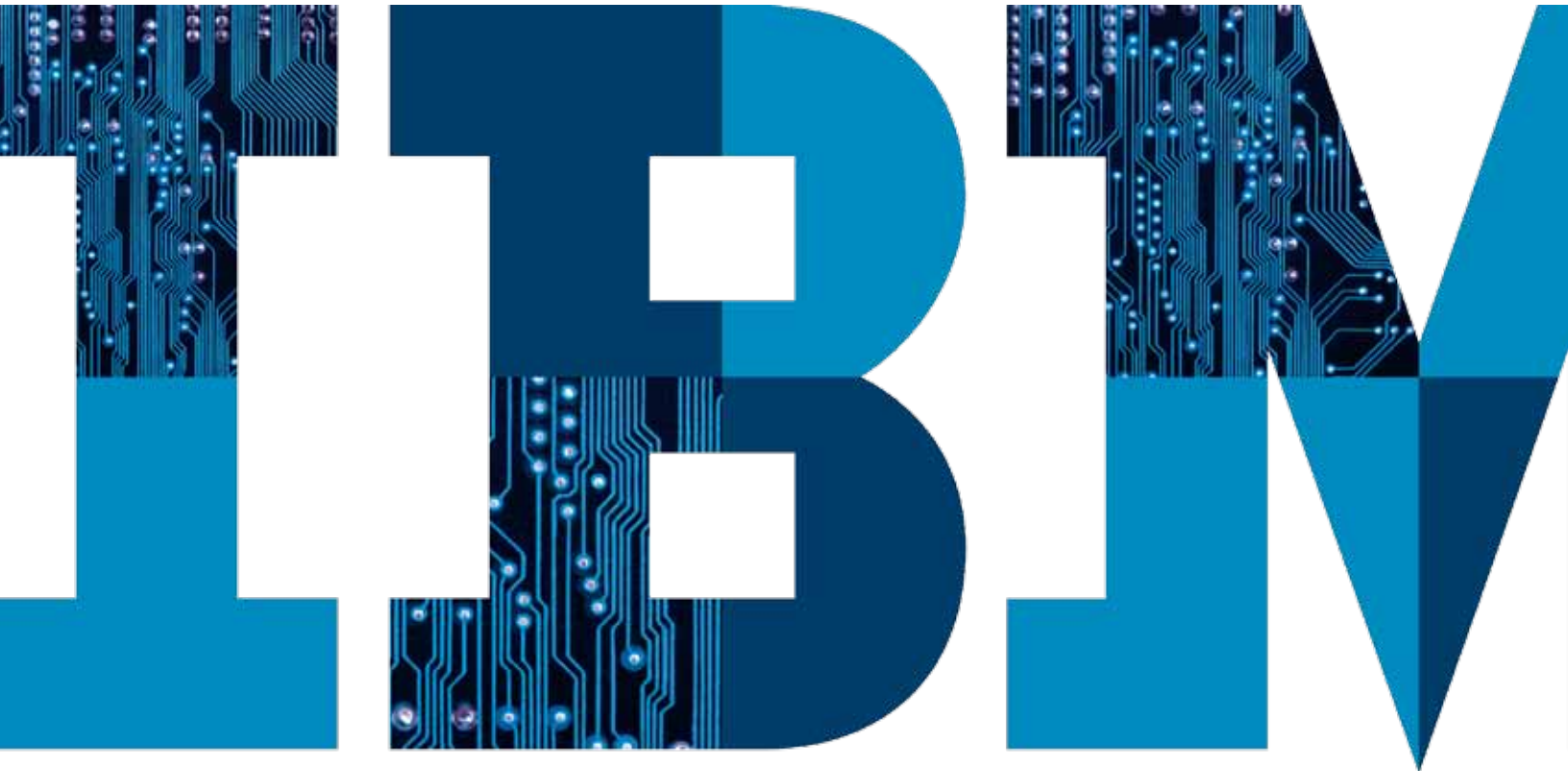# IBM DB2:
Optimized for SAP software

*Resources and information to help you make
the most of your SAP investment*

IBM

Contents

Section Three: Migration tools, techniques and skills

IBM and SAP: Collaboration with the customer in mind

Dave Laverty
Vice President, Marketing
IBM Information Management

IBM has been talking about how clients can transform their business by establishing an information strategy, or an Information Agenda. Our objective is simple—to help our clients better extract insight from their information, by getting the right information to the right people at the right time, addressing the need to integrate the various data sources and delivering that data in the right business context.

Our relationship with SAP is an extension of the same principle. IBM and SAP have a long-term commitment and investment to deliver DB2 as the preferred database for SAP. Over 100 IBM and SAP developers are jointly working on the DB2 Optimized for SAP initiative. SAP has migrated their internal systems to DB2—SAP runs DB2! DB2 gets certified by SAP within weeks of new releases. All of these reasons imply the least amount of risk for clients.

In fact, more than 700 SAP clients, such as Coca-Cola Bottling Co. Consolidated and Reliance Life, have turned to IBM DB2 database software to manage heavy database workloads for improved performance, reducing their storage needs by up to 70 percent and lowering their overall costs.

A wide range of resources—including IBM Redbooks, white papers, flyers and case studies—are available on various aspects of migration, design and support for DB2 in SAP environments. This guide contains a collection of the most-requested publications, from detailed technical documents and analyst reports to executive-level analysis and customer success stories.

The joint SAP and IBM collaboration is the biggest IT alliance and collaboration in the world. If you don't see the information you need here, you can find additional resources online at www.ibm-sap.com/db2 or contact InfoService at the IBM SAP International Competence Center in Walldorf, Germany via email at ISCC@de.ibm.com.

Thank you,

Dave Laverty

"We asked SAP for advice, they recommended DB2: it is their preferred database, and they work closely with IBM to optimize performance and reliability via a strategic roadmap for synchronized development. In fact, the close alliance between IBM and SAP is a major advantage in all respects, because it ensures good technical support and a stable platform for the future."

—Edwin Joseph, Head of IT, Gabriel India Ltd

The advantages of using DB2 in SAP environments

This section features a variety of publications describing IBM® DB2® technologies that help improve performance, reduce costs, ensure high availability and simplify administration in SAP environments. Here is some of the information you'll find in the pages that follow:

Optimization: Discover the many ways DB2 is optimized specifically for SAP. Learn how the IBM DB2 Storage Optimization Feature brings operational savings to SAP customers.

Cost reduction: Gain a better understanding of how DB2 can help decrease total cost of ownership with lower licensing and maintenance fees, simplified installation and administration, and enhanced hardware resource usage.

Near-line storage: The IBM DB2 Near-Line Storage solution for SAP NetWeaver Business Warehouse is designed to accommodate data growth while enhancing the performance of your online database. Get detailed information about deploying and managing a near-line storage environment without adding complexity.

Scalability: IBM DB2 pureScale® clustering technology helps deliver scalability that is transparent to applications and enables the database to continue processing through most unplanned outages.

High availability: DB2 features integrated high availability with failover times measured in seconds. Find out how one company achieved near-zero downtime with IBM DB2 HADR and IBM Tivoli® System Automation for Multiplatforms.

Ease of administration: Learn how IBM DB2 extends the value of SAP with easy-to-use administrative tools, including the fully integrated DBA Cockpit for DB2. Compare the complexity of tasks such as compression, backup and recovery for Oracle and for DB2, and learn how the ease-of-use features in DB2 can help increase productivity.
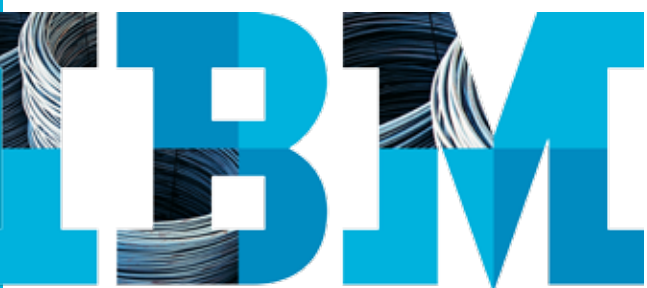
"IBM DB2 will be the database going forward for all of our SAP applications."

—Tom DeJuneas, IT Manager
    Coca-Cola Bottling Co. Consolidated

IBM Flyer

IBM DB2 Optimized for SAP software

Highlights

- Decreases total cost of ownership with lower licensing and maintenance fees, simplified installation and administration and better hardware resource usage

- Reduces the database size of your SAP systems significantly

- Features integrated high availability with failover times measured in seconds—at no additional charge

- Extends the value of SAP with easy-to-use administrative tools, including the fully integrated DBA Cockpit for DB2

- Maintains an unmatched record of outstanding IBM® DB2® performance on a wide variety of industry-leading SAP benchmark tests

- Integrated near-line storage solution for SAP® NetWeaver Business Warehouse (SAP NetWeaver BW)

Real innovation, real solutions in SAP environments

SAP customers need to make strategic decisions in today's economic environment, including:

- How to better manage current investments made in their SAP infrastructure.
- How to lower risk, optimize performance and get maximum value.

Many customers are unsure just where to begin, as the landscapes inherited are unique in terms of number of instances, SAP components deployed, customization, etc.

Opportunities exist around databases and virtualization that can give your organization a strong business case (cost savings, cost of ownership, performance) to re-platform with IBM DB2, particularly at the time of application migration.

"The close cooperation between IBM and SAP is exceptional in the tech industry, extending from the development teams and go-to-market plans to our service and support offerings. This results in innovations which translate into savings for our customers."

– Torsten Ziegler, DB2 Development Manager, SAP

Customers stand to gain many-fold by re-platforming to DB2

Optimum customer value from SAP applications will come from having a single homogenous platform to run it on, and DB2 is the jointly chosen platform (SAP runs its own systems on DB2):

- DB2 is optimized for SAP and will help customers get the most out of their SAP investments, lower infrastructure costs and get great performance.

IBM is committed to helping you get started with the DB2 savings:

- The migration is virtually risk free.
- IBM can provide a fixed-price offer to migrate the customer's existing SAP databases to DB2.
- The retraining time for DB2 is typically less than or equal to two weeks.
- For retraining, IBM and SAP provide training classes; other resources include IBM Redbooks, white papers and a large user community.

DB2 is uniquely packaged and optimized for SAP applications. It will help you lower the overall risk and cost for your SAP environment and vastly improve the overall performance.

Leading performance

DB2 has established an unmatched record of outstanding performance on a wide variety of industry-leading SAP benchmark tests. Since May 13, 2005, DB2 has led the SAP Sales and Distribution (SD) 3-Tier Application Benchmark with DB2 on IBM eServer™ p5, delivering 68 percent better performance compared to competitive hardware/database combinations.[1] DB2 has been designed with unique scale-out and scale-up capabilities and tight linkages to SAP application logic to consistently deliver optimized performance.

Coca-Cola Bottling Co. Consolidated migrated to DB2, improving the database response time 5 to 10 percent and reducing the database size by approximately 30 percent. The lower costs for data maintenance and improved ability to compress data have lowered overall costs with an anticipated ROI of 205 percent.

Watch the Jebsen & Jessen SEA (a large Asia-based technology firm) video to see how IBM DB2 and SAP can help you achieve your green objectives (www.youtube.com/watch?v=2qMWrjN59C0).

"IBM DB2 will be the database going forward for all of our SAP applications."

– Tom DeJuneas, IT Manager, Coca-Cola Bottling Co. Consolidated

DB2 Optimized for SAP software: An integrated roadmap for long-term success

The alliance of IBM DB2 and SAP represents more than just a technology agreement. It is based on five major pillars:

- **SAP runs DB2.** SAP has standardized on DB2 for its major business systems and has chosen DB2 as a strategic development platform. More and more systems within SAP now rely on DB2—as of the end of December 2009, more than 1,000 SAP systems were based on DB2.
- **Joint development/technology roadmap.** The two companies collaborate on a jointly defined and implemented DB2 technology roadmap. The main goal of the roadmap is for each new SAP release to have an optimally tuned database release.
- **Release synchronization.** DB2 Optimized for SAP software ships fully integrated as one product. You can rely on the ease and simplicity of integrated installation, one-stop service and a synchronized maintenance strategy. Due to the synchronized 5-1-2 or 7+2 maintenance strategy, customers will not be forced to make a database upgrade of their SAP system. Your organization can stay on the initially supported database version for the whole maintenance cycle.

- **First certification for DB2.** The teams' intense testing and verification during the entire development cycle help guarantee a new level of security at customer sites. This joint effort also ensures that new DB2 versions are available for SAP customers without delay following general availability—so they can immediately benefit from the new technology.
- **Partnership.** Unique in the industry, DB2 Optimized for SAP software is jointly created by IBM and SAP teams who work together in development, quality assurance and testing.

Minimizing disk space consumption

DB2 row compression provides better resource exploitation, resulting in increased I/O bandwidth, memory exploitation and CPU utilization as well as better response time. It also provides significant savings in disk space usage—up to 90 percent for certain tables. Based on the experiences in several customer implementations and a large data warehouse customer benchmark, IBM found overall database size reductions of up to 50 percent. At the same time, the response time for user requests improved by up to 20 percent.[2]

IBM DB2 9.7 uses additional compression technology to further shrink the database size. With the index, temporary table and large objects (LOB) compression available, DB2 now allows storage savings of up to 70 percent for SAP systems. Index compression, for example, reduces both I/O and the size of the index structure.

Turning the roadmap into reality

Administration and configuration

DB2 provides highly automated database administration for reducing the cost of operation with features such as self-managing storage, self-tuning memory configuration, automatic reorganization, automatic runstats, real-time statistics and backup via the integrated FlashCopy® feature. All database administration and monitoring tasks can be done within the DBA Cockpit for DB2—an easy-to-use management environment integrated into the SAP application.

Query performance and business intelligence differentiators

For users who need to further exploit SAP NetWeaver Business Intelligence (SAP NetWeaver BI) query performance, DB2 offers a unique multidimensional clustering (MDC) capability. Unlike range partitioning, MDC allows users to prestructure the data over more than one dimension for less data processing, yielding faster data access and query results. MDC can be combined with the DB2 Database Partitioning Feature (DPF), a shared-nothing architecture with proven linear scale-out capability. In fact, scalability is virtually unlimited—up to 1,000 nodes.

With DPF, the DB2 database is distributed across multiple servers. Each node operates independently in a shared-nothing architecture, communicating with other nodes over the network. DB2 assigns a portion of each query to these servers, and the results are combined before providing them back to the originator. This division of work speeds up queries within SAP Business Information Warehouse. MDC and DPF for SAP NetWeaver BI can significantly boost query response times by using innovative database technology.

Recovery and high availability

Backup/restore, recovery and log file archiving are integral components of the DB2 engine. DB2 directly manages this fundamental functionality to minimize administration time and effort and to help ensure the highest security and stability for this vital part of the database. The cornerstones of 24x7 implementations are DB2 High Availability Disaster Recovery (HADR) and IBM Tivoli® System Automation, which allow system takeover in seconds. The SAP installation tool and process provide support for setting up a high availability environment, helping to make deployment easy and secure, and helping to decrease initial setup effort. Customers using HADR may also use this setup for rolling upgrades to help avoid system outages during their planned maintenance windows.

Deployment

Fully integrated into the SAP installation process, DB2 installs on Linux, UNIX and Microsoft Windows platforms. With DB2, IT administrators can install different releases of DB2 on one server—allowing customers more flexibility in their maintenance strategies and enabling the exploitation of virtualized server environments.

For more information

To learn more about IBM DB2, contact your IBM representative or IBM Business Partner, send an email to the IBM SAP International Competence Center at isicc@de.ibm.com or visit www.ibm-sap.com

To access this article online, visit:
ftp://129.35.224.112/common/ssi/pm/fy/n/imf14007usen/
IMF14007USEN.PDF

1 The benchmark was performed by IBM in Beaverton, OR, USA on May 11, 2005 and May 13, 2005, certified with the following data: 168,300 SAP SD users; 1.95 second average response time; 16,896,670 processed order line items/hour; OS: IBM AIX® 5.3; RDBMS: DB2 UDB 8.2; R/3 Release 4.70; database server: IBM eServer p5 Model 595, 32-way SMP, POWER5™, 1.9 GHz, 32 KB(D) + 64 KB(I) L1 cache per processor, 1.92 MB L2 cache and 36 MB L3 cache per two processors, 256 GB main memory (Cert #2005021). More information at sap.com/benchmark

2 "Extreme Business Warehousing: Experiences with SAP NetWeaver® Business Intelligence at 20 Terabytes Using IBM DB2® Storage Optimization Feature." October 26, 2007.

"One of the reasons that we chose DB2 was the built-in HADR database replication, which gives us high availability with no additional cost or complexity. The automatic configuration tools in DB2 optimized for SAP software are saving us time and manual work, and freeing up my team to focus on the applications rather than on database issues. We are now doing much more productive work with the same manpower as before."

—Roy Lim
    Operations Manager, Jebsen & Jessen SEA

SAPinsider Article

Reduce your costs with IBM DB2 9.7 Optimized for SAP software

In light of the financial crisis, IT organizations are urged to further optimize their businesses and run their systems at minimum costs. An ideal place to maximize performance is in the database, a core infrastructure component of SAP's business applications.

Optimizing performance at the database level helps reduce costs, free up budgetary funds, increase user productivity and contribute to the overall success of the business because of more efficient and effective utilization of existing hardware resources.

Continuing its partnership with SAP, IBM recently released version 9.7 of IBM® DB2® for Linux, UNIX and Windows (DB2 LUW), which is IBM's fourth database version optimized for use in SAP environments since 2005. With the index, temporary-table and large objects (LOB) compression available with DB2 9.7, IBM continues the success of the DB2 row compression story, which now allows storage savings of up to 70 percent for SAP systems running on DB2. Index compression, for example, reduces both I/O and the size of the index structure.

DB2 9.7 has been integrated even deeper into SAP applications and the DBA Cockpit than all previous versions of DB2 optimized for SAP software. An integrated solution can help you optimize your business and reduce the operational costs of your SAP system landscapes (see sidebar). All DB2 administrative functions can be accomplished by using the DBA Cockpit, which is an SAP transaction. This simplifies operations and eliminates the need for technical staff to learn and use another application.

With just a mouse click, functions such as compression or the Index Advisor can be invoked, helping database administrators stay productive and minimizing training needs.

Companies are leveraging technological excellence for lower TCO

Before DB2 9.7 became available, customers reported significant savings by migrating their database to DB2. Today, companies could realize higher savings with DB2 9.7. Here's a sampling of what companies are saying about DB2:

"We concluded that DB2 UDB would cost 40 percent less over five years, including licensing, maintenance and migration," says Ulrich Klenke, CIO, rku.it.

"By choosing to implement DB2 compression right away, we have reduced the database size by around 40 percent. This gives us faster backup and reduced storage costs, and makes the SAP technical upgrades easier and quicker," says Andrew Juarez, SAP Lead Basis, Coca-Cola Bottling Company Consolidated.

"Schaeffler KG achieved a 43 percent saving in total storage requirements when using IBM DB2 with Deep Compression for its SAP NetWeaver BI application, when compared with the former Oracle database. The total size of the database shrank from 8 TB to 4.5 TB, and response times were improved by 15 percent. Some batch applications and change runs were reduced by a factor of 10 when using IBM DB2," says Markus Dellermann, Project Manager, Schaeffler KG.

Your DB2 9.7 roadmap

If your SAP system already runs on DB2, you can simply upgrade your database to the new version—DB2 9.7 is supported for all SAP applications in standard and extended maintenance.

If you are not yet using DB2, there are several natural opportunities during the system lifecycle for migrating a database to DB2, such as during SAP upgrades, Unicode migrations or hardware changes. IBM provides support to make these migrations successful.

IBM DB2 Migration Factory eases the transition

To make the transition to DB2 as smooth, fast and secure as possible, IBM has introduced the IBM DB2 Migration Factory for use with SAP software. The IBM DB2 Migration Factory provides all of the necessary services required to move a customer's SAP application environment from a legacy database to DB2 LUW. The solution applies the standard SAP design interface required of databases to run SAP applications.

IBM has deployed a T-shirt pricing model (with small, medium and large options) for customers to use the IBM DB2 Migration Factory as a service plug-in for projects that combine database migrations with SAP software upgrades or Unicode conversions.

For more information

To learn more, please visit www.ibm-sap.com/db2 or email the IBM SAP International Competence Center in Walldorf, Germany, at isicc@de.ibm.com.

You can also find comprehensive, detailed information about running SAP software on DB2 LUW solutions at https://www.sdn.sap.com/irj/sdn/db6

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IBM Solution Brief

IBM DB2 Storage Optimization Feature brings operational savings to SAP customers

Highlights

- Helps manage storage growth

- Helps improve database performance

- Helps reduce storage space and memory requirements

- Helps reduce administration costs and increases productivity of the IT team

- Facilitates lower total cost of ownership through savings in storage

- Provides seamless integration into SAP operations

The all-encompassing nature of SAP environments requires a database that performs efficiently and cost-effectively. With massive amounts of data in enterprise SAP environments, IBM® DB2® Storage Optimization Feature can not only help reduce storage costs but also contribute to increased performance. IBM customers have experienced storage reductions up to 70 percent and SAP response time improvements up to 30 percent from implementing DB2 Storage Optimization Feature, also known as DB2 compression.

DB2 is tightly integrated with SAP software

DB2 is field-proven to deliver high performance, high availability and scalability to SAP environments. Jointly developed by IBM and SAP teams, DB2 Optimized for SAP solutions uses features such as automatic storage and self-tuning memory management and is SAP workload–aware through the installation process. As part of the development effort, IBM and SAP integrated an option within the DBA Cockpit that directly invokes compression for tables. In addition, an SAP-provided report identifies a list of best candidates to compress,[1] which makes DB2 row compression not only important for storage savings but also easy to use.

"Our database is now 43 percent smaller than before, and some of the largest tables have been reduced by up to 70 percent. Despite the compression, there has been no impact on batch performance, and our most important online transactions are actually 20 percent faster with the new version of DB2."

