression Techniques
(compression ratios vs Oracle 9i, 10g, 11g etc)

<table>
<thead>
<tr>
<th>Commonly Referred to as …</th>
<th>DB2 Compression Results</th>
<th>Optimized, Best Cases</th>
<th>Typical Case, Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep</td>
<td>DB2 9.1, 9.5</td>
<td>40%-50%</td>
<td>40-45%</td>
</tr>
<tr>
<td></td>
<td>DB2 9.7</td>
<td>60%-70%</td>
<td>50-60%</td>
</tr>
<tr>
<td>Adaptive</td>
<td>DB2 10.1</td>
<td>70%-80%</td>
<td>60-65%</td>
</tr>
<tr>
<td>Actionable Compression</td>
<td>DB2 10.5 (without BLU)</td>
<td>75%-85%</td>
<td>65-70%</td>
</tr>
<tr>
<td></td>
<td>DB2 10.5 (with BLU)</td>
<td>85%-95%</td>
<td>80-85%</td>
</tr>
</tbody>
</table>

Note 1: Compression rates will vary by customer depending on the data, distribution, use.

Note 2: Besides smaller storage use and faster backups, DB2 compression improves performance on same hardware (due to reduced disk I/O).
## Operational Benefits

- **1st-year cost-avoidance Oracle licenses**: $250,000
- **Database size reduction**: 40%
- **1st-year (additional) storage cost savings**: $100,000
- **Annual license, storage, maintenance savings**: $175,000
- **Database response time improvement**: 5% to 10%
- **ROI**: +205%
- **ROI breakeven**: 8 months
- **5-year internal rate of return**: +133%
Results

• Despite the overall size & complexity of the project, the activities went largely according to plan and the project was considered highly successful.

• All SAP Oracle DB servers in scope migrated to IBM DB2.

• Targeted TCO improvements achieved through >100TB data reduction, storage & backup needs reduced by >50% through data compression. Performance on par or better, depending on application, compared to previous Oracle database setup.

• Business continuity sustained. One major incident during migrations of SAP BW databases, root cause found in faulty configuration of IBM DB2 and was proactively rectified for later migrations. Overall migrations went mainly as planned and e.g. most critical ones such as SAP ECC, APO, GTS where completed as planned.

• New database technology in use, with support ensured for 9+ years ahead.
Results achieved by utilizing private cloud

- **Database size**
  - 3.6 TB before migration (Oracle)
  - 1.5 TB after migration (DB2)
  - Database size reduction between 53% and 73%
  - Backup time reduced from 10h to 2h

- **Dialog Response times**
  - Key transaction response time improvement of 40%
  - Average response time improvement of 27%

- **Batch processing**
  - Runtime in average reduced by 50%

- **Memory consumption of SAP Database**
  - 45% less DB-RAM
  - 91% less RAM-SWAP
VolvoIT

• 29 Successful Golives - Never missed a Golive
• Performance has dramatically improved
• Backup and restore times are remarkably less
• Storage reduction of 54%

StoraEnso

• ERP performance up 22-40%
• Storage reduction of 65%
SAP on DB2 Technology Reduces Admin work -> Deliver Lower TCO

You can find more information about SAP on DB2 in SDN: http://www.sdn.sap.com/irj/sdn/db6
TCO Reduction through DB2 for SAP - Savings Details

<table>
<thead>
<tr>
<th>Cost aspect</th>
<th>DB2 Benefit</th>
<th>Typical Savings Potential</th>
</tr>
</thead>
</table>
| SW Cost             | - Reduction of database license and maintenance cost (compared to Oracle) through attractive DB2 prices  
                      - No cost for additional database management tools or separate add-on features based on comprehensive DB2 product bundle                                                                                       | ~ 25 - 40% (Maintenance 60%) |
| Storage             | - Reduction of storage cost through DB2 compression  
                      - Smaller database size  
                      - Less I/Os  
                      - Smaller backup volume and faster backups                                                                                                                                                  | ~ 60 - 75%                |
| Server              | - Reduction of server cost through better performance and scalability  
                      - Efficient use of RAM due to compressed data in DB2 buffers  
                      - Flexible virtualization support                                                                                                                                                    | ~10 -15% at database server |
| Operation / Administration | - Simplified administration, better patch/release-planning  
                      - Better 24x7 HA&DR solution for easier achievement of SLAs                                                                                                                                     |                           |
| TCO                 | Sum of all DB2 benefits – savings on the overall SAP infrastructure                                                                                                                                               | ~ 20-40%                  |
IBM achieves new WORLD RECORD (DB2 10.5)  
3-Tier SAP SD Benchmark, 266k SAP Users¹  