—Roland Heim, SAP Basis Administrator, INTER Versicherungen
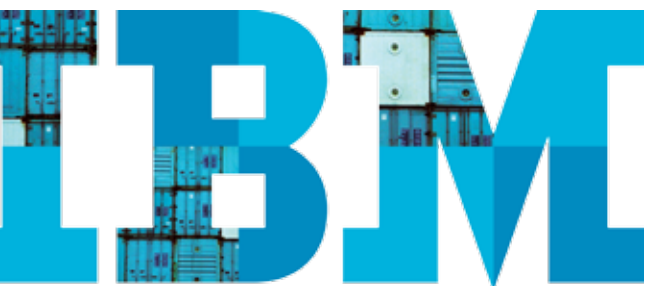
DB2 compression helps reduce storage

DB2 compression reduces database storage requirements by eliminating data redundancy. This compression technology is known as DB2 row compression. Data rows are compressed by replacing patterns of value that repeat across database rows with shorter symbol strings. This kind of compression algorithm is used for tables, temporary tables and large objects (up to 32 K). DB2 provides industry-leading reductions in storage needs by compressing data at the table level rather than the page level, which is typical of other databases. The DB2 approach leads to fewer pages per table and less data to store, and therefore lower storage costs. Additional significant storage savings will be achieved by using DB2 index and backup compression. During the SAP installation process, "deferred table creation" can be selected, which reduces the storage requirements even more. Because many SAP tables are not used in a production system, tables consuming space will therefore be created only when needed. Since storage represents nearly 48 percent[2] of the total cost of a typical enterprise IT infrastructure, cutting storage costs can dramatically affect total costs.

Applying DB2 compression beyond the production database can yield additional savings. For example, DB2 can bring similar savings to test and development environments. Compressed databases translate into reduced backup storage as well as less mirrored and off-site storage. When combining all the storage in an SAP environment that can be reduced by DB2 Deep Compression, the savings quickly add up. Other storage-related costs are also reduced, including rack space, cables, floor space, and cooling and power systems, making an investment in DB2 compression very attractive.

Experience shows that DB2 compression delivers compelling savings

A simple example shows the multiplier effect that DB2 compression can have on storage costs. An organization with a 2 TB database warehouse may also incur storage costs for a 2 TB development database, a 2 TB test database, weekly logs and backup copies of the 2 TB database and two to three backups for security reasons—up to 12 TB total—and potentially even a 2 TB off-site mirror. Thus, the 2 TB database could consume as much as 12 TB–14 TB of storage—more storage than most of us would initially think.

As a result of DB2 compression, it is assumed that disk requirements are cut in half, power and cooling are lowered, fewer administrative resources are needed and less floor space is required. Together, these benefits can lead to a potential of more than USD1 million savings on 2 TB of production data,[3] as shown in Figure 1. As explained earlier, this is a conservative approach, and the real compression rates and savings can even be higher.
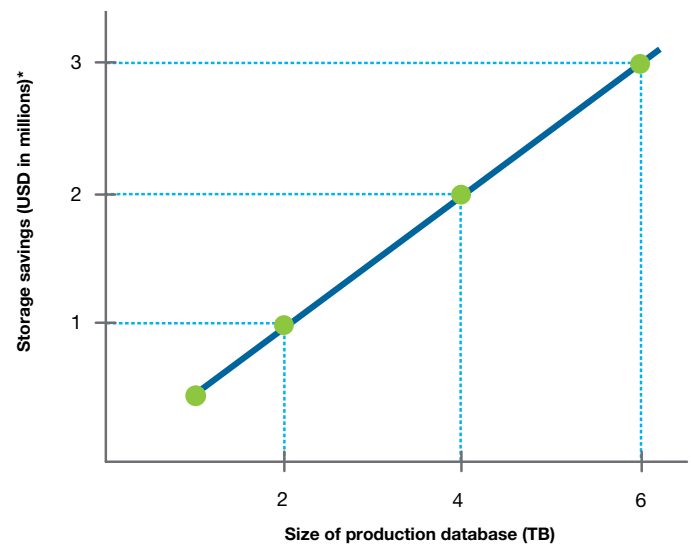
* Assumes the total storage is seven times the size of the production database (includes development, test, backups and mirrored databases plus logs). See **ibm.com**/db2 (Online Demo – Deep Compression with DB2 Optimizing Database Storage Costs) for more information.

Figure 1: Projected storage cost savings only from DB2 row compression assuming a compression rate of only 50 percent.

Smaller databases often mean higher performance

Database performance often increases when compression is added. The reason is simple: due to DB2 compression, less data is read from disk and can be stored in memory, making more efficient use of I/O bandwidth and memory available to the server. As a result, queries and other activities execute significantly faster.

INTER Versicherungen, an insurance group based in Germany, reduced its database size by 43 percent using DB2 row and index compression.

Because the volume of storage in SAP environments continues to grow over time, the savings from compression would also grow, making a compression initiative all the more compelling.

"By using DB2 Deep Compression, Newell Rubbermaid has achieved average database compression ratios of 58 percent… Additionally, database administration workload has been reduced by around 25 percent, with the integrated DBA Cockpit making a significant contribution to our cost-saving objectives."

—Creighton Kelly, Director of IT for the SAP Infrastructure, Newell Rubbermaid

Unicode conversion: A perfect time to move to DB2

Moving to the Unicode standard is a perfect time to migrate to DB2. A Unicode conversion often results in a substantial increase in database size, but this can be mitigated up front by using DB2 compression, resulting in a smaller database as shown in Figure 2. Unicode conversion and DB2 migration in a single step can also help produce savings in storage costs and backup and recovery time. This single-step approach can result in less overall downtime.

Database	Storage needed without Unicode	Storage needed with Unicode[4]	Storage needed for Unicode with compression[5]
DB2 for Linux, UNIX, Microsoft Windows	100%	90%–110%	45%–55% (DB2 compression factor = 50%)
SAP® MaxDB™	100%	140%–160%	No compression
Microsoft SQL Server	100%	140%–160%	Limitations: SAP Note: 1139642 about 100+%, (30% compression ratio ... source SAPinsider, April 2009)
Oracle	100%	90%–110%	Limitations: compression fully supported only for Oracle 11.2 with SAP kernel 6.40_EX2 and higher

Figure 2: Storage requirements for databases with and without Unicode.

DB2 brings exceptional price/ performance to SAP solutions

IBM DB2, with its compression capability tightly integrated with SAP applications, can help SAP customers achieve considerable storage cost savings while also boosting SAP performance, which can improve user productivity and help lower total cost of ownership.

Influence of DB2 backup technology on backup size and runtime

Scenario	Relative size*	Relative runtime**
No table compression, no index compression, backup compression	22%	200%
Table compression, no index compression, no backup compression	56%	--
Table compression, no index compression, backup compression	19%	--
Table compression, **index compression**, no backup compression	34%	50%
Table compression, **index compression**, backup compression	12%	100%

 * Relative size compared to original database size

** Relative runtime of backup compared to backup without any compression

The table shows a series of measurements done at a customer site and how the different compression techniques can influence the duration and size of backups.

For more information

More information about IBM DB2 can be found through the following resources:

- IBM SAP International Competence Center: isicc@de.ibm.com
- SAP and DB2 software: ibm-sap.com/db2
- IBM and SAP alliance: ibm-sap.com

To access this article online, visit:

ibm.com/common/ssi/cgi-bin/ssialias?infotype=PM&subtype=SP&appname=SWGE_IM_IM_USEN&htmlfid=IMS11832USEN&attachment=IMS11832USEN.PDF

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1 Documented in SAP Note 980067. "DB6: Using DB2 Row Compression." This tool is an SAP ABAP™ program called /ISIS/ZCOMP and referred to as a "row compression tool" within the document.

2 For more information, visit https://www14.software.ibm.com/webapp/iwm/web/signup.do?lang=en_US&source=sw-infomgt&S_PKG=db2_compression_demo

3 Ibid.

4 Based on SAP data: http://service.sap.com/unicode. Go to Unicode Media Library and choose Unicode Information on Special Topics and then Unicode Hardware Requirements. Please note: this site requires a password.

5 Based on database vendor and SAP data, and SAP Note 701235.

IBM Solution Brief

IBM DB2 Near-Line Storage solution for SAP NetWeaver BW

Help boost SAP NetWeaver Business Warehouse performance and reduce costs without sacrificing data access

Highlights

- Reduce costs by moving infrequently used data to cost-effective systems

- Deliver fast access to archived data within a near-line storage environment

- Simplify management with seamless integration between IBM® DB2® and the SAP NetWeaver® Business Warehouse component

- Improve performance on the reduced data set for frequent jobs

- Delivered as part of SAP NetWeaver Business Warehouse and available at no cost for organizations that purchase DB2 through SAP

The SAP NetWeaver Business Warehouse (SAP NetWeaver BW) component is a vital tool for organizations that need to transform vast quantities of data into actionable intelligence. But customer growth, rising numbers of transactions and the incorporation of new types of data can create excessively large online SAP NetWeaver BW databases that slow query responses, increase management complexity and add costs. Organizations need ways to streamline the online database without giving up easy access to data.

The IBM DB2 Near-Line Storage solution for SAP NetWeaver BW is designed to accommodate data growth while enhancing the performance of your online database, reducing costs and retaining fast access to information. Through a close, long-standing partnership, IBM and SAP have produced a fully integrated solution that enables you to deploy and manage a near-line storage environment without adding complexity.

Facing the challenges of explosive data growth

Volatile data growth can significantly impact the performance of your SAP NetWeaver BW implementation. As the volume of information in the online database swells to tens of terabytes, query response times increase, sapping employee productivity and discouraging decision makers from conducting potentially valuable analyses.

Data growth also translates into added costs. To support an expanding database, IT groups often buy more servers, storage and network components, and IT personnel spend more time managing databases and systems than contributing to strategic projects.

Many organizations could benefit from moving historical and infrequently used data out of their online SAP NetWeaver BW databases to archival systems. Data that is several years old and accessed only a few times per year does not need to reside in databases that use high-performance hardware and high-availability solutions. Yet IT administrators are reluctant to archive data because archival systems make it difficult and time-consuming to retrieve information.

Overcoming hurdles with near-line storage

By creating a near-line (or "near-online") environment, the DB2 Near-Line Storage solution for SAP NetWeaver BW provides a middle ground between online and traditional archival systems. Administrators can move infrequently used data out of the online database to a separate database, reducing the size of the online database and consequently boosting its performance. At the same time, keeping data in a DB2 database enables organizations to capitalize on DB2 management capabilities; users can access information in the DB2 database more quickly than if the data was archived in another file system or on tape.

From delivery and installation to ongoing management and technical support, the DB2 Near-Line Storage solution is fully integrated into SAP NetWeaver BW. For both administrators and users, the solution helps to deliver a seamless SAP NetWeaver BW experience.
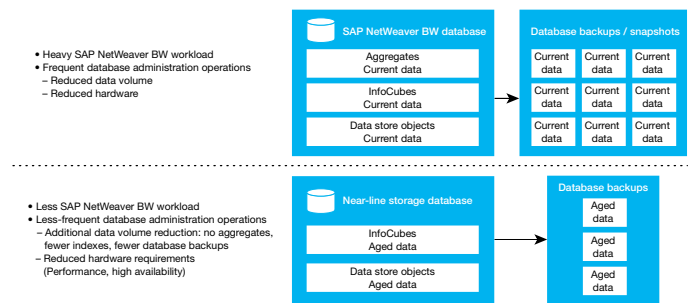
Figure 1: Near-line storage can help improve performance while reducing costs by decreasing the storage capacity required for online systems and minimizing administrative operations.

Simplifying management with tight integration

Administrators can create the near-line environment rapidly using only the SAP installation tool. They then add a near-line storage connection to the SAP NetWeaver BW system and create a data archiving process for each InfoProvider. Administrators can select particular data to be moved or set rules based on age of data, product group or other criteria. Through the archiving interface, data can be transferred to the near-line environment, the traditional archival system or both—simultaneously. The entire process can be automated to further simplify management.

Data stored in the near-line database is read-only. To enable modification of the data, administrators simply reload the data into the online SAP NetWeaver BW system and then transfer data back to the near-line system after changes are made.

For those and all other tasks, no specialized IT skills are required—administrators can draw on existing skills for managing SAP NetWeaver BW and DB2 environments. The ability to automate tasks and use remote management capabilities through the DBA Cockpit helps ensure that the near-line environment will not add IT complexity. If additional support is required, organizations can rely on standard SAP NetWeaver BW on DB2 support channels.

Increasing online performance

By moving infrequently used data out of the online database, the DB2 Near-Line Storage solution for SAP NetWeaver BW can help significantly increase performance of the online system. Reducing the size of the online database can accelerate data load times and query results while also speeding up frequent maintenance tasks, such as backing up data and taking snapshots.

The solution also brings proven DB2 capabilities to the near-line environment. These capabilities, such as automatic storage, self-tuning memory management, index and row compression, Multi-Dimensional Clustering (MDC) and the Database Partitioning Feature (DPF), help enhance database efficiency, facilitate scaling and optimize performance.

Reducing costs

By moving data off of the high-performance—and high-cost—systems often used for running SAP NetWeaver BW, the near-line storage solution can help organizations significantly decrease costs. Keeping only recent, frequently used data in the online database helps you avoid purchasing more and more hardware to stay on pace with data growth. Administrators can deploy the near-line storage environment using more cost-effective servers, storage and networking since users do not need instantaneous access to that historical data. Using DB2 Compression technology in the near-line environment helps control costs by minimizing the storage capacity required even as the database volume grows. Sub-capacity pricing also allows cost-effective DB2 licensing solutions.

Creating a near-line environment also can help reduce management costs. Typically, the information stored in a near-line system does not have the same availability requirements as the data kept in an online system. As a result, administrators do not have to back up that data as frequently or take continuous snapshots. Because they can send data to the traditional archival system at the same time as the near-line environment, administrators can keep data well protected without excessive manual intervention.

Accelerating access to information

Moving infrequently used data to traditional archiving environments can deliver some similar performance and cost benefits as the near-line solution. But once data is moved to those archival environments, access to information is limited. A query that takes only seconds in the online system might take much longer in an archived environment because archival tapes must be mounted and data must be reloaded to read all the information needed.

With the DB2 Near-Line Storage solution for SAP NetWeaver BW, users continue to have transparent access to the data in the near-line storage database. They access data in that near-line database the same way they would access data in the online SAP NetWeaver BW database and experience only slightly longer query times. As a result, users can work with even infrequently used data to generate new business insights.

Providing options with flexible implementation

While this solution uses DB2 for the near-line environment, it can be deployed even if you currently use a different database platform for SAP NetWeaver BW. The DB2 Near-Line Storage solution for SAP NetWeaver BW gives you the flexibility to capitalize on near-line storage without forcing you to upgrade or modify your existing environment.

IBM also offers an appliance-based version of this solution with the IBM InfoSphere® Balanced Warehouse® C-Class system. This complete, preconfigured solution is designed to help small and midsize organizations capitalize on a robust business warehouse solution while minimizing configuration and management requirements.

Delivering business intelligence

The DB2 Near-Line Storage solution for SAP NetWeaver BW can help you accommodate fast-rising volumes of data while improving performance, reducing costs and simplifying access to information. Delivered as part of SAP NetWeaver BW and available at no cost for organizations that purchase DB2 through SAP, this solution provides a simple way to combine the power of SAP NetWeaver BW and DB2 to deliver effective business intelligence.

For more information

To learn more about the DB2 Near-Line Storage solution for SAP NetWeaver BW, please send email to the IBM SAP International Competence Center at isicc@de.ibm.com or visit:

- www.ibm-sap.com/db2
- www.sdn.sap.com/irj/sdn/db6

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IBM DB2 pureScale: Scalability and availability to support business growth

Designed for organizations that run online transaction processing (OLTP) applications on distributed systems, IBM® DB2® pureScale® software is based on technology from IBM DB2 for z/OS® and is available as an option on the IBM DB2 9.7 Enterprise Server Edition. DB2 pureScale helps reduce the risk and cost of business growth by providing near-limitless capacity, continuous availability and application transparency.

DB2 pureScale software provides practically unlimited capacity for transactional workloads. Scaling your system is simply a matter of connecting a new node and issuing two simple commands. Its cluster-based, shared-disk architecture reduces costs through efficient use of system resources. DB2 pureScale also provides continuous availability through the use of highly reliable clustering technology on IBM systems and a redundant architecture.

There is no need to change your application code to efficiently run on multiple nodes. You can even run applications written for other database software with little or no changes—DB2 offers native support for commonly used syntax and PL/SQL procedure language, making it easier than ever to move from Oracle database to DB2.

A detailed how-to guide from SAP, *Running an SAP System on IBM DB2 pureScale*, shows how to install or upgrade to DB2 pureScale in an SAP environment. Find this guide and more resources at www.sdn.sap.com/irj/sdn/db6

DB2 pureScale software on IBM Power Systems

DB2 pureScale on IBM Power Systems™ leverages IBM mainframe prowess, including reliability and virtualization features and unique energy-saving capabilities, to deliver performance gains.

DB2 pureScale is supported on selected IBM POWER6® and POWER7® servers. DB2 pureScale on Power Systems also incorporates PowerHA® pureScale technology to further boost database scalability and availability.

In addition, the IBM pureScale Application System is an integrated system that is workload optimized for transactional processing. It extends the reliability, speed and performance of DB2, IBM WebSphere® Application Server and IBM Power 770 servers with PowerHA pureScale clustering technology.

DB2 pureScale software on IBM System x

DB2 pureScale on IBM System x® leverages the outstanding business benefits of IBM X-Architecture® and runs SUSE Linux Enterprise Server, providing a cost-effective, open, reliable and secure IT environment that is flexible enough to meet ever-changing workload demands.

DB2 pureScale is supported on System x3650 M3, System x3690 X5 and System x3850 X5 servers.

For more information

To find out more about DB2 pureScale software, please visit: **ibm.com**/software/data/db2/linux-unix-windows/editions-features-purescale.html

IBM Brochure

IBM DB2 pureScale

Near-limitless capacity with continuous availability

In today's business environment, agility is everything. Business is never closed in a globalized world—even a small gap in availability for critical systems can impact customer satisfaction and result in lost revenue. What's more, capitalizing on opportunities often depends on the ability to scale key applications rapidly and reliably.

Designed for organizations that run online transaction processing (OLTP) applications, IBM® DB2® pureScale® offers clustering technology that helps deliver high availability and exceptional scalability, transparent to applications. DB2 pureScale leverages the industry standard for OLTP scalability and reliability set by IBM DB2 for z/OS® and its IBM Parallel Sysplex® architecture and brings best-of-breed architecture to the distributed platform. DB2 pureScale is available as an option on IBM DB2 9.7 Enterprise Server Edition.

Grow with your business

DB2 pureScale enables the database to continue processing through unplanned outages and provides nearly unlimited capacity for any transactional workload. Scaling your system is simply a matter of connecting a host and issuing two simple commands. The cluster-based, shared-disk architecture of DB2 pureScale also helps reduce costs through efficient use of system resources. With DB2 pureScale, organizations can scale their OLTP systems to meet the most demanding business needs while controlling data management costs.

Scale up transparently without complex application tuning

As application usage grows, the databases must grow in step with application usage to ensure that the business continues operating smoothly and without bottlenecks. But adding servers to a critical database can be tricky, as applications must often be adapted to take advantage of new resources and then tuned to achieve maximum efficiency.

Unlike other distributed shared-disk database cluster technologies, DB2 pureScale does not require administrators to perform complex tuning or update application code when scaling the database. DB2 pureScale flexible application workload balancing and grouping capabilities allow multiple servers to appear as a single database, and new hosts can be used immediately. This helps reduce deployment complexity and helps cut costs.

Avoid downtime

Just a few minutes of downtime for critical applications can significantly damage an organization's bottom line. Avoiding downtime is an important component of building competitive advantage in an on-demand world.

Some distributed shared-disk database clusters can take minutes to resume processing after host failure—but DB2 pureScale is designed to continue operating even in case of host failure and to maintain data consistency without performance degradation. Centralized locking and cache management allows the remaining hosts in the cluster to access critical information promptly and quickly absorb the additional workload. No incoming workloads are rejected because the cluster is able to automatically adjust within seconds. During planned outages, administrators can perform rolling maintenance on individual hosts without affecting the availability of the cluster.

Support performance with a clustering architecture designed for scalability

Designed for high-use clustered servers, the DB2 pureScale architecture helps ensure that applications do not hit a scalability wall after the workload is distributed across more

than a few hosts. It can deliver near-linear scalability and maximum throughput, helping to reduce software licensing costs and power and cooling expenditures (see Figure 1).
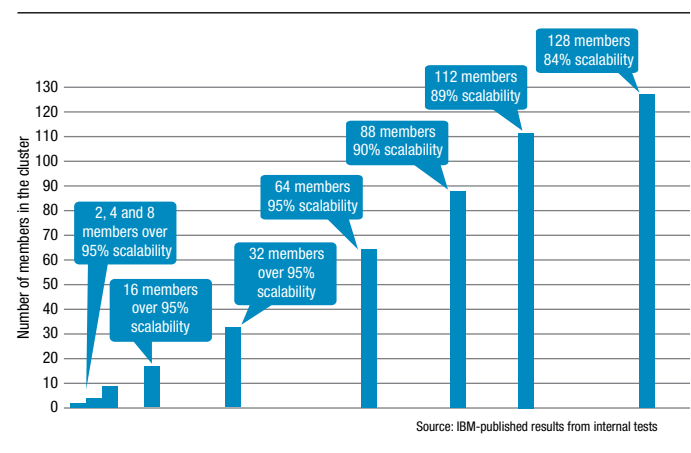
Figure 1: IBM DB2 pureScale technology delivers near-linear scalability for up to 128 members.

DB2 pureScale delivers enhanced performance by leveraging IBM servers

IBM offers this efficient and highly reliable scaling capability across three leading business computing platforms: IBM System z®, IBM Power Systems™ and IBM System x®. DB2 pureScale runs on Power Systems, a worldwide leader in UNIX server revenue share.[1] From reliability and virtualization features inspired by IBM's success in mainframe systems to unique energy-saving capabilities, Power Systems helps you build a cost-effective infrastructure with around-the-clock availability.

DB2 pureScale is also available on x86-based System x servers running SUSE Linux Enterprise Server. This expanded platform support further strengthens the IBM portfolio of Smarter Systems and makes DB2 pureScale technology available to a larger client base. By making DB2 pureScale available on System x, IBM has reinforced its commitment to clients who use the x86 architecture for their business systems.

In addition, running SUSE Linux Enterprise Server on System x servers provides clients with an additional cost-effective, open, reliable and secure IT environment that can easily scale with workload demands. SUSE Linux Enterprise Server is a highly reliable, scalable and secure server operating system, built to power both physical and virtual mission-critical workloads. With this foundation, enterprises can deliver business services, enable secure networks and manage heterogeneous IT resources.

The power of InfiniBand networking

InfiniBand is an industry-standard, powerful network interconnect protocol that delivers high-speed I/O connectivity between servers in a cluster. The System x cluster interconnect technology utilizes Mellanox Technologies' end-to-end InfiniBand lossless connectivity solution that delivers extreme performance by providing the highest throughput at the lowest latency available.

The IBM POWER® cluster uses QLogic 9000 InfiniBand switches, which provide high-performance, low-latency interconnect ideal for high-performance computing solutions. Tested and optimized for use with IBM Power Systems solutions, they provide network connectivity that is easy to install and manage. The combination of serial communication, high bandwidth and low latency enables the creation of cost-effective clusters of systems that can deliver better performance, scalability and reliability.

Simplify database management with streamlined installation and monitoring

In addition to supporting outstanding scalability, availability and performance, DB2 pureScale is designed to simplify database and clustering administration. Hosts can be added to and removed from the cluster easily, enabling IT staff to scale the cluster up or down quickly to meet changing business requirements.

DB2 pureScale also features a single installation process for all software components: one bundle contains all the tools necessary for setup, which is automated at install.

Smooth scaling is key to an outstanding customer experience

The ability to grow transactional databases along with customer demand is imperative for companies trying to capitalize on new business opportunities. DB2 pureScale can help deliver this capability and lower costs through unlimited capacity, application transparency and continuous availability.

For more information

To learn more about IBM DB2 pureScale, please contact your IBM representative or IBM Business Partner, or visit **ibm.com**/db2/pureScale

To view this article online, visit: **ibm.com**/common/ssi/cgi-bin/ssialias?infotype=PM&subtype=BR&appname=SWGE_IM_DM_USEN&htmlfid=IMB14061USEN&attachment=IMB14061USEN.PDF

1 IDC Worldwide Quarterly Server Tracker Q2 2009 September 2009.

"The IBM Power servers and DB2 database both provide excellent scalability and can sustain our business requirements going forward. Overall we are very happy with the solutions that SAP and IBM have provided for Parazelsus Indonesia."

—Iqbal Syahrial, Senior IT Manager, Parazelsus Indonesia

IBM Technical Brief

# Advantages of IBM POWER5 technology for mission-critical environments

Positioning for growth and achieving near-zero downtime with IBM DB2 HADR and IBM Tivoli System Automation

This brief provides a technical overview of the system architecture, project planning and deployment for a database migration with a main focus on high availability, IBM® DB2® 9 High Availability Disaster Recovery (HADR) and a fully integrated backup/recovery solution in a totally virtualized environment.

An automobile-parts supplier saw the benefits of HADR and the close IBM-SAP working relationship firsthand during a migration project to move more than 40 SAP database systems to a new platform running IBM DB2 9 on IBM System p®. The total size of all databases after the migration was about 60 TB in a compressed form, while the largest database was running at roughly 4.5 TB. IBM IT specialists from the Böblingen Lab, Integrated Technology Services and SAP's DB2 integration team jointly designed and delivered the high-availability solution based on IBM Tivoli® System Automation (TSA) and the DB2 HADR feature.

Based on the customer's experience, the IBM SAP International Competence Center produced a technical brief that provides an overview of the system architecture, project planning and deployment for this database migration, with a main focus on high availability and a fully integrated backup/recovery solution in a virtualized environment. This summary presents the main points of the brief.

For a complete copy of the technical brief, visit: **ibm.com**/software/success/cssdb.nsf/CS/STRD-79YNA4?OpenDocument&Site=gicss67sap&cty=en_us
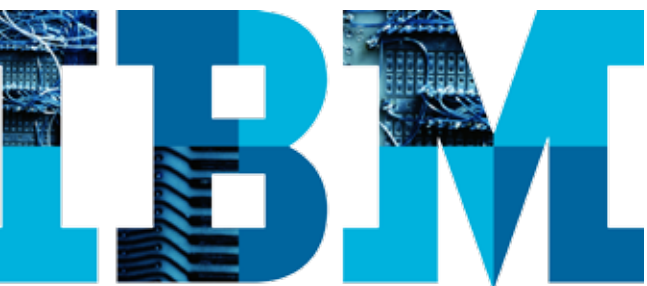
Customer objectives

- Prepare for growth of transaction load and data volume to 10 times the current size, starting with a current 4.5 TB database and 7,000 concurrent users
- Provide near-zero downtime for database services
- Perform a seamless migration with zero production impact in parallel with large-scale SAP functional rollouts
- Recover from data loss in less than four hours even for the largest databases
- Improve maintainability and serviceability

IBM solution

- IBM Advanced POWER® Virtualization technologies for effective consolidation and flexibility even for the most demanding workloads
- IBM DB2 High Availability Disaster Recovery (HADR) for high-availability solutions with downtimes below one minute, in combination with IBM Tivoli System Automation for Multiplatforms
- DB2 9 row compression for all databases to improve storage and memory efficiency
- IBM FlashCopy® backup technology of IBM System Storage® DS8000® used in combination with IBM Tivoli Storage Manager (TSM) in virtualized disk environments to meet challenging backup/recovery requirements

Customer benefits

- Scalability to support a tenfold increase in database volume and transaction load
- Improved SAP database performance for up to 50 percent faster application response
- Ultra-fast system cloning with FlashCopy and TSM backup/restore capabilities
- Database failover times of less than two minutes for the largest databases
- Deployment of new databases in hours instead of days

The customer is a leading supplier to many automobile manufacturers worldwide, with more than 50,000 employees and more than 100 locations around the globe. The project was initiated to enable a growth path for the customer's SAP database environments. The plan estimated the databases would grow up to 10 times their current size. A total of 41 database instances were within the scope of the project and had to be migrated to the target environment.

The database migration portion of the project was planned for execution after a two-month period of setting up the infrastructure and establishing operational procedures. The migrations had to be aligned with all other SAP rollout activities and were completed on time over a period of six months. All databases were compressed during or after the migration, saving about 30–40 percent in disk space.

The team implemented two IBM System p5® 595 servers equipped with 64 processor cores each. Twenty-four cores were activated on each system, with the additional resources available to be activated on demand. Dual-port Gigabit Ethernet (1 GB) adapters and dual-port, 4 GB Fibre Channel adapters provided attachment to a storage area network (SAN).

Sufficient disk space for the test migrations and the parallel operation of the new System p5 environment was an important prerequisite. A pair of DS8300 disk storage subsystems in a RAID-5 configuration provided a total 60 TB of usable capacity. A pair of TS3500 tape libraries with six TS1120 tape drives each met the backup and restore requirements. Separate DS4700 midrange disk storage subsystems with a disk capacity of 2 TB provided a staging area for fast backup and restore of the database log files without depending on the availability of the tape library.

Providing services for solution design and delivery

The ability to provide solution services and expertise was essential to the success of the project. IBM specialists from the Systems and Technology Group and from Integrated Technology Services provided services in the areas of server virtualization, partitioning technology and performance tuning. Database specialists from IBM Software Group advised on the setup and tuning of the DB2 database, and the IBM SAP International Competence Center added valuable information on special requirements for a DB2 SAP database implementation.

IBM IT specialists from the Böblingen Lab, Integrated Technology Services and SAP's DB2 integration team jointly designed and delivered the high-availability solution based on Tivoli System Automation (TSA) and the DB2 HADR feature.

Making the most efficient use of resources

The migrated databases belonged to multiple SAP components, including Enterprise Resource Planning (ERP), Exchange Infrastructure (XI), Human Resource (HR), Supplier Relationship Management (SRM), Knowledge Management (KM), Records Management (RM), Solution Manager (SM), Central User Administration (CUA) and Global Trade Systems (GTS).

To make the most efficient use of memory and disk resources, the IBM and SAP team decided not to implement each database in a separate logical partition (LPAR). Instead, all databases were grouped according to their service-level requirements into a total of 12 development, quality assurance and production LPARs. These 12 LPARs were then distributed over the two IBM System p5 595 systems. The team also decided to virtualize all resources in preparation for the forthcoming requirements of the Live Partition Mobility feature on IBM POWER6® platforms.

The implementation of two logical areas with separate Virtual I/O Server (VIOS) pairs per System p5 595 addressed the requirement to have separate environments for non-production and production databases. This implementation enables the customer to test new VIOS software without impacting the production LPARs. The team implemented a cluster for testing TSA, DB2 and operating system patches in the non-production area. A highly available Tivoli Storage Manager Server was also located in the non-production area.

Delivering high availability with DB2 HADR and Tivoli System Automation

To ensure a high-availability environment, the team made virtual network resources redundant through the use of EtherChannels and VIOS pairs with Shared Ethernet Adapter (SEA) failover. Disk access was also fully virtualized. Implementing IBM AIX® multipath I/O and using the multipath DS8000 subsystem device driver inside the VIOS provided full redundancy. The team installed the DB2 9 databases in this environment.

Each production database has a primary copy and a standby copy using separate sets of data and executables on separate disk subsystems. The standby database is created using a redirected restore from a backup of the primary. The HADR mechanism of DB2 ensures the synchronicity of the two databases, and TSA automates the switchover from the primary to the standby database in case of hardware or software failures.

Planning for backup and recovery in a virtualized environment

The team set the database recovery time objective at four hours, even for the largest databases, and used the FlashCopy techniques in the DS8000 subsystem to meet this challenge. A FlashCopy is taken from each of the two mirrors with a 12-hour time difference. One of these FlashCopy images is then backed up to tape and attached through a VIOS to an IBM Tivoli Storage Manager server.

This method ensures that two valid disk images of the production database are always available. They can be used for a restore operation and then brought back into a consistent state with archived logs from disk or tape. In case of a HADR failover to the standby database server, a FlashCopy and backups can be run from the second DS8000.

Measuring performance in a fully virtualized HADR environment

Detailed analysis using the *nmon* tool showed that the greatest portion of the shared processor pool was used by the customer's largest ERP system. The fact that this ERP system produced more than 20,000 random I/Os per second and up to 50 MB/s network throughput over long periods during the day showed that there were no limitations in the virtualization layer of the hypervisor. Together, all VIOS used only two physical processor cores, resulting in better database performance. Also, the near-synchronous mode for transaction logging between the primary and standby databases did not show up as a performance limitation.

IBM Technical Publication

The SAP DBA Cockpit

Flight plans for DB2 LUW database administrators

This is an excerpt from the first chapter of *SAP DBA Cockpit: Flight Plans for DB2 LUW Database Administrators* by Eduardo Akisue, Jeremy Broughton, Liwen Yeow and Patrick Zeng. The book provides a thorough examination of the DBA Cockpit and its capabilities, including performance monitoring, storage management, job scheduling, backup and recovery, configuration and database diagnostics.

To access the full publication, please visit: http://www.sdn.sap.com/irj/scn/go/portal/prtroot/docs/library/uuid/10a5f238-d09a-2c10-9a8a-d0a64f6a506b?QuickLink=index&overridelayout=true

Chapter 1: The SAP DBA Cockpit—a pilot must know the controls

Like a pilot must know the aircraft cockpit, a database administrator must know the SAP database administration tools. The SAP DBA Cockpit is the central database administration interface for SAP systems on all databases. The DBA Cockpit for DB2 provides administrators with a more comprehensive administration and monitoring tool for SAP databases.

Piloting a large commercial aircraft requires a great deal of skill. Pilots must understand how the adjustments they make to the aircraft components affect the flight of the airplane. Balancing lift and drag, speed and altitude, yaw and wind are all important parts of a safe, comfortable flight. However, a huge amount of technology also operates and manages the individual aircraft components.

A pilot who flew the aircraft without knowing what the technology does could disrupt automated flight operations. Similarly, if the technology were not leveraged specifically for the aircraft flight requirements, flight operations could become more difficult. To ensure an efficient and comfortable flight, an adept pilot must understand both the high-level operation of the aircraft and the underlying technology that operates the components.

Considering the operation of the database technology within an SAP application, administrators and pilots have similar skill requirements. Operating SAP applications without considering the optimizations within the database technology can cause inefficiencies, and configuring the database without considering the unique SAP application workload characteristics can produce unstable, suboptimal performance results. Adept SAP administrators must understand how to best leverage the database technology specifically for the workloads of their SAP systems.

Traditionally, this is where administrative consoles have come up short. Database administration consoles were too generic to focus on application-specific requirements, and application administration consoles were not specific enough to fully leverage the database. SAP and IBM took huge steps to bridge this gap, though, with the development of the DBA Cockpit for DB2. The result is a complete graphical interface for monitoring and administering the database, all within a single transaction in the SAP application.

Administrators can now easily access all of the database *key performance indicators (KPIs)* and make changes to improve system performance from within the same dialog screens.

The most important information for SAP administrators is now at their fingertips, and the database administrative tasks can often be executed with a few simple mouse clicks. This single DBA Cockpit interface simplifies monitoring and maintenance tasks, and can reduce the overall time spent on database administration.

The DBA Cockpit contains two main sections: a large detailed display on the right and a small navigation menu on the left. Figure 1 shows the System Configuration screen, which is the initial dialog screen displayed by running the DBACOCKPIT transaction. This can also be displayed at any time by clicking the System Configuration button, just above the left navigation menu.
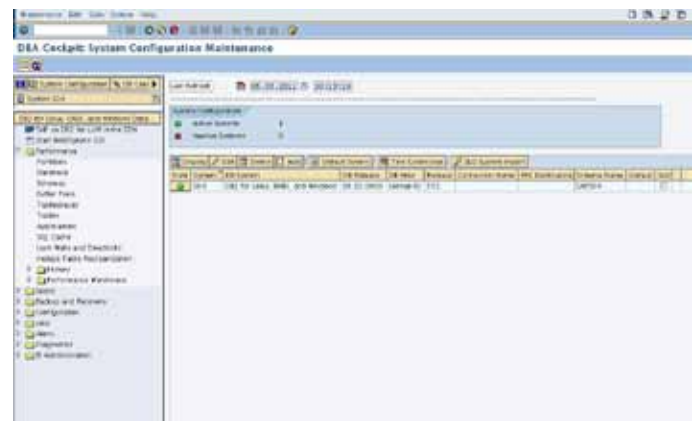

Figure 1: The DBA Cockpit for DB2 has a large display area on the right and a small navigation menu on the left.

The right display window contains a list of all the database systems that are configured for monitoring from the DBA Cockpit. The left navigation menu contains the following folders for navigating into database function groups:

- **Performance**—Display performance statistics for monitoring database memory, disk I/O, application resource usage, query execution and more.
- **Space**—Review historical and real-time storage usage for table spaces, containers and individual tables, and perform administrative functions to alter the logical and physical storage layout of the SAP database.
- **Backup and recovery operations**—Review historical backup and log archival information and real-time log file system statistics.
- **Database configuration**—Display and update database configuration parameters, configure partition groups and buffer pools and adjust monitoring and automatic maintenance settings.
- **Job scheduling**—Create, schedule and monitor periodic jobs from a planning calendar.
- **Alert monitoring**—View key database health alert statuses and messages and enable notification for database alert threshold violations.
- **Diagnostic functions**—View and filter messages from the database diagnostic logs, view optimizer access plans and recommended indexes for SQL statements, run SQL commands, view DB2 online help and more.

- **Workload management**—Set up, maintain and monitor the different workloads and service classes configured for the SAP system in DB2 Workload Management.
- **SAP NetWeaver BW administration**—Change data distribution and analyze Multi-Dimensional Clustering in partitioned SAP NetWeaver Business Warehouse (SAP NetWeaver BW) databases.

The left navigation frame of SAP Enhancement Package 1 for SAP NetWeaver 7.0 contains two additional screens. The first entry links the user directly into the DB2 LUW main web page in the SAP Developers Network (SDN), allowing the user to browse the SDN from directly within the SAP GUI. The other screen launches the new web browser-based DBA Cockpit. Several of the new features of the DBA Cockpit are now launched as WebDynpro browser applications. When one of these is clicked in the GUI-based DBA Cockpit, the corresponding WebDynpro screen will automatically launch in the browser. The Start WebDynpro GUI menu entry launches the main page of the web browser-based DBA Cockpit, similar to the DBACOCKPIT transaction in the SAP GUI.

The contents of the left navigation menu may differ slightly among different versions of SAP BASIS, in order to leverage new functionality available in the latest releases of SAP and DB2. This book illustrates the latest features available in the DBA Cockpit in SAP Enhancement Package 1 for SAP NetWeaver 7.0.

Central monitoring of remote systems

The DBA Cockpit allows administrators to configure connections to every SAP system from a single DBA Cockpit session. A Solution Manager instance or a standalone SAP NetWeaver instance can be installed for administrators to use for central monitoring and administration. You should keep this SAP system at the most current SAP release level, to maximize backward compatibility and make the most advanced DBA Cockpit features available for all systems.

Remote connections can be established using the database information from the System Landscape Directory (SLD). Alternatively, they can be configured manually from within the DBA Cockpit, using the DB Connections button at the top of the left navigation menu. From the System Configuration screen, simply click the SLD System Import button. This provides a graphical interface to select and register the unregistered SAP systems into the cockpit.

This allows the entire SAP system landscape to be centrally managed in the SLD, and provides a simple way to register any new or changed systems in your central DBA Cockpit.

Alternatively, click the Add button to manually register new databases into the cockpit. This allows administrators to register even non-SAP systems. Therefore, the DBA Cockpit can provide a single administrative GUI for every SAP and non-SAP database in your IT landscape.

Summary

The DBA Cockpit for DB2 is a powerful interface for SAP pilots to centrally manage the DB2 database operations of their SAP systems. It provides a single point of administration for every DB2 database in your organization. The DBA Cockpit for DB2 gives administrators fast and easy access to all of the most important DB2 database information, all from within the familiar look and feel of the SAP GUI.

Triton Consulting: Quantitative Complexity Analysis

Comparing DBA productivity: An Oracle/IBM DB2 task complexity analysis

Abstract

As staff costs continue to consume an ever-increasing proportion of IT budgets, productivity and ease-of-use are becoming more important factors in the overall TCO for a given IT system. The degree of complexity associated with common DBA activities is therefore a key differentiator between the various database vendors' products.

Triton Consulting conducted an objective assessment of the complexity of several routine DBA activities, comparing Oracle Database 11gR2 and IBM® DB2® for Linux, UNIX and Windows 9.7 (DB2 for LUW 9.7). These selections present the high-level results and conclusions from the complexity analysis. For further details, including a detailed breakdown of the individual task complexity scores for each activity, please refer to the full Triton White Paper entitled "Comparing DBA Productivity: An Oracle/DB2 Task Complexity Analysis" at https://www14.software.ibm.com/webapp/iwm/web/signup.do?lang=en_US&source=sw-infomgt&S_PKG=analyst-db2_oracle_triton

Introduction

The cost of IT staff such as database administrators (DBAs) continues to consume an ever-increasing proportion of IT budgets. As a result, the productivity of IT staff and the ease-of-use of the IT systems they work with are becoming more important factors in the overall Total Cost of Ownership (TCO) equation. The degree of complexity associated with common DBA activities is therefore a key differentiator between the various database vendors' products.

Triton Consulting conducted an objective assessment of the complexity of several routine DBA activities comparing Oracle Database 11gR2 and DB2 9.7. This study examines the following common DBA activities, and assesses the complexity of each within an Oracle Database and DB2 for LUW environment:

- Installation
- Enabling table compression
- Enabling index compression
- Backup and recovery
- Automatic memory tuning
- Authorization

Each of these activities has been broken down into a number of more detailed steps, which are subjected to complexity analysis.

Complexity analysis methodology

The methodology used to assess activity complexity within the paper is based upon an objective assessment of the following attributes of each activity sub-task:

- Context shifts
- Navigational guidance
- Input parameters
- System feedback
- Error feedback
- New concepts

Complexity analysis is a new approach to evaluating and communicating the usability of software and is based on established research as described in this document: **ibm.com/ software/ucd/Resources/ComplexityAnalysisDGarticle.pdf**. It provides complexity metrics that quantify the usability of specific tasks and a means for illustrating how these metrics are derived. As a complexity metric increases the difficulty of the task also increases (and usability decreases). Complexity analysis reduces the subjectivity associated with usability claims and injects a strong element of objective transparency into the picture.

Further details of this methodology can be found in Appendix A.

Summary and conclusions

The study examined six common DBA activities, and assessed the complexity of each within Oracle Database 11gR2 and DB2 9.7 environments. As shown in Table 1, DB2 holds a significant advantage in every single category. Of these, the most significant advantage is shown in the index compression task, but DB2 also has a clear advantage within the data compression, backup and recovery, automatic memory management, installation and authorization activities.

Task	Complexity metric		DB2 advantage
	DB2 9.7	**Oracle Database 11gR2**	
Installation	326.5	570.5	43%
Data compression	117.5	224	48%
Index compression	0	189.5	100%
Backup and recovery	72.5	439	83%
Automatic memory management	62.5	617	90%
Authorization	138	730	81%

Table 1: Complexity metrics and DB2 advantages for six common DBA activities.

The analysis results are also shown graphically in Figure 1.
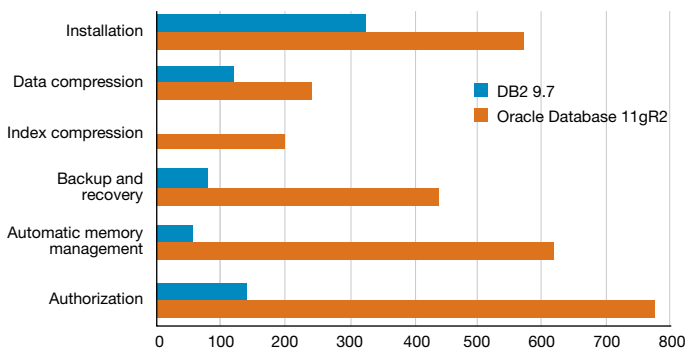
Complexity Analysis Summary

Figure 1: Complexity analysis results for DBA activities on DB2 and Oracle.