Featuring 64-core IBM Power® 780 AIX® 7.1 & DB2® 10.5  

DB2 on Power has held the leadership result for the highest number of SAP SD users on the three-tier SAP SD standard application benchmark for over 7 years²  

1) Results of DB2® 10.5 on IBM Power 780 on the three-tier SAP SD standard application benchmark on SAP enhancement package 5 for SAP ERP 6.0, achieved 266,000 SAP SD benchmark users, certification # 2013010. Configuration: 8 processors / 64 cores / 256 threads, POWER7+ 3.72 GHz, 512 GB memory, running AIX 7.1  
2) Results of DB2® UDB 8.2.2 on IBM eServer p5 Model 595 on the three-tier SAP SD standard application benchmark running SAP R/3 ® Enterprise 4.70 (ERP) software, achieved 168,300 SAP SD benchmark users, certification # 2005021. Configuration: 32-core SMP, POWER5, 1.9 GHz, 256 GB memory, running AIX 5.3  
3) Results of Oracle 11g Real Application Clusters (RAC) on SAP sales and distribution-parallel standard application benchmark running the SAP enhancement package 4 for SAP ERP 6.0, achieved 180,000 SAP SD benchmark users, certification # 2011037. Configuration: 8 x Sun Fire X4800 M2 each with 8 processors / 80 cores / 160 threads, Intel Xeon Processor E7-8870, 2.40 GHz, 8 x 512 GB memory, running Solaris 10  

Source: http://www.sap.com/benchmark  

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Sample of other DB2 Optimizations
SAP Profitability Analysis (COPA)

• SAP COPA is a SAP ERP module for reporting sales and profit data using different customized characteristics (such as customer, country, product) and key figures (such as cost, price)
• SAP COPA generates complex SQL queries with large number of aggregated rows (several 100 Million records)
• SAP default: DB2 parallel processing is switched OFF for SAP ERP
• SAP optimizer profiles can be used to switch on DB2 parallel processing on COPA tables (like CE1IDEA, CE3IDEA, CE4IDEA) using the SAP optimizer profile <DEGREE VALUE="ANY" /> (see SAP note 1818503)

=> Benefit: Significant performance improvements with DB2 parallel processing

IBM Lab Results:
• DB2 parallel degree increased from 1 -> 8  
  ➔ up to factor 4x faster
• DB2 parallel degree increased from 1 -> 16  
  ➔ up to factor 7x faster

Customer Results:  
➔ up to factor 3.8x faster  
➔ in average factor 1.8x faster
Row-oriented versus Column-oriented Data Store Model

Both data store models are valid and important for the business.
IBM DB2 BLU Acceleration

- **Dynamic In-Memory**
  In-memory columnar processing with dynamic movement of data from storage data

- **Actionable Compression**
  Patented compression technique that preserves order so that the data can be used without decompressing

- **Parallel Vector Processing**
  Multi-core and SIMD parallelism (Single Instruction Multiple Data)

- **Data Skipping**
  Skips unnecessary processing of irrelevant data

**Encoded**

Super Fast, Super Easy — *Create, Load and Go!*
No Indexes, No Aggregates, No Tuning, No SQL changes, No schema changes
BLU Acceleration in SAP environment:

50x improvement in performance of SAP BW queries

80% compression or higher, for all SAP fact tables

“As we have accurate insights faster, we will have more accurate simulations of what-if scenarios which will give our business a strong competitive advantage.”

Thomas Brauchle
Director of IT Technology & Infrastructure
IBM DB2 – One cost efficient database technology for all SAP Application Workloads

Average dialog response time
0.2 - 0.8 sec

Average dialog response time
0.4 – 2+ sec

IBM DB2
SAP Business-Suite, Industry Solutions
OLTP workload

IBM DB2
SAP BW
Big Data & op. Analytics
OLAP workload

IBM DB2
Near-line Storage for BW
Near-line Storage for HANA

Transactional
Analytical
Near-line Storage
Considering an upgrade?

Switching SAP environment to DB2

• Is risk free
• Reduces annual OPEX costs by >20%
• Improves OLTP performance by >30% and OLAP up to 10x-50x
• Pays back < 18 month
THANK YOU

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