A detailed breakdown of the individual task complexity scores for each activity is included in the full Triton Consulting White Paper entitled "Comparing DBA Productivity: An Oracle/DB2 Task Complexity Analysis." Based on the results of the study, DB2 has a clear and overwhelming advantage over all six of the routine DBA activities evaluated. This DB2 complexity advantage translates into higher DBA productivity for these tasks through factors such as:

• Less DBA time spent on researching and performing these tasks. (Projections for time savings for these tasks are included in the full Triton Consulting White Paper.)
• Less time spent in training new staff.
• Lower risk of errors that can impact quality of service.

It is worth noting that lower complexity is directly correlated to interaction time[1] savings. For example, a DBA would need approximately half the interaction time to implement data compression with DB2 9.7 relative to Oracle Database 11gR2 given that DB2 9.7 is approximately half as complex as Oracle Database 11gR2 for the data compression activity. Similarly, the 90 percent complexity advantage for DB2 for automatic memory management means that this activity would require approximately 90 percent less interaction time with DB2 9.7 in comparison to Oracle Database 11gR2. Therefore, this analysis demonstrates tangible TCO benefits for these common DBA activities.

Furthermore, Triton Consulting also examined these tasks from a lifecycle analysis perspective. For example, after initial setup of table and index compression it may be necessary—over time—to revisit the compression tasks in response to evolving business requirements that result in schema changes. Through this lifecycle analysis, it was found that the DB2 advantage of lower complexity is propagated beyond the initial setup and configuration stages. Many of the complexity advantages of DB2 cited in this report are part of recurring lifecycle events that add up to a considerable DB2 advantage over time. This lifecycle analysis is described in more detail in the full Triton Consulting White Paper.

Appendix A—Complexity analysis methodology

Overview
The complexity analysis methodology used within this study consists of the following major steps:

• Define user roles and usability objectives.
• Define targeted user tasks.
• Rate the complexity of each step.
• Calculate the complexity metrics.
• Analyze the results.

Please refer to the following document for further details about the complexity analysis methodology: **ibm.com**/software/ucd/Resources/ComplexityAnalysisDGarticle.pdf

Complexity ratings

Complexity analysis is based on the following complexity dimensions. Each of these dimensions captures a potential source of complexity experienced by the user while interacting with software to perform a step in a user task/activity.

Context shifts

A context shift occurs when the user crosses user interface, tool, or product boundaries in order to perform a step. For example, if a user moves from an eclipse-based application development tool to a web-based monitoring tool to complete a step then the user experiences a context shift.

Navigational guidance

Navigational guidance refers to the support provided to a user for proceeding into a step (from the previous step) and through the step. It is characterized by the user question: "Where do I go next, and what do I do when I get there?"

Input parameters

An input parameter is data supplied by the user to complete the step. For example, a user ID and password are two input parameters commonly associated with task steps that involve security authentication.

System feedback

System feedback is the system response to the user actions for a given step (with the exception of error feedback, which is addressed in the next point). Examples of system feedback include progress indication dialog boxes, confirmation of command execution, and system-generated reports.

Error feedback

Error feedback is the system response to common error situations the user may encounter. Examples of error feedback include error messages, visual cues that identify incorrect field values, and troubleshooting documentation.

New concepts

A concept is background information on a topic area the user needs to understand in order to perform a step. Concepts include the underlying externals model of the product and user interface objects/metaphors/models. A new concept for a step is a concept that is introduced to the user for the first time in the context of their current task(s).

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1 Interaction time is the dedicated time spent by the user in actively working with a system to perform a task. It includes the time spent on work activities such as executing commands, writing scripts and interpreting system output. Interaction time does not include system response time, as in the case where a utility takes a long time to execute and during which the user can attend to other work. Interaction time also does not account for work interruptions—it assumes the user works in an uninterrupted manner.

Real-world experiences

How does IBM® DB2® stack up against other database technologies such as Oracle and Microsoft SQL Server? What do the analysts think? And what do DB2 customers have to say about their experiences with DB2 in SAP environments? This section provides a variety of analyst reports and customer references that help answer those questions.

Forrester Total Economic Impact Study

In the Total Economic Impact Study prepared for IBM, Forrester Research, Inc. interviewed five global organizations that use DB2 in SAP and non-SAP environments to discover how DB2 delivers benefits in three areas: administration, operational expenses and storage costs. The aggregate findings can help you evaluate the financial impact of DB2 on your organization, as well as underscore some of the benefits of migrating from a legacy database platform to DB2.

International Technology Group reports

International Technology Group (ITG) conducted several reports comparing DB2 to other database technologies, including three focused on comparisons with Oracle Database 10g, Oracle Database 11g and Microsoft SQL Server. This section includes summaries of those reports, and online sources where you can find more information about the studies' findings.

Customer references

Learn how companies like Fossil and Rossi Residential benefit from the IBM and SAP technical partnership. Read how Agrium and Central Michigan University are using DB2 to help reduce costs in their SAP environments.

See how other organizations are tackling important challenges—from business productivity and rapid growth to avoiding the need for capacity expansion—using specific DB2 technologies and techniques. Read case studies on Mitsubishi Motors Australia Limited, Iskra Mehanizmi, Britannia, Jebsen & Jessen SEA and Banca Nazionale del Lavoro.

"As organizations move to the next generation of SAP solutions, the opportunity emerges to put in place new core databases that will have a positive effect on functionality, costs and risk exposure for a long time to come. The costs of making this change will be outweighed, by wide margins, by the savings that will result from it."

—International Technology Group
    "Value Proposition for IBM DB2 9.7"

Forrester Total Economic Impact Study prepared for IBM

The total economic impact of migrating to IBM DB2 for SAP and non-SAP environments

A Multicompany Analysis; Forrester
Research, Inc.
Project Director: Jon Erickson
March 2011

The purpose of the Forrester Total Economic Impact Study is to provide readers with a framework to evaluate the potential financial impact of IBM DB2 on their organizations. This study illustrates the financial impact of adopting IBM DB2 for both SAP and non-SAP applications based on aggregated findings of customers that migrated to DB2 from a variety of legacy database platforms. In conducting in-depth interviews with five global organizations using IBM DB2 within SAP and non-SAP environments, Forrester found examples of how DB2 delivered key benefits both inside and outside of IT in three key benefit areas: reduced cost of administration, improved operational expenses and reduced storage cost.

The five organizations interviewed for the report were:

- A U.S.-based global consumer products company with 23,000 employees
- A Europe-based electric utility with 6 million customers
- A Latin American financial services provider
- A Europe-based financial services organization
- A Europe-based chemical manufacturer

To read the full study, please visit: https://www14.software.ibm.com/webapp/iwm/web/signup.do?source=sw-infomgt&S_PKG=forrester_db2_tei

Key findings and highlights

ROI and migration business case

Based on data from the five DB2 customers, Forrester found that the ROI for a representative organization was 192 percent with a breakeven point (payback period) of 12 months. Incremental benefits included improvements in storage and administration efficiency, lower operational and capital costs, and savings from reduced storage through compression.

The need to maintain or reduce the annual maintenance spend was a consideration in the overall business case for migrating to DB2. Organizations that were leveraging DB2 in combination with their SAP application footprint noted the product integration between SAP and DB2 through initial configuration and application and database, as well as the integrated monitoring available through the DBA Cockpit.

Interestingly, organizations generally spent significantly more time planning and preparing for the migration than performing the actual migration itself.

Benefits

Organizations in the study realized many benefits including:

- 20–30 percent reduction in the impact of backup and restore events on IT and end-user organizations
- 30 percent reduction in growth of staffing
- 15–30 percent reduction in problem resolution time
- 15 percent reduction in maintenance costs
- Storage growth reduction of 30 percent per year due to compression, with compression rates between 35 percent and 75 percent

ITG Management Brief: Executive Summary

Value proposition for IBM DB2 9.7: Cost/ benefit case for SAP enterprise migrations

International Technology Group
Value Proposition for IBM DB2 9.7
June 2009/Management Brief

This selection from the June 2009 International Technology Group (ITG) Management Brief presents the executive summary information. The full brief can be viewed online at http://download.boulder.ibm.com/ ibmdl/pub/software/data/sw-library/information-on-demand/analyst- reports/analyst-report-itg-sap.pdf

Challenges and opportunities
It is a time of unprecedented challenges for SAP users.

For many organizations, the immediate focus is on cost cutting. But business needs must still be met. Trends toward greater volatility of markets, erosion of traditional forms of competitive differentiation, industry concentration and the effects of globalization have not diminished. The central issue becomes how to maintain competitive momentum while reducing costs.

For most organizations, migration to another vendor's enterprise resource planning (ERP) systems would be neither realistic nor desirable, while postponing migration to next-generation SAP solutions would risk damage to organizational competitiveness. In an economic downturn, this might be an unwise choice.

There is a third option—change databases. Migration from Oracle 10g to IBM® DB2® 9.7 can significantly reduce costs not only for database software, but also for server and storage infrastructures and for the personnel who administer and maintain these resources.

It will come as no surprise that DB2 9.7 costs less than Oracle 10g. DB2 9.7 licenses are priced by SAP at 8 percent of SAP Application Value (SAV), compared to 11 percent for Oracle 10g, and support costs are correspondingly lower. However, this proves to be only part of the picture.

If allowance is made for DB2 9.7 performance, compression and automation capabilities, the potential for savings is significantly larger. Reductions occur not only in database software costs, but also in costs for disk and tape storage systems, database servers and database and system administration processes. These reductions offset—by wide margins—costs of migration from Oracle.

This report documents the extent of the cost savings opportunity if DB2 9.7 is employed. Combined five-year costs for databases, storage systems, database servers and personnel supporting these were calculated for use of Oracle 10g and DB2 9.7 in large-scale SAP Business Suite 7 installations in three companies.

These were an US$8 billion manufacturer of industrial machinery, tools and parts; a US$6 billion manufacturer of electronic systems, components and subassemblies; and a US$5 billion aerospace manufacturing and systems integration company.

Results may be summarized as follows:

Baseline costs comparison. In a simple comparison whose results are shown in Figure 1, combined five-year costs for use of DB2 9.7 average 38 percent less than for Oracle 10g.

Costs include database licenses and support; hardware acquisition and maintenance, systems software licenses and support and facilities costs for disk and tape systems and database servers; and personnel costs for database and system administration.
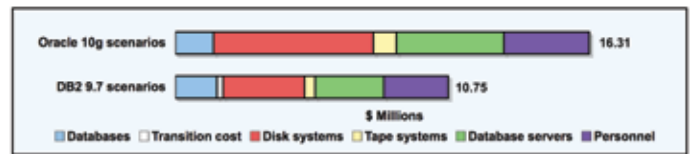

Figure 1: Baseline costs comparison: averages for all installations.

Migration costs comparison (1). In this comparison, it is assumed that organizations migrate from Oracle to DB2 9.7 at the beginning of the five-year cost measurement period.

Database costs for use of Oracle 10g are support fees only, as it is assumed that organizations already have Oracle installed. Database costs for DB2 9.7 are adjusted to include transition costs for data conversion and staff retraining, and to allow for IBM migration pricing incentives. Other costs are the same as for baseline comparisons.
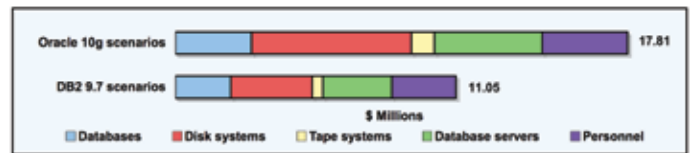
Results are summarized in Figure 2.

Figure 2: Migration costs comparison (1): averages for all installations.

Combined five-year costs for use of DB2 9.7 average 34 percent less than for use of Oracle 10g; that is, there is little change in comparative costs.

Migration costs comparison (2). In the previous two comparisons, it is assumed that organizations put in place new storage systems and database servers at the beginning of the five-year cost measurement period. Users, however, may continue to employ at least some existing storage resources and servers.

In this comparison, it is assumed that companies build upon existing database server and storage systems, but invest in some additional capacity to support SAP deployments. Calculations include 50 percent of storage systems and database server costs. All other costs are as for the previous comparison. Results are summarized in Figure 3.

Combined five-year costs for use of DB2 9.7 average 29 percent less than for use of Oracle 10g. Again, there is little change in comparative costs.

These calculations are based on use of IBM System Storage® DS8000 and DS5000 disk systems, IBM System Storage TS3500 tape systems, IBM Power® database servers and systems software normally employed with these in SAP environments.
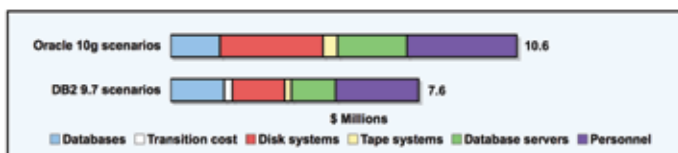

Figure 3: Migration costs comparison (2): averages for all installations.

These platforms are in most cases recognized industry price/performance leaders, and IBM pricing for maintenance and systems software is generally more aggressive than that of competitors. Costs would typically be larger if equivalent storage systems and servers from other vendors were employed.

Additional, separately charged Oracle tools may be required to provide functionality equivalent to DB2 9.7 for SAP environments. Oracle costs may be further increased if standby servers are employed.

Information on installations, configurations and staffing levels, along with granular cost breakdowns and details of the methodology and assumptions employed for these calculations may be found in the "Detailed Data" section of the full report.

Risk factors

Migrations by SAP users from Oracle to DB2 have occurred since the 1990s. Since DB2 9 was first introduced in 2007, the pace has accelerated. It can be expected that enhancements in DB2 9.7, as well as budgetary pressures resulting from the current economic environment, will cause it to accelerate further.

Organizations that have migrated SAP systems from Oracle cite cost savings as a major reason for their decisions. Other factors, however, have also contributed.

One of these is SAP's commitment to DB2 9, and the close relationship between IBM and SAP in database development and optimization. DB2 9 is SAP's "preferred and recommended" database for its current generation of solutions.

Among organizations that have migrated, the close relationship between SAP and IBM has been widely cited as reducing the risks associated with implementation and long-term operation of large-scale SAP environments.

Decision makers were aware that SAP solutions would have a pervasive impact on the efficiency and competitiveness of their organizations for the foreseeable future. If structural flaws or inefficiencies became embedded within SAP environments, or within infrastructures supporting them, the bottom-line impact might be both serious and long lasting.

A specific concern was that users planned based on SAP's strategic product and maintenance schedule. If database upgrade and support cycles were not consistent with this schedule, cost and complexity would be added to the process of maintaining system currency. Migration to next-generation solutions could also be disrupted, delivery of new application functionality could be delayed or impaired, or both could occur.

According to users, the agreement between SAP and IBM to coordinate future upgrade and maintenance schedules significantly mitigates such risks.

More than a decade of experience has demonstrated that organizations that deploy enterprise-wide SAP systems become fundamentally dependent upon them. As the SAP solution portfolio expands beyond transaction processing to address a broader range of processes that deal with information and collaboration, that dependence will increase.

From this perspective, the risks of dysfunction between database platforms and the evolution of the SAP enterprise environment extend far beyond IT organizations. They pose a larger, longer-term threat to business performance. Many organizations believe that commitment to DB2 materially reduces that threat. It is difficult to fault their logic.

Conclusions

Databases are the core of any SAP environment. The capabilities of underlying database platforms affect the overall performance of SAP systems, and the quality of service experienced by users of these.

Database scalability determines, in no small measure, how well organizations manage the growth in data volumes and workloads that will occur even if the business itself does not expand. Database resiliency plays a key role in the ability of organizations to protect sensitive data and withstand disruptions.

As SAP users deploy new applications that deal with the collection, distribution and exploitation of data, the role of core database platforms will expand further. They will play an increasingly critical role in determining how well organizations use information to achieve bottom-line business advantage.

Finally, as the results presented in this report demonstrate, differences in database architecture and technology have a broader impact on overall IT cost structures than is generally recognized. Compression and performance levels, as well as automation capabilities, may increase—or reduce—the cost-effectiveness of large segments of SAP system infrastructures.

As organizations move to the next generation of SAP solutions, the opportunity emerges to put in place new core databases that will have a positive effect on functionality, costs and risk exposure for a long time to come. The costs of making this change will be outweighed, by wide margins, by the savings that will result from it.

Additional information

This ITG Executive Summary is based upon results and methodology contained in a Management Brief released by the International Technology Group.

ITG Management Brief: Executive Summary

Value proposition for IBM DB2 9.7: Cost savings potential compared to Oracle Database 11g

This selection from the August 2009 International Technology Group (ITG) Management Brief presents the executive summary information. The full brief can be viewed online at ftp://ftp.software. ibm.com/common/ssi/sa/wh/n/iml14187usen/IML14187USEN.PDF

Executive summary
Challenges and opportunities
The pressure is on IT organizations to contain costs. Yet business demands must still be met, and in many cases, these are magnified by today's economic conditions. The mandate is to "do more with less."

Even if businesses are not growing, databases continue to expand, and costs for database software, storage systems and servers to support them continue to increase. Overall growth in data and storage volumes is routinely in the range of 30 to 50 percent per year, and may be higher in individual organizations.

At the same time, a broader shift is occurring. Demand for information now extends beyond specialist communities to include mass populations of internal users, as well as customers and business partners. Organizations must deal not only with data growth, but also with increasing database complexity, more frequent changes and updates, and the need to deliver new applications to increasingly diverse user groups.

Demand for information is not reduced by a weak economy. As businesses seek to increase competitiveness and improve efficiency, the reverse is occurring. Informational applications have become one of the most critical areas of IT activity at a time of budgetary constraints and hiring freezes.

How will these challenges be met?

This report examines an option—use of IBM® DB2® 9.7 for Linux, UNIX and Windows as an alternative to Oracle Database 11g—that represents a major new opportunity for organizations to meet escalating demand while reducing IT costs.

In three installation examples presented in the full report, use of DB2 9.7 results in combined three-year costs for database software, disk and tape storage systems, servers and personnel that average 36 percent less than those for use of Oracle 11g. Figure 1 illustrates these results.
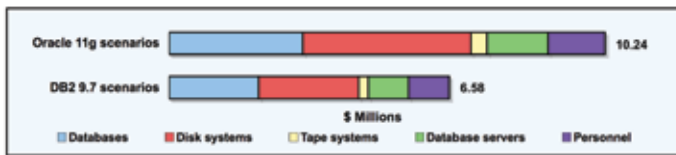

Figure 1: Three-year costs for Oracle 11g and DB2 9.7 deployments: Averages for all installations.

For most organizations, it will come as no surprise that DB2 9 databases are less expensive. IBM pricing has generally been more aggressive than Oracle, and DB2 incorporates tools that are available from Oracle only as separately charged options. Higher levels of database administrator (DBA) productivity for DB2 9 than for Oracle environments have also been widely documented, resulting in lower personnel costs.

The overall cost savings picture, however, is significantly broader. Higher levels of compression mean that less disk capacity is required than for Oracle-based systems. This generates savings in storage hardware and administration overhead and reduces costs for storage software tools priced on a per-terabyte basis. Further economies are realized in tape systems and in replication and backup operations.

Higher compression levels as well as more efficient DB2 9.7 software structures also mean that less database server capacity is required. Further reductions in hardware, software, personnel, energy and cooling costs occur.

In the examples presented in this report, the largest savings are realized in storage (disk and tape) system costs. Figure 2 illustrates this picture.
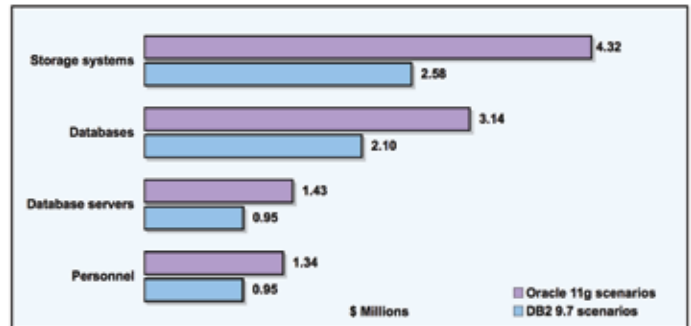

Figure 2: Storage system, database, database server and personnel costs for Oracle 11g and DB2 9.7 scenarios: Averages for all installations.

The installations upon which these comparisons are based include billing, customer relationship management (CRM) and operational systems in a telecommunications company; a retail data warehouse; and an Extensible Markup Language (XML)–enabled core banking system.

Cost calculations are based on use of IBM Power® servers, IBM System Storage® DS8100 and DS5300 disk systems and TS3500 tape libraries, along with software typically employed with these. Calculations allow for database and workload growth over a three-year period.

These platforms are recognized industry price/performance leaders, and IBM pricing for systems software and maintenance is generally more aggressive than that of competitors. Costs—and cost disparities—would typically be larger if equivalent storage systems and servers from other vendors were employed. In most cases, IBM platforms are also more energy efficient than competitive equivalents.

There are some variations in comparative costs between installations that are illustrated in Figure 3. Three-year costs for use of DB2 9.7 ranged from 34 to 39 percent less than for use of Oracle 11g.

Generally, however, differences in comparative costs were consistent across different types of applications, including transactional as well as business intelligence (BI) systems.

Descriptions of installations, configurations, methodology and assumptions may be found in the Basis of Calculations section of the full report.
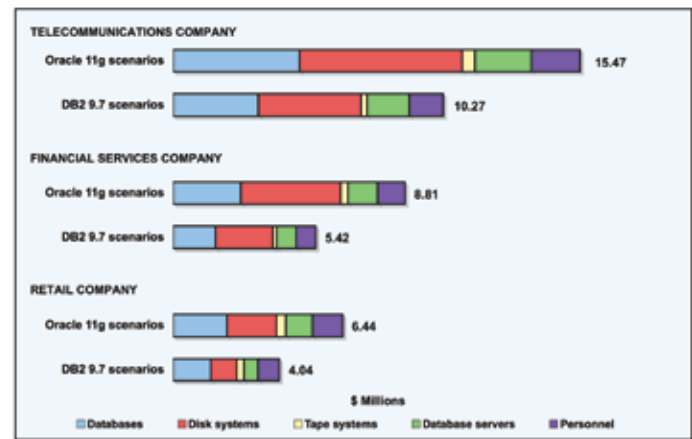

Figure 3: Three-year costs for Oracle 11g and DB2 9.7 deployments by installation.

Positioning DB2 9.7

Operational functions

The advantages of DB2 9 over Oracle 11g in compression, performance and DBA productivity that affect operational functions and costs became apparent after the introduction of version 9.1 in 2007. The latest version 9.7 extends these advantages.

The level of compression that may be realized is increased in DB2 9.7 with the addition of new index and temporary space compression capabilities, while a number of functions improve performance. This is particularly the case for larger, more complex database structures. Enhancements to automatic storage as well as in-memory monitoring further reduce the amount of time and effort required for DBA tasks.

Users have also found that higher levels of full-time equivalent (FTE) DBA staffing for Oracle compared to competitive databases remain the norm with 11g. For a number of years, the industry "rule of thumb" has been that 25 to 35 percent more DBA time is required for Oracle than for DB2 environments.

It is likely that this disparity will increase with DB2 9.7. A key focus of DB2 9.7 productivity enhancements has been to reduce the amount of time required to perform ongoing changes to database schemas. Where such changes occur frequently, time savings will be significantly greater than in more stable environments.

XML applications

DB2 9 capabilities designed to optimize performance and functionality for XML data content have also been enhanced in DB2 9.7.

DB2 9 pureXML® provides full support for XML storage, indexing, queries, updates and data management. The full range of DB2 9 capabilities—including database and range partitioning, multidimensional clustering, compression, query optimization and automation—have been extended to XML data content.

Oracle 11g also supports XML and has been adopted by a number of organizations for XML database applications. Users report, however, that DB2 9 typically delivers higher levels of performance.

XML capabilities are more deeply embedded in DB2 9.7 than is the case for Oracle 11g, and benefit from more advanced optimization functions. DB2 9.7 performance advantages are, again, particularly significant for more complex databases and queries.

Early experiences with DB2 9.7 also suggest that disparities in DBA productivity for XML-related tasks are, if anything, wider than for pure relational environments. This is particularly the case where it is necessary to perform frequent changes to data structures.

These strengths will become more significant over time. XML applications are, in most industries, at an early stage of development. Databases are typically small, and data structures, queries and transactional workloads are comparatively simple. However, this picture will clearly change.

Emerging industry standards such as Financial products Markup Language (FpML) and Financial Information eXchange (FIX) Protocol in financial services, ACORD XML in insurance and Health Level Seven (HL7) in health care all employ complex schemas. It can be expected that applications implementing them will undergo frequent changes and enhancements.

From this perspective, DB2 9.7 is—by a wide margin—better designed and optimized to deal with the future evolution of the XML world than any competitive database.

Conclusions

In comparing the capabilities of Oracle 11g and DB2 9.7, certain themes recur. First, DB2 9.7 is designed to deliver high levels of system efficiency and administrator productivity across the entire infrastructure of servers, storage systems and software that support database applications.

Second, the strengths of DB2 9.7 are particularly relevant to database environments that are characterized by complex database schemas, large data volumes, diverse workloads, and frequent changes and enhancements. This is the case for pure relational as well as XML environments.

In particular, key DB2 9.7 capabilities in automation, workload management and related areas are better optimized for such environments than is the case for Oracle 11g.

Third, to a much greater extent than Oracle 11g, DB2 9.7 is designed to handle large-scale XML databases and applications with the same levels of performance and functionality as for relational environments.

The cost comparisons presented in this report are based on present-day applications. However, DB2 9.7 design parameters are geared more closely to the way in which data structures, application portfolios and workload mixes will evolve over the next five years than is the case for Oracle 11g. It can be expected that cost disparities in favor of DB2 9.7 will widen over time.

"Over a five-year period, the examples presented in this report show that combined costs of databases, storage, servers and personnel required to support SQL Server 2005-based ERP 6.0 environments are almost double those for DB2 9. Organizations that migrate from SQL Server 2005 to DB2 9 may reduce these costs by 46 percent."

—International Technology Group
"Business case for IBM DB2 9 for SAP enterprise deployments"

ITG Management Brief

Business case for IBM DB2 9 for SAP enterprise deployments

Comparison with Microsoft SQL Server

This selection from the April 2008 International Technology Group (ITG) Management Brief presents the executive summary information. The full brief can be viewed online at **ibm.com**/software/data/information/db2-9-sap.html

Decisions
The SAP world is entering a new era.

Over the next few years, most enterprise resource planning (ERP) users will begin to move beyond application-by-application deployment of SAP ERP 6.0 solutions to large-scale migrations of core enterprise systems. If experience is any guide, the lifecycle of these systems will be from 10 to 15 years. The next round of decisions about SAP deployment will be among the most important today's executives will make.

Not least of these decisions is which database to employ. Databases are the fundamental underlying structures of the SAP environment. Database choices may materially affect the performance, scalability and cost-effectiveness of next-generation SAP solutions.

Moreover, the database role will expand as applications that deal with the collection, distribution and exploitation of information move to the forefront of the SAP value equation. The quality and functionality of underlying database infrastructures, in no small measure, will determine how well organizations use information as a new source of business advantage.

SAP users must also deal with another factor—growth. Annual data growth rates in the 30 to 60 percent range are already routine. Organizations that have migrated to SAP ERP 6.0 have seen further acceleration. Transitions to Unicode, increasing database size and complexity, and expanding use of informational applications are creating unprecedented challenges in data and storage management.

If these trends are projected even a few years into the future, the importance of database decisions becomes clear. If they are projected five or more years into the future, the implications are sobering. Organizations may be faced with data and storage volumes that are orders of magnitude larger than is the case today. What happens then?

This report deals with these issues. Specifically, it compares costs and benefits for large-scale deployment of SAP ERP 6.0 solutions on Microsoft SQL Server 2005 and IBM® DB2® 9.

One conclusion is particularly striking. SQL Server 2005 is often perceived as a "low-cost" database. For relatively small deployments, this may be the case. But for large-scale ERP 6.0 installations experiencing sustained data growth, the picture is very different.

Over a five-year period, the examples presented in this report show that combined costs of databases, storage, servers and personnel required to support SQL Server 2005-based ERP 6.0 environments are almost double those for DB2 9. Organizations that migrate from SQL Server 2005 to DB2 9 may reduce these costs by 46 percent.

Costs

Cost comparisons presented in this report are based on three composite profiles of large-scale SAP ERP 6.0 installations in three companies: (1) a US$8 billion manufacturer of consumer packaged goods; (2) a US$6 billion aerospace manufacturer; and (3) a US$3 billion diversified electronics manufacturer.

Profiles were constructed using data on application portfolios, databases, user populations, workloads, server and storage bases, staffing levels and other variables supplied by 16 SAP users in the same industries and approximate size ranges, with generally similar business profiles.

For each profile, scenarios were developed for use of SQL Server 2005 and DB2 9. Three sets of costs were calculated for each of the scenarios: (1) initial investment costs for databases, storage systems and database servers; (2) five-year operating costs for these, including allowance for capacity growth; and (3) data conversion and other costs for transitioning from SQL Server 2005 to DB2 9.

The following cost comparisons were then made:

Baseline comparisons. If it is assumed that companies are deploying SAP ERP 6.0 solutions for the first time and that no database migrations occur, overall costs for DB2 9 scenarios for the three installations average 47 percent less than those for SQL Server 2005 equivalents.

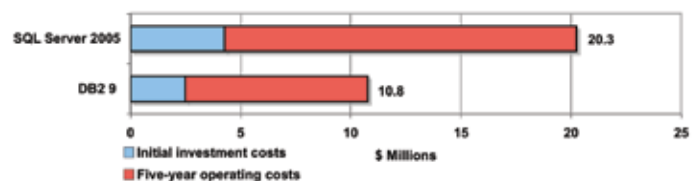These results are illustrated in Figure 1.

Figure 1: Baseline comparisons (1): average scenario costs for all installations.

The largest cost disparities are, as Figure 2 illustrates, for disk and tape storage resources. Initial investment and five-year operating costs for databases, disk systems and software, tape systems and media, and database servers are combined in this figure.
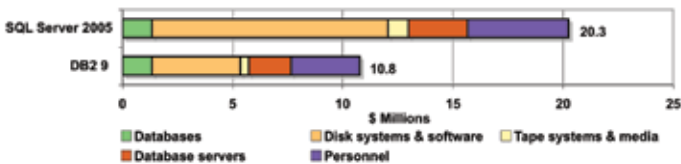

Figure 2: Baseline comparisons (2): average scenario costs for all installations.

Disparities in storage costs are due primarily to technology differences. The DB2 9 encoding scheme results in hardware capacity requirements for Unicode databases that are 33 percent smaller than those for SQL Server 2005 equivalents. DB2 9 compression provides further reductions—typically in the range of 40 to 45 percent, but larger for some applications— in capacity requirements. SQL Server 2005 does not support compression.

As a result, storage capacities required to support SQL Server 2005-based ERP 6.0 systems are two to three times larger than for DB2 9 equivalents. Storage costs are correspondingly higher than those for DB2 9 installations.

This is the case not only for storage hardware, but also for software for such functions as real-time data replication, point-in-time copy, backup and storage management that would be required in any mainstream SAP environment. All major vendors price such offerings on a per-terabyte basis. Tape media and handling costs are also higher for SQL Server 2005 installations.

In addition, streamlined DB2 9 software structures, as well as the effects of compression, result in savings in database server costs. Higher database administrator (DBA) productivity and lower storage administration overhead result in lower personnel costs.

In these baseline comparisons, SQL Server 2005 and DB2 9 costs are the same. Reflecting normal SAP pricing, initial license costs for both databases are calculated as 8 percent of SAP Application Value (SAV), and software support costs are calculated at 17 percent of initial database license costs per year.

Database migration comparisons. If it is assumed that companies initially employ SQL Server 2005 but migrate to DB2 9 at the beginning of the five-year measurement period, combined costs for DB2 9 scenarios for the three installations average 46 percent less than those for SQL Server 2005 equivalents.
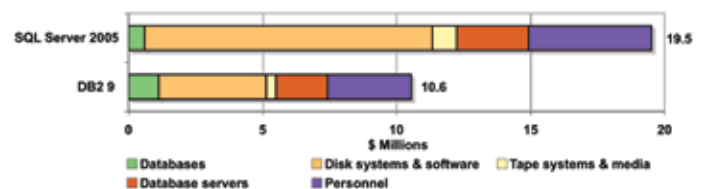
Results are illustrated in Figure 3.

Figure 3: Database migration comparisons: average scenario costs for all installations.

In Figure 3, database costs for DB2 9 scenarios include initial database license and five-year support costs, along with data conversion, system setup, staff retraining and other costs to transition SAP systems from SQL Server 2005 to DB2 9. Database costs for SQL Server 2005 scenarios are for ongoing support only.

Transition costs for moving from SQL Server 2005 to DB2 9 are more than offset by special pricing offered by SAP for such migrations.

For database migration comparisons, disparities for initial investment and five-year operating costs in favor of DB2 9 are similar. Initial investment costs average 42 percent less than for SQL Server 2005 equivalents, while five-year operating costs average 47 percent less.
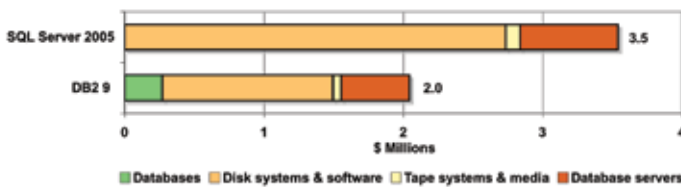
Figures 4 and 5 illustrate these results.

Figure 4: Database migration comparisons: average initial investment costs for all installations.
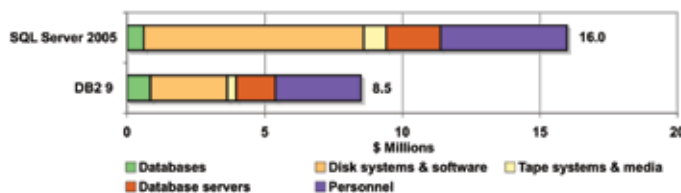

Figure 5: Database migration comparisons: average five-year operating costs for all installations.

Cost calculations for all comparisons are based on use of current versions of SQL Server and DB2 9. Disk and tape storage costs are based on IBM System Storage® DS8000 and DS4000 disk systems and software and IBM System Storage TS3500 tape systems. Database server costs are based on use of IBM System x® Enterprise servers equipped with Microsoft Windows Server 2003 Enterprise or Datacenter editions, depending on configurations.

In all calculations, software and hardware acquisition, maintenance and support costs were calculated based on discounted "street" prices (that is, prices actually paid by users). Personnel and facilities costs were calculated based on U.S. norms. Additional information on profile installations, along with granular cost breakdowns and details of cost assumptions and methodologies, may be found in the following section.

These comparisons are specific to the profile installations, assumptions and methodologies upon which calculations are based. Actual costs may differ widely, depending upon application portfolios, database sizes and structures, workload characteristics, staffing and compensation levels, growth patterns and other variables. Vendor configurations pricing may also vary.

Whatever the actual cost picture may be for individual users, one conclusion may reasonably be drawn: the costs of migrating from SQL Server 2005 to DB2 9 are outweighed by potential savings.

Cost savings, however, are only part of the picture. Migration to DB2 9, according to users, offers other benefits that may be equally if not more important.

Benefits

In preparing this report, input was obtained from five organizations in Europe and North America that had migrated SAP ERP environments from SQL Server to DB2 9 databases or were in the process of doing so. It was found that, in all cases, potential savings contributed to migration decisions. Reductions in storage costs were particularly cited.

Other benefits from moving to DB2 9 also proved to be significant. These included the following:

- **Performance.** All five organizations reported significant improvements in SAP system performance after migrating to DB2 9.

  This is consistent with industry experience. Numerous users that have migrated SAP solutions to DB2 9 have reported improvements in dialog, batch and query performance. This appears to be a function both of DB2 9 compression capabilities—reduced data volumes improve system throughput—and of other design characteristics such as the comparatively lightweight nature of DB2 9 software structures.

  Effects on SAP business intelligence (BI) workloads have been particularly striking. Users have experienced improvements of up to eight to nine times in performance for processes involving repetitive queries, large tablespaces or both. DB2 9 features such as Database Partitioning Feature (DPF) and Multi-Dimensional Clustering (MDC) are also reported to yield significant performance benefits for large SAP BI systems.

  In comparison, SQL Server 2005 range partitioning offers more limited capabilities, and there is no SQL Server 2005 equivalent to Multi-Dimensional Clustering. Although large

BI databases may be deployed using SQL Server 2005, there are potentially significant penalties in performance, cost (more powerful server configurations are required) or both.

- **Availability.** Four of the five organizations that had migrated from SQL Server to DB2 9 reported that they had been able to realize higher levels of SAP system availability with the latter. The fifth had not maintained pre- and post-migration records of system uptime, but believed that availability had improved.

  Three organizations cited the need to maintain "24x7" availability as a primary reason for deciding to migrate. One, an automotive parts manufacturer, noted, "our business is highly competitive…we cannot afford downtime."

  This is, again, consistent with industry experience. The IBM High Availability Disaster Recovery (HADR) solution for DB2 9, for example, is generally recognized as a more reliable and efficient solution for real-time data mirroring and failover than the Microsoft Database Mirroring offering for SQL Server 2005. HADR has proved particularly effective in high-volume SAP environments.

  Users have reported that DB2 9 also offers significant advantages in reducing the number and frequency of planned outages. The IBM Unicode encoding scheme and DB2 9 compression capabilities mean that data volumes are significantly reduced. Less time is required for such processes as copying, backup and archiving.

- **Manageability.** There was general agreement among organizations that had migrated to DB2 9 that database as well as storage administration tasks were simpler when the latter was employed, and were better integrated with SAP management tools.

One benefit was reported to be that less administrator time and effort were required. However, it was also noted that the complexity of SQL Server administration tasks made errors more likely. Simpler DB2 9 administrative procedures reduced risks of system disruptions.

These perceptions are clearly correct. DB2 9, for example, is more closely integrated with the SAP DBA Cockpit than is the case for SQL Server 2005.

The IBM DB6COCKPIT capability for DB2 9 enables administrators to handle a broader range of system and data administration tasks through the SAP management interface. In comparison, only basic monitoring and scheduling are supported for SQL Server 2005. Other tasks must be handled outside the SAP environment using Microsoft tools.

Another difference, which is particularly relevant to the issues addressed by this report, is that DB2 9 is equipped with highly efficient mechanisms for automated table expansion. This materially facilitates management not only of data, but also of storage growth. The largest gains are realized for SAP systems containing large tables such as high-end BI systems.

In comparison, SQL Server 2005 functions for expansion and management of storage capacity generate such high levels of overhead that they may severely impact system performance. SAP recommends that these functions be disabled and that configuration upgrade tasks be performed manually when systems are offline.

Administrative overhead and risks of errors may again be reduced, and planned outages may be minimized. In this as in other areas, SQL Server 2005 is less well optimized than DB2 9 for the high-volume, high-growth databases and storage resources that are increasingly characteristic of SAP enterprise environments.

- **Alignment.** All five organizations cited the close relationship between IBM and SAP and the alignment of SAP offerings and DB2 as major factors in migration decisions. Coordination between SAP and Microsoft, at least in databases, was seen as looser and less reliable.

Such perceptions are reasonable. The IBM-SAP relationship for database development and optimization is exceptionally close. DB2 9 is SAP's "preferred and recommended" database for its ERP 6.0 generation of solutions and is employed internally by SAP for development of these. IBM has also committed to extensive optimization of DB2 9 for SAP-specific requirements.

The two companies have agreed to align product and maintenance schedules for ERP 6.0 solutions at least through 2015. This provides a high degree of stability and predictability for organizations planning for future upgrades of and enhancements to their SAP systems.

Few would associate such terms as "stability" and "predictability" with Microsoft product schedules. New product introductions and upgrades have often been delayed and have routinely been incomplete, flawed or both when shipped. In numerous cases, problems have not been resolved until long after initial shipment dates.

The latest version of SQL Server, for example, was originally scheduled for general availability in the second quarter of 2008, but this has been postponed at least until the third quarter. Few large users plan to deploy it on any scale until well into 2009, to ensure that it is stable.

Such behavior may be acceptable—or at least tolerable—for suppliers of non-critical software. However, the databases supporting a major ERP system are scarcely "non-critical."

SAP users plan based on the company's strategic product and maintenance schedule. If database upgrade and support cycles are not consistent with this schedule, which is illustrated in Figure 6, bottom-line impact may be significant.
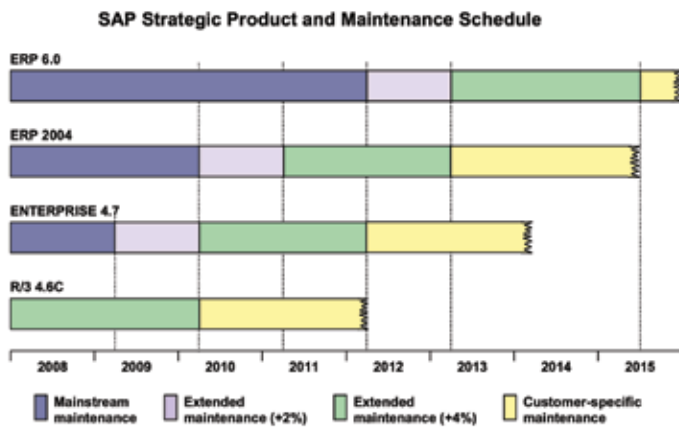

Figure 6: SAP strategic product and maintenance schedule.

Experience has shown that, for organizations undertaking large, multiyear deployments, the effects of even short delays may ripple through the entire project lifecycle. Numerous project activities may be affected, and multiple milestones may be missed.

Delays of 6 to 12 months in delivery schedules, which have proven to be routine for Microsoft offerings in the past, could seriously disrupt SAP deployment schedules, drive up costs and impair delivery of critical new application functionality. The

effects would be magnified if further delays were imposed while organizations waited for new SQL Server functions to become stable.

The Microsoft-SAP relationship, moreover, is less focused on database capability than is the case for IBM. Cooperation between Microsoft and SAP for Duet office and productivity applications, for example, does not materially affect integration of SQL Server with core SAP ERP systems. In certain areas, such as ERP solutions for small and midsize businesses, the two companies are major competitors.

This does not mean that SAP and Microsoft do not cooperate closely to support SQL Server. Clearly they do. But the relationship is inherently less predictable than that between SAP and IBM, and the degree of risk exposure for organizations that deploy major SAP solutions on SQL Server is correspondingly greater.

Among organizations that had migrated to DB2 9, the benefits of employing this database formed part of a broader perception that it was better suited for "business-critical" SAP environments.

SQL Server, it was noted, might be an attractive solution for small-scale application-specific deployments that did not require high levels of performance or availability, or did not experience high levels of growth. However, if one or more of these variables changed, so did the cost/benefit equation. It would, as one respondent noted, be necessary to make major investments in software engineering, skill sets and support to provide capabilities that, at best, approximated the standard features of DB2 9.

Risks

Decades of experience have shown that organizations that deploy large-scale, integrated ERP systems become fundamentally dependent on them. Inefficiencies may impact business processes across the entire organization. Disruptions, quite literally, may bring the business to a halt. The effects of both inefficiencies and disruptions may cascade through the supply chain as a whole, affecting customers, suppliers and other partners.

With the SAP ERP 6.0 generation of solutions, vulnerabilities increase. Next-generation environments will be less structured and technologically more diverse than was the case for SAP R/3 and R/3 Enterprise systems. This makes it particularly important that organizations should be able to control technical complexities and that the future evolution of their SAP ERP 6.0 environments should be both predictable and manageable.

Risks are also multiplied by the fact that, with the transition to the SAP ERP 6.0 generation of solutions, the SAP enterprise environment becomes functionally broader. The transactional systems that formed the backbone of first-generation deployments are increasingly joined by an array of informational and collaborative applications that provide new sources of business vitality and competitiveness.

There is, however, a downside to this shift. Flaws within the SAP infrastructure may cause bottlenecks and outages that extend beyond transactional systems to impair high-value informational and collaborative processes. Critical information may be lost. Customer and partner interactions may be interrupted. Time-sensitive decisions may be postponed.

In a next-generation SAP ERP environment, the impact of failing to deliver the right information to the right person at the right time may be as serious as a delay in delivering a part to a production line, or a shipment to a distribution center. The result may be tangible "lost productivity," such as lost orders, dissatisfied customers, idle factories and empty warehouses.

Broader industry trends magnify risk exposure. Supply chains operating in real time, with few or no inventory buffers, are more vulnerable to disruption than those operating less efficiently. Organizations that consolidate ERP system instances will be more severely impacted by flaws in database infrastructures than their decentralized counterparts. There are many other such examples, in a wide range of industries.

The final risk multiplier is growth. Many organizations struggle to manage SAP environments that contain a few terabytes of data, or a few dozen terabytes. How will they deal with hundreds or thousands of terabytes? Performance could be seriously impacted. Database updates, replication and transformation, backup and recovery—including disaster recovery—along with archiving, retention, security and other processes could all become significantly more difficult and more prone to error.

The extent to which SAP users will be exposed to these risks over the next decade will be materially affected by their choice of a core database platform.

There may be legitimate business reasons for incurring risk. However, there is no business case for incurring unnecessary risk—particularly when the higher-risk option is also significantly more expensive.

Additional information

This ITG Executive Summary is based upon results and methodology contained in a Management Brief released by the International Technology Group.

Case studies:
IBM DB2 Optimized
for SAP software

"The initiative 'DB2 Optimized for SAP software' signaled the start of a new chapter in IBM's collaboration with SAP. Part of this agreement is to provide a series of new versions of DB2 that are specifically tailored to meet the needs of SAP clients."

—Rob Thomas,
 Vice President Business Development,
 IBM Information Management Software

Challenge for a modern IT solution

Clients are looking for solutions that are simple to use and enable information to be exchanged quickly—not only within the company but also beyond the confines of the company with clients, partners and suppliers.

First, it must be possible to integrate these solutions into existing information management structures. They must be flexible and capable of expansion in order to respond in a dynamic manner to future changes.

In addition, the solutions must be cost-effective both to implement and to run. In other words, they must offer a rapid return on investment (ROI) and a low total cost of ownership (TCO).

IBM and SAP

To be able to satisfy the previously mentioned client requirements to an even greater extent, the SAP and IBM partnership has been working to develop and integrate the IBM® DB2® for Linux, UNIX and Windows (DB2 LUW) database with the SAP solutions portfolio. Based on their long-standing and successful alliance, the two companies have set themselves the goal of further optimizing the DB2 database for use with SAP applications.

IBM and SAP are already offering a solution, in the form of the DB2 database, of outstanding quality and functionality. Both companies will continue along this path of joint development and optimum integration in the future to be able to offer their joint clients a solution that meets high requirements at low overall costs.

"IBM and SAP have a long history of working closely together to help our mutual clients reduce the costs of running complex business systems. IBM DB2 9.7 is optimized for our recently announced SAP Business Suite 7, which means our clients can take advantage of both the latest SAP capabilities and DB2 enhancements to further lower operational costs—such as storage and server expenses— using the latest DB2 9.7 data compression and performance management capabilities."

—Craig Jonsson, Vice President, Global IBM Alliance

Companies that already use IBM DB2 tell us of the advantages that result from the close IBM-SAP collaboration and our high level of investment in development. The following success stories will show you how our clients are gaining concrete benefits from this today. To view more IBM and SAP case studies, visit **ibm.com**/software/success/cssdb.nsf/ customerVW?OpenView&Count=10&RestrictToCategory= gicss67sap&cty=en_us

Partnership between IBM and SAP

In 2005, IBM and SAP significantly expanded their partnership in the area of databases. Under the motto "DB2 Optimized for SAP software," an initiative lasting several years was launched with the aim of optimally adapting DB2 to new releases of the SAP NetWeaver® technology platform.

Development

SAP and IBM have joint development teams in Walldorf, Germany and Toronto, Canada, where DB2 is being developed. With the aid of a technology plan and by closely incorporating the SAP software development into the overall DB2 cycle of development, innovations are made available to clients quickly and with high levels of quality. The DBA Cockpit for DB2, the SAP tuner and the integration of DB2 into the SAP software installation process are the fruits of this intensive collaboration.

Support

The maintenance cycles for the SAP software and IBM DB2 have been synchronized. Each version of DB2 that is supplied with an SAP application is supported throughout the entire maintenance period for the SAP application—there are no mandatory upgrades. All support-related inquiries, irrespective of whether they relate to DB2 or SAP software, are covered by the SAP support process. DB2 specialists are involved in the SAP support process, which helps to avoid adaptation-related difficulties.

Sales

Specially trained IBM sales staff assist clients with planning and implementing their DB2 installation with SAP software. Feasibility studies and workshops aimed at verifying the performance of DB2, especially in the case of migrations, can be arranged.

Marketing

There are a large number of joint marketing initiatives in place to explain the benefits of the partnership to a broad client base. SAP openly endorses DB2 to its medium-sized clients, for example.

"SAP has also been using IBM databases internally for many years, both in the area of development and also in its internal financial, staffing and sales systems. With over 1,000 systems having been installed here at SAP, DB2 is the development platform that is used the most often."

—Torsten Ziegler, Development Manager, SAP AG

Sell what we use/use what we sell

As far as their internal business solutions are concerned, IBM and SAP have been reaping benefits from the ideal combination of SAP software and DB2 for many years. SAP has converted its most important internal business systems to DB2 and is also using DB2 in its development operations. Well over 1,000 development systems operate using DB2.

Case study: Fossil reaches its global branded market more quickly with SAP and IBM

Fossil, Inc. (www.fossil.com) is one of the world's leading fashion brands. Primarily known for watches sold under the FOSSIL, RELIC and ZODIAC brands, the company has added eyewear, leather, apparel and jewelry to its ranges as well as licensed brands from some of the most prestigious companies in the world, such as Burberry, Calloway, Columbia, Diesel, Disney, DKNY and Emporio Armani, to name but a few. Founded in 1984, the company has grown dramatically, consistently achieving sales increases of up to 20 percent per year. Growth has been achieved by a combination of acquisition and brand extension into fashion accessories and apparel.

The challenge

Fossil needed to bring consistency to diverse global operations by integrating processes across different geographies and customer groups.

The solution

IBM and SAP helped Fossil centralize IT and integrate information across divisions and geographies to optimize supply chain and gain business process efficiencies.

The benefit

By implementing scalable, flexible and centralized IT services, Fossil can better manage its complex supply chain for fast-moving fashion goods, introduce best practices and gain a consolidated, high-speed view of global operations.

To learn more about how Fossil integrates retail and wholesale operations with IBM and SAP, visit: **ibm.com/software/success/cssdb.nsf/CS/STRD-795MNK?OpenDocument&Site=gicss67sap&cty=en_us**

Integration between SAP and DB2 was a key deciding factor for Fossil's database choice.

"The close SAP and IBM development relationship ensures better integration, leaving us free to focus on the value-add for Fossil rather than application integration—all part of our 'fashion-not-software' ethos."

—Ed Jurica, Chief Information Officer, Fossil

Case study: Rossi Residencial shrinks database size and reduces cost by migrating its SAP applications to IBM DB2

Rossi Residencial is part of Grupo Rossi, founded in 1913 and one of the leading engineering, construction and development groups in Brazil. The Group's real estate operations were launched in 1961, and Rossi Residencial was created in 1980.

The challenge

Real estate business Rossi Residencial was growing fast and needed to gain rapid insight into group operations, which was not possible with the existing applications. With data volumes growing by up to 50 percent annually, operational costs were increasing even as system performance declined.

The solution

In preparation for new Java-based software and SAP applications such as SAP Supply Chain Management and SAP Customer Relationship Management, Rossi Residencial migrated its data to IBM DB2.

The benefit

The migration to a single instance of DB2 has enabled Rossi Residencial to gain a complete, accurate and up-to-date view of its operations. IBM DB2 Deep Compression functionality has helped to reduce data storage growth, saving infrastructure and management costs, and has also produced faster system response times.

To learn more about how Rossi Residential reduced costs by migrating its SAP applications to DB2, visit: **ibm.com/ software/success/cssdb.nsf/CS/TCHL-7LWLAD?OpenDocume nt&Site=gicss67sap&cty=en_us**

"We concluded that both Microsoft SQL Server and MaxDB were too limited in terms of performance and security for what we were planning to do, so we needed to choose between Oracle and DB2. We decided on DB2 mainly due to the partnership between SAP and IBM and secondly because DB2 offers lower expected total maintenance costs."

—Reginaldo Mobrizi, Chief Information Officer, Rossi Residencial

Minimization of overall costs

Thanks to its low license fees and minimal required administration effort, DB2 offers you extremely favorable overall costs. Customers who migrated their SAP systems from Oracle to DB2 reported cost savings from 25 percent to up to 50 percent. Agrium[1] saved approximately 50 percent on maintenance costs by migrating to DB2; rku.it[2] concluded that DB2 would cost 40 percent less over five years, including licensing, maintenance and migration; and Austrian Railways[3] reported a 25 percent reduction in TCO with DB2 compared to Oracle. When switching from Oracle to DB2, you can also take advantage of attractive migration offers. The bottom line is that you could save a considerable amount of money by migrating from Oracle to DB2. So what are you waiting for?

"Many clients have been able to achieve a reduction of between 20 and 40 percent in their overall costs by switching from Oracle to DB2. At the same time, a return on investment has been achieved in as little as 12 to 36 months in the case of these migration projects, despite the migration outlay."

—Ferdinand Prezenski, Director of Worldwide DB2/SAP Sales

Reducing database size and lowering storage costs

DB2 9 enables you to compress database tables, indices and more. The size of the database can be reduced up to 70 percent.[4] In most cases, hardware storage costs are reduced by the same amount. Compressing the database tables also reduces the size of the backup images to half the size, and the runtime is halved. You benefit from saving space, time and money.

Ease of use

Many additional advantages result from the fact that the DB2 database solution is closely integrated with the SAP applications. For example, the DB2 database is installed as part of the SAP software installation process, which saves you time, and is optimally configured for use with SAP applications at the touch of a button. Autonomic computing functions automate administration tasks and relieve the burden on the database administrator. You reap the benefits of minimal administration effort, a low level of complexity and a high level of productivity.

Performance Health Check

Still not convinced? Invite an IBM SAP expert free of charge to see how much your organization could save by getting a tailored assessment for your own environment.

IBM Migration Factory

Why not get a fixed-price quote from the IBM Migration Factory? All migrations have a 100 percent success record, and the migration to DB2 is virtually risk free.

Skills and training

Wondering whether you have the skills you need within your organization? The retraining time to DB2 is typically less than or equal to two weeks, as the database administration is merged into the SAP tools and DB2 utilizes the same relational database management systems concepts as other vendors. Multiple IBM Redbooks®, DB2 classes run by SAP and technical support provided by IBM should help you make the transition as smoothly as possible.

Case study: Agrium finds the formula for growth with IBM System p and DB2

Agrium, based in Calgary, Alberta, Canada, is a leading global manufacturer and wholesaler of agricultural nutrients, industrial products and specialty fertilizers with major agricultural retail interests in North and South America. The company achieved total sales of more than US$4 billion in 2006 and employs over 6,500 people.

The challenge

Anticipating rapid growth, Agrium realized that its existing hardware infrastructure was reaching end-of-life and lacked the capacity to store and process increasing data volumes.

The solution

Working with IBM Global Technology Services and REALTECH, an IBM Business Partner, Agrium migrated its SAP software environment from a number of aging Alpha servers to just five IBM System p5® 570s. The company also migrated from Oracle to IBM DB2 and extended its SAN infrastructure, adding an IBM System Storage® DS4800 and using IBM SAN Volume Controller (SVC) to virtualize the entire storage environment.

The benefit

The new virtualized server and storage infrastructure increases flexibility, boosts performance and provides scalability for future growth. Migration to DB2 reduced database maintenance costs by 50 percent. The IBM SVC helps protect existing storage investment and provides simpler storage management. The IBM development advocate program provides highly responsive technical support for the DB2 environment.

To learn more about how Agrium planned for growth using DB2, visit: **ibm.com**/software/success/cssdb.nsf/CS/STRD-78NMXN?OpenDocument&Site=gicss67sap&cty=en_us

"In particular, the SAP DBA Cockpit for DB2 enables most database administration to be handled from within the SAP software environment. In addition, we are saving about 50 percent on maintenance costs with DB2, compared to our previous platform."

—Luke Lau, Director of IT Planning, Agrium

Case study: Central Michigan University gives high grades to IBM Information On Demand

Universities are known as teaching institutions, but they're also learning lessons of their own these days about information management. As the volume of its information grows, the educational community is realizing that it must entrust its data to the most scalable, flexible, high-performance information management solutions. That's happening today at Central Michigan University (CMU), a vibrant community of scholars, leaders and partners dedicated to achieving excellence in undergraduate and graduate learning. One of the 100 largest universities in the United States with nearly 28,000 students, CMU maintains a friendly, small-college learning environment with a strong commitment to teaching, research and discovery.

"The price/performance advantage of DB2 is compelling. One of the things we found out about working in a virtualized environment is that we have enormous peaks in usage at student enrollment time, but we don't want to pay for all those CPU cycles during the rest of the year. DB2 allows us to put the horsepower where it's needed, when it's needed, so we don't have idle CPU resources sitting around, and we have 100 percent utilization of the system where we need it."

—Eric Lorenz, Associate Director of Advanced Technologies, CMU

The challenge

CMU needed to make student and administrative information readily accessible to a rapidly growing user community.

The solution

IBM DB2 Universal Database™ is the information management infrastructure for the SAP ERP system and student information management system.

The benefit

CMU is able to run data-intensive applications in just seconds as compared to 20 minutes previously; recognize real-dollar savings in hardware costs by fully utilizing existing hardware using IBM virtualization; and experienced a flawless implementation by the IBM Global Services data migration team.

To learn more about how CMU used DB2 to address reliability and scalability, visit **ibm.com**/software/data/db2/press/central.html

Technology

IBM DB2 Optimized for SAP software offers technological advantages that are especially tailored to meet the needs of SAP clients. Joint development teams allow SAP clients' demands on the DB2 database to be implemented promptly.

DB2 provides functions that are outstandingly adapted to SAP applications.[5] DB2 is installed in the background as part of the SAP software installation process and can be optimally parameterized at the touch of a button, for example. DB2 High Availability Disaster Recovery (HADR), combined with IBM Tivoli® System Automation (TSA), represents a high-availability solution that is easy to implement and cost-effective, and is also firmly rooted in the SAP installation routines.

Unique functions such as the DB2 Database Partitioning Feature (DPF) or Multidimensional Clustering (MDC) for the SAP NetWeaver Business Intelligence (SAP NetWeaver BI) component allow the optimum performance of the entire system by means of an almost linear scaling of the application and/or by means of optimum storage of data on disk.[6] This significantly speeds up the time it takes to respond to queries and helps reduce the time it takes to load data into SAP NetWeaver BI.

DB2 9 introduced DB2 compression in many flavors; it is a technology that makes it possible to effectively compress data to save up to 70 percent of disk space.[7] Moreover, in many cases this reduces the response time up to 30 percent.[7]

The IBM SAP DB2 Center of Excellence (CoE) in Böblingen, Germany is the central contact point that assists clients throughout the world with ventures including complex feasibility studies and migration projects.

"IBM SAP DB2 CoE provides advice on questions relating to IT architecture as well as on evaluating the scope of a project. In the case of complex projects involving competition, our experts also provide support at client premises."

—Rainer Staib, Manager of IBM SAP DB2 CoE, IBM Deutschland Entwicklung GmbH

Case study: Mitsubishi Motors Australia Limited cashes in with IBM DB2 and SAP

Mitsubishi Motors Australia Limited (MMAL) is part of Mitsubishi Motors Corporation. MMAL's headquarters are located at Clovelly Park in South Australia, and it distributes its products throughout more than 200 dealerships across the country.

The challenge

MMAL found its database volumes were growing with corresponding increases in costs. Database growth was likely to increase data storage needs, and the company was seeking a way to reduce its costs.

The solution

Working closely with IBM Global Business Services, MMAL migrated to the latest version of IBM DB2, which includes advanced deep compression technology.

The benefit

Using IBM DB2 9 with deep compression, storage requirements for SAP applications shrank by almost 40 percent. Some tables were compressed by as much as 80 percent. This enabled MMAL to reduce additional resource charge fees above the baseline changes by up to 50 percent annually.

To learn more about how MMAL took advantage of DB2 Deep Compression features, visit: **ibm.com**/software/success/ cssdb.nsf/CS/STRD-7ENKDS?OpenDocument&Site= gicss67sap&cty=en_us

"We have moved from a mixture of legacy systems to an integrated solution with SAP software. The introduction of DB2 9 has immediately proved that there are savings available from implementing the latest technologies, and our aim now is to continue to drive down costs while taking the greatest possible advantage of our investments."

—Mark Tiddy, Manager, ICT Services at MMAL

Case study: Iskra Mehanizmi moves into the automotive sector with SAP and IBM

Iskra Mehanizmi, which manufactures a wide range of electromechanical products, operates from two sites in Slovenia and recently opened a new plant in Bosnia and Herzegovina. The company employs about 500 people and has been in business for over 50 years.

The challenge

To increase its resilience to changing market conditions, manufacturer Iskra Mehanizmi sought to diversify its product range by moving into the automotive sector. This created an increasingly complex supply chain, which the company's legacy information systems were struggling to manage.

The solution

Working with IBM, Iskra Mehanizmi implemented ERP software from SAP. As the environment grew, the company migrated to the IBM System p platform, using an IBM DB2 database and deploying a SAN using IBM System Storage DS4300 hardware and IBM Tivoli Storage Manager. The SAP applications are also integrated with the company's IBM Lotus® Domino® document management system.

The benefit

A single, central SAP application environment can handle complex business processes for all Iskra Mehanizmi manufacturing divisions, minimizing administrative workload and improving financial management. Virtualized System p hardware provides excellent reliability and a 90 percent reduction in SAP application response times. System p is easy to manage, cutting IT department workload by 20 percent.

To learn more about the benefits Iskra Mehanizmi realized after migrating its SAP environment to DB2, visit: **ibm.com/** software/success/cssdb.nsf/CS/STRD-7CEH4V?OpenDocument&Site=gicss67sap&cty=en_us

"Because of the close relationship between IBM and SAP, DB2 needs very little expert tuning for the SAP software environment. Unlike SQL Server, it also has a DBA Cockpit that can be accessed within the SAP software interface, which makes it easy for database administrators to learn how to use it, and contributes significantly to the 20 percent overall reduction in administration workload. We have also found that DB2 caching is very efficient, which means less physical I/O traffic and better performance."

—Zoran Šimnic, Chief Information Officer, Iskra Mehanizmi

Case study: Britannia gets cooking with mySAP ERP and IBM

A joint partnership between the Wadia Group and Groupe Danone, Bangalore-based Britannia Industries employs more than 2,600 people making cakes, cookies and other bakery products and is the largest manufacturer of biscuits in India. In recognition of its vision and accelerating graph, Forbes Global rated Britannia as "One amongst the Top 200 Small Companies of the World," and the *Economic Times* pegged Britannia as India's second most-trusted brand.

The challenge

To compete effectively, Britannia found that it was essential to get salespeople out in front of customers—yet this isolated them from their ordering systems. Managers wanted to enable remote working to allow more time to be spent with customers, while providing easier access to ordering and production management tools.

The solution

Britannia implemented mySAP ERP applications on high-performance, highly scalable IBM technologies. The mySAP ERP software enables full access to company production planning, stock, sales order systems and more, and can be accessed through a simple web browser and SAP client.

The benefit

Britannia expects to achieve around 30 percent lower database administration costs with better technical performance leading to increased productivity as sales staff complete orders more quickly without waiting to return to the office. Britannia can provide information on pricing and availability in real time. Lower software license fees for remote systems and a reduced administrative and maintenance workload mean a significant reduction in TCO.

"With DB2, we are able to run dual instances of DB2 on the same server, and with the fully integrated database administration cockpit for DB2 in the SAP computing center management system, DB2 helps to keep management and administration workload to a minimum."

—T S Purushothaman, Corporate Head of IT Systems, Britannia

Case study: Jebsen & Jessen SEA doubles performance and cuts 20 percent from TCO with SAP ERP 2005 software on IBM DB2 on IBM System p5

The Jebsen & Jessen Group of Companies South East Asia (Jebsen & Jessen SEA) can trace its history back to a trading partnership formed in 1895 in Hong Kong. Today, the group has diversified into seven core businesses: chemicals, communications, life sciences, marketing, material handling, packaging and technology. Jebsen & Jessen SEA employs about 2,500 people in 50 subsidiaries in Singapore, Indonesia, Malaysia, Philippines, Thailand and Vietnam.

The challenge

Jebsen & Jessen SEA needed to migrate its business-critical SAP ERP environment to a new database platform, both to ensure continued support and to enable greater performance and availability. The company also wanted to consolidate the physical server infrastructure supporting its ERP environment to improve resource utilization and drive down the total cost of ownership.

The solution

Jebsen & Jessen SEA engaged IBM to migrate its SAP R/3 4.6C software from IBM Informix® to IBM DB2 Optimized for SAP software. The company also took the opportunity to replace seven servers running HP-UX with three IBM System p5 servers running IBM AIX®, clustered using IBM High Availability Cluster Multi-Processing (HACMP). The SAP R/3 software was then upgraded to the SAP ERP 2005 application, which now runs in multiple logical partitions across two System p5-550Q servers.

The benefit

Jebsen & Jessen SEA experienced a rapid, low-risk migration of SAP R/3 4.6C software from Informix to DB2, with expert assistance from IBM. DB2 offers improved performance at low TCO, and use of IBM Advanced POWER® Virtualization for System p gives Jebsen & Jessen SEA much greater flexibility in allocating computing resources as business needs change. The speed of data extraction to SAP NetWeaver BI was cut from 12 hours to 4 or 5 hours. TCO for the entire infrastructure supporting SAP software was also reduced by 18 to 20 percent.

"One of the reasons that we chose DB2 was the built-in HADR database replication, which gives us high availability with no additional cost or complexity. The automatic configuration tools in DB2 Optimized for SAP software are saving us time and manual work, and freeing up my team to focus on the applications rather than on database issues. We are now doing much more productive work with the same manpower as before."

—Roy Lim, Operations Manager, Jebsen & Jessen SEA

Case study: Banca Nazionale del Lavoro, Gruppo BNP Paribas virtualizes its SAP application landscape on IBM Power Systems servers

Banca Nazionale del Lavoro (BNL) is part of the international BNP Paribas Group. BNL offers both retail and corporate banking services, principally in Italy, serving millions of customers since 1913. The bank was one of the first in Italy to adopt SAP applications, starting with human resources and procurement functions, and subsequently introducing SAP NetWeaver Business Intelligence (SAP NetWeaver BI).

The challenge

Growing regulatory requirements were increasing the reporting workload at BNL. Only by using a very high degree of automation—and two new SAP applications—could the bank easily meet the demands for financial information. BNL seized the opportunity to seek new ways to consolidate and improve the business performance of its IT infrastructure.

The solution

BNL implemented two IBM Power® 595 servers, taking advantage of advanced virtualization capabilities to consolidate workload from both SAP and other applications. The servers are linked using IBM PowerHA® to provide a very high-resilience service, and an IBM System Storage DS8300 is used to store 15 TB of associated SAP application data.

The benefit

By using virtual servers on Power 595 servers, BNL is able to meet the very high workload requirements of the SAP General Ledger and Bank Analyzer applications by reassigning system resources exactly as required. Virtualization and Micro-Partitioning allow the Power 595 servers to be subdivided into numerous virtual servers, creating a compact and highly efficient computing platform.

To learn more about how BNL boosted performance levels with IBM and SAP technology, visit: **ibm.com**/software/ success/cssdb.nsf/CS/STRD-7FRHC5?OpenDocument&Site= gicss67sap&cty=en_us

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"We are using DB2 to support SAP Bank Analyzer because it offers performance and scalability needed to handle large volumes of data. DB2 is very easy to use with comprehensive autonomic features that reduce the administration workload."

—Leopoldo Palombini, Head of BNL IT Central Systems Management

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1 See case study: "Agrium finds the formula for growth with IBM System p," GK12-4306-00 (10/07).

2 See case study: "rku.it optimizes business performance for SAP with IBM DB2," GK12-4083-00 (12/05).

3 See case study: "Austrian Railways rolls out lower TCO with IBM Information On Demand," GC38-0732-00.

4 See case study: "Mitsubishi Motors Australia Limited cashes in with IBM DB2 and with SAP." SPC03038-AUEN-00 (05/08). "Rasselstein: Migration nach IBM DB2 optimiert Kosten und verbessert Performance im SAP Umfeld." MMC03006-DEDE-00 (03/10) "Schaeffler KG increases storage efficiency for SAP applications with IBM DB2." SPC03055-DEEN-00 (09/08). "INTER Versicherungen protects SAP software and IBM hardware investments with DB2." GK12-4220-00 (03/07).

5 See SAP note #1351160 "Use of DB2 9.7 with SAP software." See SAP note #1089578 "Use of DB2 9.5 with SAP software." See SAP note #930487 "Use of DB2 9.1 with SAP software."

6 "SAP Solutions on IBM DB2 UDB V8.2.2 Handbook," IBM Redbook, October 2005, www.redbooks.ibm.com/abstracts/sg246765.html?Open and "Building and Scaling SAP Business Information Warehouse on DB2 UDB ESE," IBM Redbook, February 2004, www.redbooks.ibm.com/ abstracts/sg247094.html?Open

7 Customer case study: Rasselstein (ThyssenKrupp Steel) **ibm.com**/ software/success/cssdb.nsf/CS/STRD-83EMDY?OpenDocument&Site= default&cty=en_us

Tools and tips to optimize your SAP environment

Today's organizations require more from their database environments to accommodate growth and capitalize on new market opportunities. In this section, you'll find a wealth of information on IBM tools, techniques and software services you can leverage to help ensure that your SAP database environment is running efficiently and cost-effectively.

Migration
An ever-growing number of companies are changing their database software to IBM® DB2® in conjunction with SAP upgrades, Unicode conversions, hardware or operating system changes, and system consolidations. Find out how they are making the transition to DB2 smoothly, quickly, and securely—while keeping costs down.

Optimization
Increase your organization's business-critical productivity and competitiveness by achieving maximum DB2 database performance in your SAP environment. Get expert advice from IBM consultants on how to exploit new SAP-related features available in DB2. Gain skills on new features quickly and efficiently.

Administration
Discover how to quickly bring your DBAs up to speed with resources such as IBM eLearning courses on DB2 administration for SAP, based on a face-to-face workshop delivered by the World Wide DB2-SAP Technical Sales organization.

"From our own experience, and from listening to the experiences of our customers, we would definitely recommend the combination of Unicode conversion and database migration as part of an SAP software upgrade project. A reduction in database size may initially seem counterintuitive, but many companies have experienced the same thing. Moreover, performing a database migration during the Unicode upgrade adds very little to the overheads of the project, so it is more efficient to do both at once."

—Peter Bögler, Solution Architect, SAP IT

IBM Redbook

DB2 optimization techniques for SAP database migration and Unicode conversion

This IBM® Redbooks® publication describes optimization strategies and best practices for migrating SAP systems to IBM DB2® for Linux, UNIX and Windows, as well as for performing Unicode conversions. DB2-specific recommendations are presented. This guide is intended for experienced SAP migration consultants involved in operating system and database (OS/DB) migrations choosing IBM DB2 as a target database platform. It addresses advanced SAP migration techniques and considerations for database layout and tuning, plus unique DB2 capabilities such as compressing the target database while loading data.

For a complete copy of this Redbook guide, visit: www.redbooks.ibm.com/abstracts/sg247774.html

SAP has developed a set of tools that allow customers to export their source database in a database-independent format and import it into the target database. The same set of tools allows you to convert a non-Unicode SAP system to Unicode. From a technical point of view, the process of migrating an SAP system to another platform or converting an SAP system to Unicode is basically the same procedure regarding export and import: they are both based on the use of R3load. As a result, OS/DB migrations and Unicode conversions can be combined easily into one project.

Minimizing downtime using the Combined Upgrade and Unicode Conversion process

The process of copying an SAP system while changing the operating system or the database platform is known as *heterogeneous system copy*. The database of the source system is exported into a database- and operating system-independent format using SAP tools. A new SAP system is then installed, using the export from the first step to load the database.

No SAP user activity is allowed during the exporting or importing process. For this reason, organizations normally allow two days or more for performing a heterogeneous system copy. However, if the system is large or the time frame is tight, special techniques can be used to optimize the export and import process. Some of the advanced techniques should be used only if the time frame or compression requirements make them necessary.

The Unicode conversion itself is normally executed during the export phase. It is, therefore, very easy to change the database for the target system without additional effort. Restrictions on the migration procedure due to the Unicode conversion are few. To minimize downtime for those customers who must perform an upgrade with a Unicode conversion, SAP has developed the Combined Upgrade & Unicode Conversion (CU&UC) process.

Comprehensive guidance from migration essentials to advanced options

Written by a team of specialists working at IBM Germany, the *DB2 Optimization Techniques for SAP Database Migration and Unicode Conversion* Redbook guide covers the essentials of migration, the tools available, optimization strategies and best practices. The guide also highlights specifics related to DB2 that should be taken into account during planning and execution of a project. All of the techniques discussed in the guide are based on extensive testing as well as experience gathered from numerous migration projects.

Recommendations are summarized in an early chapter that can be used as a quick reference for experienced migration consultants. For example, to speed up export and import using table splitting, the guide offers the following recommendations:

- See if you can create an index that refers to the table column used in the WHERE clause. Be aware that creating additional indexes can impact production operation, as this requires additional hardware resources and may also affect the access plans of queries.
- If you have created an additional index to support table splitting, see if you can reorganize the table to be clustered by this index. In some cases, this results in a better export performance.
- If some of the table pieces show a longer export time compared to the others, you can introduce additional WHERE conditions to further split this table part.
- Be sure to understand the advantages of using sequential DB2 LOAD versus parallel inserts and plan the migration based on your needs.

Beyond the recommendation summary, the Redbook guide includes a detailed discussion of the migration process divided into six areas:

- Best practices and recommendations for the source system database export
- Advanced migration techniques such as table splitting and socket transfer
- DB2 database layout and configuration options
- Database import recommendations, including the use of DB2 row compression
- SAP NetWeaver Business Warehouse migration
- Information about Unicode and related techniques

For a complete copy of this Redbook guide, visit:
www.redbooks.ibm.com/abstracts/sg247774.html

IBM Flyer

IBM DB2 Migration Factory for use with SAP software

To make transitioning to IBM® DB2® as smooth, fast and secure as possible, IBM has introduced the IBM Migration Factory for use with SAP software. The Migration Factory offers organizations all the services necessary to move an SAP database to DB2, including migrating in conjunction with an SAP software upgrade and/or Unicode conversion. Combining migration with an upgrade or conversion provides an opportunity to eliminate redundant project tasks, helping to keep the cost as low as possible.

This summary provides an overview of the Migration Factory services including assessment, planning and execution. For a complete copy of the flyer, visit: ftp://public.dhe.ibm.com/common/ssi/ecm/en/spb03003usen/SPB03003USEN.PDF

Flyers and price lists are available for the U.S., UK/Ireland, Germany, France, Italy and the Nordic countries. For more information, please contact Joerg Peinelt, IBM Germany, DM Service Lead for the Worldwide SAP/ERP practice by sending email to: PEINELT@de.ibm.com.

DB2 can be installed in a time-saving manner during the SAP software installation process. Deep subject-matter skills and expertise from the entire IBM organization enable successful migration projects from any non-DB2 database to DB2 for Linux, UNIX and Windows, and the process is based on well-established methodologies that are approved by SAP. The IBM team works closely with customers to document their unique requirements, identify the right solutions and make recommendations prior to starting the migration project.

When to migrate?

Three of the most common scenarios for migration to DB2 are:

- **Database substitution:** Migration to DB2 as a stand-alone project, before a Unicode conversion or SAP upgrade, provides the immediate benefit of DB2 optimization for SAP software. In addition, the time required for future projects can be reduced by having DB2 Deep Compression already in place.
- **Upgrade to the next release of SAP software:** An upgrade project for SAP software can be extended to include a migration to DB2 with limited extra effort. The migration project leverages some of the same activities that must be executed for the upgrade, including testing.
- **Unicode conversion:** The highest level of synergy is achieved when combining a Unicode conversion with a migration to DB2, because many of the project tasks are the same. This type of migration adds very little extra project time and no additional downtime.

Benefits of a migration

Moving to DB2 can provide significant benefits, including low license and maintenance fees, minimal administration, and reduced database size and improved performance with DB2 Deep Compression. Autonomic computing functions within DB2 are designed to automate tasks and reduce the workload of the database administrator. And the High Availability Disaster Recovery (HADR) feature available with DB2 helps protect the database environment from software and hardware failures.

Another benefit is the near-linear scale-out capability offered by the DB2 Database Partitioning Feature (DPF) for SAP NetWeaver Business Intelligence through optimized storage of data on disk and hardware-optimized parallelism. This approach helps speed up the time it takes to respond to queries and reduces the time it takes to load data into the SAP NetWeaver Business Intelligence component.

IBM Flyer

IBM Information Management Software Services

Migration services for SAP systems

Highlights

- Leverage the SAP standard methodology and IBM Software Services best practices

- Shorten migration and cutover time using the Migration Center's proven migration methodology

- Low-risk IBM "plug-in" migration process fits into your SAP upgrade or Unicode conversion schedule

In today's competitive IT market, many leading organizations continue to evolve their IT infrastructure, applications and hardware to reduce costs and remain competitive. With the help of IBM® Information Management Software Services, customers worldwide have maximized their SAP systems by providing a streamlined migration path to IBM DB2®.

With years of collaborative SAP migration experience, SAP-certified IBM migration experts have helped customers shorten migration and cutover time using the Migration Center "best practices" methodology.

This flyer provides an overview of IBM migration services for SAP systems, including needs assessment, infrastructure check and post-migration activities. To view the complete flyer online, visit: ftp://ftp.boulder.**ibm.com**/software/data/services/SAP_Migration_Service.pdf

What are the IBM migration services for SAP systems?

Developed to deliver cost-effective migrations backed by IBM experts, the Migration Center can develop a customized SAP migration plan for your organization. Our consultants strictly follow SAP standard methodology and Software Services best practices. Our consultants can migrate your database environment from source database types such as Oracle, Sybase and Microsoft SQL Server to IBM DB2.

We offer several SAP migration delivery models designed to meet your resource and price targets. Our flexible approach spans from partnering with our customer to augment their staff resources at any point throughout the migration process to taking a complete leadership role and delivering the SAP migration.

What's involved

The IBM Migration Service begins with an application and database migration needs assessment. The information gathered enables our consultants to plan each migration to DB2 according to the customer's unique requirements. If a Unicode migration or SAP upgrade is already planned, the low-risk IBM "plug-in" migration process fits into your SAP upgrade or Unicode conversion schedule.

With the high-level migration plan, our consultants leverage the SAP standard methodology and Software Services best practices to deliver low-cost, reliable and proven migrations to DB2. Our standard offering includes:

- **Migration assessment:** Prepare SAP migration project plan templates before the project starts to allow extra time to define the order in which your SAP landscape(s) and systems are migrated. Once the migration assessment phase starts, we perform an on-site review of your SAP landscape(s) and prepare the first source and target systems for migration.
- **Pre-migration production system scan:** We provide a free tool and instructions for scanning the SAP ABAP layer for potential issues that will require resolution before migration.
- **Production system test migration(s):** We perform one or more test migrations to reduce risk on each production system cutover. These test migrations are re-executed using a copy of the production system and a target system identified by your team. Test migrations are used to tune the migration process until your cutover downtime requirements are met. Completed test migrations are referred to your team for validation to ensure a satisfactory outcome.
- **Go-Live infrastructure check:** We assist you with an SAP Go-Live infrastructure check to ensure your environment is prepared for backup and restore activities. This includes a full migration readiness review for DB2 on the target platform.

- **SAP system migrations:** This includes executing the data export and import processes, testing and refining the Unicode conversion (if applicable), and implementing DB2 Deep Compression if it is part of your requirements. Nonproduction systems are migrated while the production system is being prepared for migration.
- **Post-migration activities:** We provide comprehensive support for any needed performance tuning, and assist with your validation of the migrated test system.

The Migration Center applies SAP-approved and well-established DB2 best practices to the entire migration process. We work in partnership with you to understand your unique requirements and provide a migration solution that helps minimize risks and maximize the value that DB2 can offer in your SAP environment.

Supported migrations

IBM migrates all of the following source databases:

- Oracle
- SAP MaxDB
- Microsoft SQL Server
- Sybase

For more information

To learn more about IBM Information Management Software Services and this service offering, please contact your IBM sales representative or send email to dmskills@us.ibm.com, or visit: **ibm.com**/software/data/services

IBM Flyer

IBM DB2 HealthCheck Optimized for SAP software

Highlights

- Increase business-critical productivity and competitiveness by achieving maximum IBM® DB2® 9 database performance in your SAP NetWeaver environment

- Get expert advice from IBM DB2 consultants on how to exploit new SAP-related features available in DB2 9

- Gain skills on new DB2 features quickly and efficiently through knowledge transfer directly from IBM consultants

Today's leading organizations require more from their database environments to accommodate growth and capitalize on new market opportunities. Since the overall health of these database systems are critical, thousands of customers leverage IBM Software Services to help ensure their database environment is running efficiently in the shortest possible time frame.

This summary provides an overview of the IBM DB2 HealthCheck Optimized for SAP software, including recommendations and planning from IBM Software Services. To view the complete flyer online, visit: ftp://ftp.boulder.**ibm.com**/software/data/services/DB2_HealthCheck_Services_Optimized_for_SAP.pdf

What is a DB2 HealthCheck Optimized for SAP software?

A DB2 HealthCheck Optimized for SAP software is designed to maximize the benefits of running SAP on DB2, increasing business-critical productivity and competitiveness. In addition, an extensive review of your DB2 environment will be conducted to assess the overall health of your system. You can rely on IBM Information Management Software Services to help your organization get the most from your SAP on DB2 9 landscape.

Our consultants will provide recommendations to keep your DB2 database system running smoothly and achieve greater performance gains, while avoiding potentially costly issues in the future. This offering provides excellent value and a solid foundation for companies to achieve their SAP and DB2 performance objectives. The DB2 HealthCheck takes advantage of the latest SAP-related improvements to DB2 9 and leverages the consolidated lessons learned from DB2 consulting field experience to help propel your DB2 database to better performance.

What's involved

When engaging IBM Software Services, you can be confident you are working with industry-leading database experts. This offering is more than just a system review. It's tailored to meet the identified needs of the business and is also an ideal opportunity to mentor your staff on the latest SAP on DB2 best practices.

The database is the heart of any SAP solution. It is critical to the overall performance and availability of the complete SAP application. The IBM-SAP Alliance has led to the close integration of the IBM DB2 database with SAP solutions. The latest versions of DB2 make that integration tighter than ever: SAP-optimized versions of DB2 use autonomic computing technologies specifically tuned to help DB2 DBA staff improve performance and increase availability.

Gain SAP on DB2 skills quickly and efficiently with expert advice and knowledge transfer directly from our mentors, including advice on the administration and operational procedures required to support the DB2 software in your unique environment. Our consultants will work closely with the administrators of your database systems to analyze the system, determine and troubleshoot the key issues and identify opportunities for improvement, including suggesting changes beneficial to your SAP environment.

The primary activities undertaken in this HealthCheck offering include:

DB2 engagement objectives and scope setting

- Identify and set the scope and objectives of the DB2 engagement

DB2 environment assessments

- Review and document the current state of the DB2 installation
- Review and document performance reports on the operating system and DB2 by using Self-Tuning Memory Manager (STTM)
- Review and document software environment level on DB2 servers (for example, DB2 fixpacks, SAP kernel, support packages and OS level)
- Review and document OS and DB2 configuration with a focus on SAP-related configuration parameters and registry variable settings

- Review DB2 backup, database layout and recovery procedures on DB2 servers
- Review operating system error logs on DB2 servers and DB2 error logs
- Review and document any DB2 outages and action taken
- Review and document use of SAP DB2 Administration Tools
- Review and document partitioning strategy and use of Multidimensional Clustering tables (MDCs)
- Review and document reorganization strategy

DB2 recommendations

- Identify and document changes to operating system/DB2 configuration parameters and operating procedures that can improve or enhance DB2 performance and stability in the SAP NetWeaver environment
- Identify the use of cost-effective DB2 techniques, tools and features that can improve or enhance DB2 performance and stability in the SAP NetWeaver environment
- Present and recommend best practices to optimize administration efforts
- Identify and document short-term and long-term recommendations to improve the overall DB2 environment and the next steps needed to implement these recommendations
- Summarize and present findings and recommendations along with performance benefits in a formal engagement report

For more information

To learn more about IBM Information Management Software Services and the DB2 HealthCheck Optimized for SAP software service offering, please contact your local IBM sales representative or send an email to dmskills@us.ibm.com.

Visit our website at: **ibm.com**/software/data/services

DB2 migration and training education

Migration to IBM DB2 can be safe and easy, as well as affordable, with fixed-price offerings from IBM Services (based on the size and scope of the migration). Training is quick and simple as well—less than two weeks are normally required to retrain SAP or Oracle DBAs on DB2. SAP training classes, IBM Redbooks® and white papers provide further support, and a worldwide DB2 user community is ready to help.

No-cost SAP on DB2 LUW eLearning course

The new IBM eLearning course "DB2 LUW Administration for SAP Software" is available on the IBM eLearning portal. Beta testers at SAP and IBM provided excellent feedback about this course. The presented material covers DB2 for Linux, UNIX, and Windows (LUW) up to version 9.7. The following presentation provides information about how to access the course: http://www.sdn.sap.com/irj/sdn/db6?rid=/library/uuid/d044fed5-078c-2d10-3f8d-fd31a64fe72e

To learn more about DB2/SAP training paths and the skills covered, and for more information on migration and training classes, visit **ibm.com/developerworks/wikis/display/im/DB2+Best+Practices+for+Optimized+SAP+Migration**. You will also find information on available workshops and bootcamps for migrating to DB2 9.7, DB2 tuning and monitoring, and working with other useful IBM DB2 tools and IBM products.

"The migration to DB2 was completed in three months. We estimate that database operational costs have been cut by 68 percent. Deep system and analysis checks that formerly took several hours are now completed within 30 minutes, returning valuable management data quickly and cost-effectively. The migration was smooth and completed absolutely without a hitch."

—Ralf Rohrer, Head of Server and Storage Operations, Industrielle Werke Basel

Migration case studies: IBM DB2 Optimized for SAP software

"In our assessments that are provided free of charge, we determine the cost savings that you can expect and the outlay involved in migrating your SAP systems to DB2."

—Jörg Peinelt, WW Service Manager for SAP DB2 migrations, IBM Deutschland GmbH

Nowadays, migration is a standard process. However, the duration and scope depend to a very large extent on customer circumstances.

An optimum time to change the database is when an SAP software release is upgraded or when a conversion to Unicode takes place. System consolidations and a change of hardware and/or operating system are also suitable opportunities for a database migration. The additional outlay that is required in order to simultaneously change the database is therefore minimal.

During the migration process, tools from SAP are used and are implemented in a process stipulated and approved by SAP.[1] In agreement with SAP, IBM completes the migration process using its own tools in order to speed up the time it takes to perform the migration. This makes it possible to perform even large-scale migration in just one weekend (see the Schaeffler case study).

The IBM international service team provides assessments free of charge. This involves experienced consultants checking a client's existing SAP software landscape with regard to the planned database migration. In addition, we offer particularly reasonably priced migration services that are adapted to the client's system landscape.

IBM also offers training sessions to accompany the migration process to clients who are planning a change or who have already decided to carry out a migration process. The aim of the training sessions is to ensure that the migrated systems run as smoothly as possible.

Plan migration
Order hardware Make amendments to contract
SAP checks project plan
SAP sends migration tools

3–4* months

Test migration
Test SAP applications
Test live migration
Production migration

3–4* weeks

Test live migration

4–6 weeks* following production migration
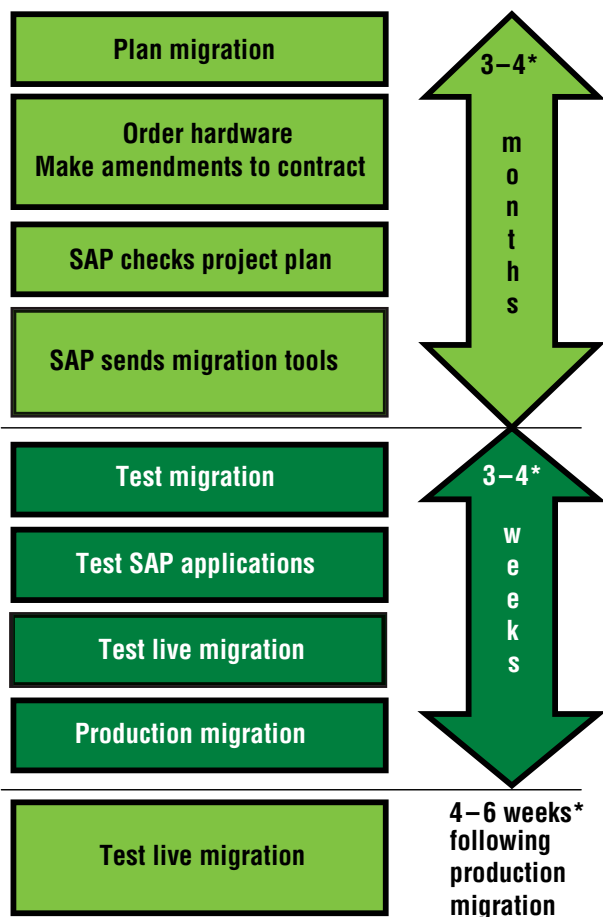
* Empirical values taken from IBM client projects

Case study: IWB switches to DB2 for SAP applications, saving 68 percent in costs

Industrielle Werke Basel (IWB) is the energy service provider for citizens and businesses in and around Basel, Switzerland. The company sells electricity, gas, water, district heating and energy services and is extending its capabilities into new areas, including IT and telecom solutions. IWB employs around 750 people and has annual sales of CHF 575 million (€350 million).

The challenge
Increased business volumes at Swiss energy company IWB were leading to increased database software license fees and rising disk capacity requirements. During migration to the latest SAP applications, IWB looked for ways to minimize both data storage needs and costs.

The solution
IWB switched from Oracle to IBM® DB2® to support its new SAP ERP 6.0 applications, saving approximately 68 percent on total operational costs.

"In our context, for SAP application operations, IBM DB2 offers massively improved functionalities when compared to Oracle."

—Iwan Nussbaumer, Head of ICT, Industrielle Werke Basel

The benefit

Lower operational costs contribute directly to bottom-line performance. Close integration of DB2 and the SAP applications reduces administrative workload by 30 percent. Advanced DB2 tools will allow third-party software to be discontinued, offering further cost savings. Migrating to DB2 has reduced disk storage needs by 10 percent, and IWB expects further savings of 40 percent or more through future use of the DB2 Deep Compression feature.

To learn more about the savings IWB realized after migrating to DB2, visit: **ibm.com**/software/success/cssdb.nsf/CS/ STRD-7DKHC3?OpenDocument&Site=gicss67sap&cty=en_us

"The migration to DB2 was completed in three months. We estimate that database operational costs have been cut by 68 percent. Deep system and analysis checks that formerly took several hours are now completed within 30 minutes, returning valuable management data quickly and cost-effectively. The migration was smooth and completed absolutely without a hitch."

—Ralf Rohrer, Head of Server and Storage Operations, Industrielle Werke Basel

Case study: SAP IT selects IBM DB2 as strategic database platform for internal business systems

SAP AG in Walldorf, Germany, is one of the world's leading business software providers. With more than 45,000 employees serving international enterprises of every conceivable type, SAP AG has people and offices on every continent, operating in multiple languages.

The challenge

SAP IT (the IT department of SAP AG) wanted to be able to take advantage of new SAP software functionalities while reducing the complexity and operational costs of its IT landscape. The company also wanted to move to a new database platform to deliver optimal performance.

"This project was a great example of the benefits of combining Unicode conversion and database migration, because the data cleansing and archiving processes helped us reduce the size of the database by more than 22 percent."

—Peter Bögler, Solution Architect, SAP IT

The solution

In three separate projects, SAP IT upgraded its Human Capital Management (HCM), ERP and Business Intelligence applications, simultaneously performing Unicode conversion and migrating databases from Oracle to IBM DB2.

"From our own experience, and from listening to the experiences of our customers, we would definitely recommend the combination of Unicode conversion and database migration as part of an SAP software upgrade project. A reduction in database size may initially seem counterintuitive, but many companies have experienced the same thing. Moreover, performing a database migration during the Unicode upgrade adds very little to the overheads of the project, so it is more efficient to do both at once."

—Peter Bögler, Solution Architect, SAP IT

The benefit

Simultaneous upgrade/conversion/migration helps reduce business disruption without significantly increasing project complexity. Response times in the HCM environment have improved by around 40 percent. Archiving and database reorganization have reduced the size of the ERP database by 22 percent—and DB2 9 Deep Compression could provide further reductions. Conversion to Unicode has helped SAP IT introduce multiple-language applications, facilitating international operations. SAP's Business Intelligence system is now positioned for nearly unlimited scalability and massive growth with DB2.

To learn more about how SAP IT uses DB2, visit: **ibm.com/** software/success/cssdb.nsf/CS/STRD-7AHE5W?OpenDocument &Site=gicss67sap&cty=en_us

Case study: University of Toronto sees the whole student picture by migrating SAP solutions to DB2

With around 70,000 students, 10,000 faculty and staff members, and revenues of around C$1,500 million, University of Toronto is one of Canada's leading seats of learning and research. From applied science to social work, the university awards some 14,000 degrees annually, including all affiliated colleges and programs.

The challenge

With no single system able to provide a unified view of operations and finances, the University of Toronto struggled to provide accurate and timely management information. This led to slowed decision making when planning student programs, research, grants and administrative services.

The solution

University of Toronto created an integrated information system using SAP software and IBM DB2. The new system connects data on people, activities and finances and provides a single place to discover, report and analyze operations.

"We are pleased with our decision to migrate SAP from Oracle to DB2 on AIX running on IBM pSeries because of the proven performance, availability and cost-effectiveness. Automating the configuration of DB2 and providing a single point for storage management will allow us to further drive down our costs. We rely on both SAP and IBM to meet our high standards for continuous availability and high performance."

—Graham Kemp, Director of Administrative Management Systems, University of Toronto

The benefit

University of Toronto has reduced its software license costs, cut complexity and training, and—most important—has released the budget to the educational programs. The ease of access to information is enabling a more responsive organization, providing managers with a clearer view of budgets, personnel, teaching workload and much more.

To learn more about the University of Toronto's migration of SAP solutions to DB2, visit: **ibm.com**/software/success/ cssdb.nsf/CS/DNSD-6KBH4V?OpenDocument&Site= gicss67sap&cty=en_us

Case study: Schaeffler KG increases storage efficiency for SAP applications with IBM DB2

The Schaeffler Group is a world-class supplier of bearings and precision components for the automotive industry. The company employs approximately 66,000 people at over 180 locations worldwide, with revenues of some €8.9 billion.

The challenge

Schaeffler KG found that increasing use of business analysis was driving rapid growth in data storage needs. As volumes grew, application performance tended to decline, frustrating the users in their search for information. At the practical level, data storage and management expenses were rising, and Schaeffler KG sought to reduce costs while delivering faster response times.

The solution

Schaeffler KG migrated the databases for its SAP NetWeaver Business Intelligence (SAP NetWeaver BI) environment to IBM DB2. The immediate impact was to reduce the SAP NetWeaver BI database volume by 43 percent, from 8 TB to 4.5 TB, and other databases also benefited from significant reductions.

"Schaeffler KG achieved a 43 percent saving in total storage requirements when using IBM DB2 with Deep Compression for its SAP NetWeaver BI application, when compared with the former Oracle database. The total size of the database shrank from 8 TB to 4.5 TB and response times were improved by 15 percent. Some batch applications and change runs were reduced by a factor of 10 when using IBM DB2."

—Markus Dellermann, project manager for the migration

The benefit

With reduced total storage requirements, Schaeffler KG is able to deploy its existing infrastructure more effectively and avoid the need for capacity expansion. The migration to IBM DB2 has improved system performance, which allows Schaeffler KG to exploit its existing infrastructure without upgrading.

To learn more about how Schaeffler KG reduced database volumes by migrating to DB2, visit: **ibm.com**/software/success/cssdb.nsf/CS/STRD-7JEJG9?OpenDocument&Site=gicss67sap&cty=en_us

1 "DB2 Optimization Techniques for SAP Database Migration And Unicode Conversion." IBM Redbook: August 2009. www.redbooks.ibm.com/abstracts/sg247774.html?Open

IBM Technical Brief

Coca-Cola Bottling Co. Consolidated utilizes SAP technical upgrade project to migrate from Oracle to IBM DB2

Learn more about the Coca-Cola Bottling Co. Consolidated migration and Unicode conversion project and view the technical brief online: **ibm.com**/software/success/cssdb.nsf/CS/STRD-7N5MJB?OpenDocument&Site=gicss67sap&cty=en_us

This technical brief describes the migration of an SAP® R/3® Enterprise (version 4.7) non-Unicode system on Oracle Database 9i to a Unicode system with IBM® DB2® version 9. To achieve its business objectives, Coca-Cola Bottling Co. Consolidated (CCBCC) faced a technical upgrade of its SAP R/3 Enterprise system to SAP ERP 6.0. Completing this upgrade would require the company either to upgrade its existing Oracle database and purchase extra Oracle licenses, or to move to a different database platform.

The CCBCC team decided it was time to derive more performance from the business-critical SAP applications, while driving down hardware and software costs. Instead of upgrading Oracle, the team decided to introduce IBM DB2. As part of the SAP upgrade project, CCBCC's R/3 system would require a conversion to Unicode. By combining the Unicode conversion and the database migration, the customer realized many technical and cost advantages—for example, exploiting time savings by sharing backup and test phases.

Background, starting point and objectives

Coca-Cola Bottling Co. Consolidated (CCBCC) makes, sells and delivers sparkling and still beverages, primarily products of The Coca-Cola Company. CCBCC is the second-largest bottler of Coca-Cola products in the United States, operating in eleven states, primarily in the southeast. Founded in 1902, CCBCC enjoys net sales of more than US$1.4 billion and is headquartered in Charlotte, North Carolina.

Customer objectives

- Drive down software and hardware costs for the existing SAP software
- Complete the conversion/migration project on time and under budget
- Utilize the database migration project to avoid overhead for the Unicode conversion
- Gain better performance for the SAP applications
- Reduce storage needs
- Remove workload from the database administrators

IBM solution

- IBM DB2 9.1 for Linux, UNIX and Windows (LUW), DB2 Storage Optimization feature (Deep Compression)
- IBM Power Systems™ servers (model p5-560)

Customer benefits

- Combining the database migration with the SAP Unicode conversion saved time, money and caused essentially no overhead in effort for the database migration.
- Initial migration results show that even after the Unicode conversion, DB2 delivers a reduction in storage needs of approximately 40 percent, as a result of Deep Compression of the SAP R/3 Enterprise 4.7 system.
- The duration of manufacturing runs was reduced from 90 minutes to just 30—an improvement of more than 65 percent.
- The migration was completed under budget and ahead of schedule, with less than 26 hours of planned downtime— saving time and costs.
- The company has reduced overall licensing and maintenance costs by avoiding the purchase of additional Oracle licenses.
- DB2 is easier to administer and requires less attention from the SAP Basis database administrator, contributing to reduced costs.
- The company predicts savings in the next five years of about US$750,000.

"By choosing to implement DB2 compression right away, we have reduced the database size by around 40 percent. This gives us faster backup and reduced storage costs, and makes the SAP technical upgrades easier and quicker."

—Andrew Juarez, SAP Lead Basis, Coca-Cola Bottling Company Consolidated

Leveraging synergies: SAP Unicode conversion and DB2 migration

Prior to the technical upgrade of the SAP landscape, CCBCC decided to perform both a Unicode conversion and a migration from the existing Oracle database platform to IBM DB2 with Deep Compression. These changes would eliminate the need to buy new Oracle licenses, and would thus reduce the total cost of ownership (TCO).

By switching on the DB2 Deep Compression feature during the migration, the company was able to reduce the size of the database by more than 40 percent—which will result in faster backups and shorter runtimes for the upcoming SAP software upgrade.

Figure 1: Combined database migration with SAP Unicode conversion

In the meantime, before the SAP upgrade, CCBCC can benefit from the highly automated DB2 database administration, offering reduced cost of operation. DB2 version 9 includes features such as self-managing storage, self-tuning memory management (STMM), automatic reorganization, automatic runstats, real-time statistics and backup via the integrated IBM FlashCopy® feature.

All database administration and monitoring tasks can be completed from within the DBA Cockpit for DB2—an easy-to-use management environment integrated into the SAP application environment.

Deploying Unicode as a future-proof solution

CCBCC decided to deploy Unicode because all new SAP product releases (from SAP NetWeaver 7.0 onwards) will be based on the Unicode standard. CCBCC wanted to be prepared for new SAP applications such as SAP NetWeaver Process Integration (SAP NW PI), which are already part of future implementation plans.

In technical terms, the requirements for a Unicode conversion are very similar to those of a database migration. In both scenarios the customer must perform an export and import of the database using the SAP program R3load.

The Unicode conversion itself is executed during the export phase of the migration. It is therefore very easy to direct the database toward a new target system without additional effort and downtime. Migrating to IBM DB2 in conjunction with an SAP software upgrade and/or Unicode conversion leverages an opportunity to avoid duplicating project tasks such as backup and testing, and keeps the cost of the migration as low as possible.

Migration process—heterogeneous system copy

CCBCC used a standard SAP methodology for the migration process, known as the heterogeneous system copy (or OS/DB Migration) method. CCBCC was able to perform the migration and conversion during a scheduled maintenance window, so there was no need to make use of enhanced migration tools/services from SAP such as Zero Downtime.

The migration project for the entire SAP R/3 Enterprise landscape took eight weeks in total, including two test iterations for the 1 TB production database. The migration of the production SAP system itself was completed over one weekend, starting on Saturday night and finishing in the early hours of Monday morning. The total downtime for the production migration was just 26 hours.

To achieve this reduced downtime, a set of SAP-specific migration tools were used:

- Unsorted Export for the transparent tables
- Package Splitter for the largest tables ("big tables" group)
- Table Splitter for three large cluster tables
- Multiple instances of Migration Monitor to allow distributed parallel import and export processes
- R3load with Deep Compression option to activate compression during the migration phase

The next part of this document depicts the way CCBCC utilized these tools, explains the reasons for the choices and highlights the benefits.

Architectural overview—migration project at CCBCC

For the migration, CCBCC used four logical partitions (LPARs) on an IBM Power Systems server (model p5-560). Three LPARs were used to handle database export processes from the source system, and one LPAR was running the target system for the import processes. The export partitions consisted of a Central Instance/Database partition, which had 16 CPUs of 1.5 GHz and 64 GB of memory (CI/DB), and two other partitions that had four CPUs of 1.5 GHz and 12 GB of memory each. The import partition (or new CI/DB partition) had 16 CPUs of 1.5 GHz and 64 GB of memory.

During the testing phase, this system setup emerged as the optimal migration environment to handle the migration workload.

In order to meet the downtime objectives, the workloads of the export packages were distributed between the CI/DB server and the other two servers (Hosts A and B) running in the first three LPARs. The CI/DB server handled the three largest cluster tables via Table Splitter. Host A handled the smaller tables. Host B was used to handle the export of the "big tables" group (which contained >10 million, >2 million and >200,000 records); these

"Running the SAP Unicode conversion and the database migration together produced a perfect result: the combination needed no additional downtime, and the project completed on time."

—Tom DeJuneas, SAP Systems Manager, Coca-Cola Bottling Company Consolidated

were divided into smaller packages using Package Splitter. All three hosts used local storage to dump the export data to disk. Each export process was controlled by a Migration Monitor (*MigMon*) instance with its own configurations.

On the import side there was only one server—Host C (new CI/DB server). The export disks of CI/DB, Host A and Host B were mounted via NFS (for reading) on Host C. The import was controlled by multiple *MigMon* instances.

From the "big tables" group on Host B, a subset was exported using the sorted unload option, which required additional CPU power and was one of the reasons for assigning an additional server for the export phase. During the import, the tables from the "big tables" group were compressed during the load process.

Database export—migration tools used
Unsorted vs. sorted export
CCBCC used both sorted and unsorted exports to unload the data from the Oracle database. In general, the unsorted export is faster than the sorted. But as CCBCC was also running a Unicode conversion, the migration team was forced to export the SAP cluster tables (for example, CDCLS, RFGLG, EDI40) and SAP repository data classes via a sorted export. Sorting the data required additional CPU power, which was one of the reasons CCBCC handled the export phase with three servers.

- Sorted Export—Pool Tables, Cluster Tables, Reports, Dynpros and Nametabs
- Unsorted Export—Most of the transparent tables

With a sorted export, the pages of a table are read in the sequence of the primary key. If the cluster ratio is not optimal, data pages will not be read continuously. In addition, database sort operations may occur that will also extend the export runtime. By using the unsorted option, data is read sequentially and written directly to a file, instead of using an index that attempts to sort the data before writing to the file.

Unicode considerations for cluster tables
As a result of the Unicode conversion, the contents and the length of the records may change. Even the number of the physical records belonging to a logical record may change. Because the physical records are built together to form a logical record, the data must be read in a sorted manner to find all physical records that belong to a logical record. For these reasons, an unsorted unload is not possible.

Database limitations
DB2 supports unsorted exports, but some other databases only allow sorted exports. This represents a major roadblock in migrating away from these databases, and can also be a limitation in daily operations—for example, it is more difficult to set up test and QA systems using sorted exports. Especially for very large databases, being forced to run a sorted export will heavily extend the downtime window and make it almost impossible to change the database or even complete a Unicode conversion in a reasonable time.

Package and table splitting
The database size of nearly 1 TB and the very large tables had been the determining factors for the downtime. CCBCC decided to parallelize the database export to improve the speed of the whole migration process, by using Package and Table Splitters.

Package Splitter splits tables of the source database into packages and exports them. In each case a dedicated R3load process handles each package. These processes can run in parallel and consequently make better usage of CPU power. Table Splitter R3ta generates multiple WHERE conditions for a table, which are used to export the table data with multiple R3load processes running in parallel. Each R3load process requires a WHERE condition so that it can select a subset of the data in the table.
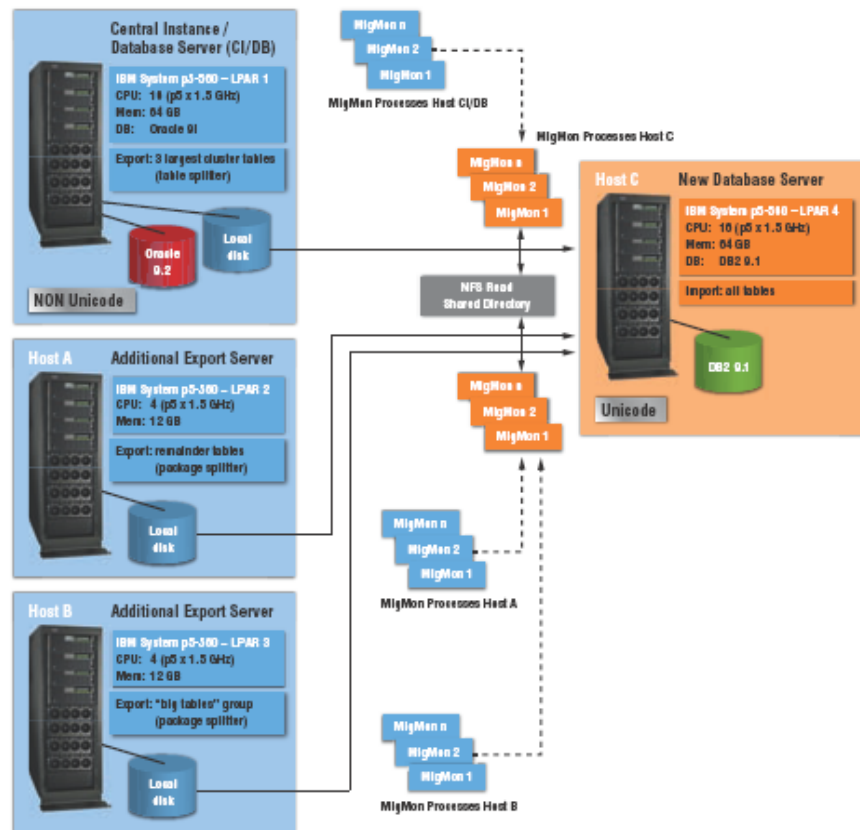
Source:	Target:
SAP release: SAP R/3 Enterprise (version 4.7)	SAP release: SAP R/3 Enterprise (version 4.7)
OS: AIX 5.3	OS: AIX 5.4
Database: Oracle 9.2	Database: DB2 9.1
Database size: 950 GB	Database size: 575 GB (with compression)
Data format: Single codepage system without Unicode	Data format: Unicode

Figure 2: Landscape overview.

- 262 large tables ("big tables" group) were put in their own package using Package Splitter, to increase parallelism and ensure better granularity of the packages, resulting in better resource usage during the migration.
- 12 very large tables were divided into multiple packages using Table Splitter, enabling multiple R3load processes for parallel export and import of the table.
- The remainder of the tables were combined in joint packages, using Package Splitter. By splitting the content to multiple R3load processes (20 parallel processes) it was possible to export and import the data in parallel, saving considerable time.

Migration Monitor (MigMon)

In a Unicode conversion, the system copy causes very high CPU load during the export. Most of the CPU power is spent on data conversion, especially when processing cluster tables.

To avoid CPU bottlenecks, CCBCC distributed the exports and imports across four LPARs to parallelize these processes more effectively. This allowed CCBCC to take advantage of additional processor resources for the database export/import. The Migration Monitor helped to perform and control the unload and load process during the system copy procedure and enabled 20 export and import processes to be run in parallel.
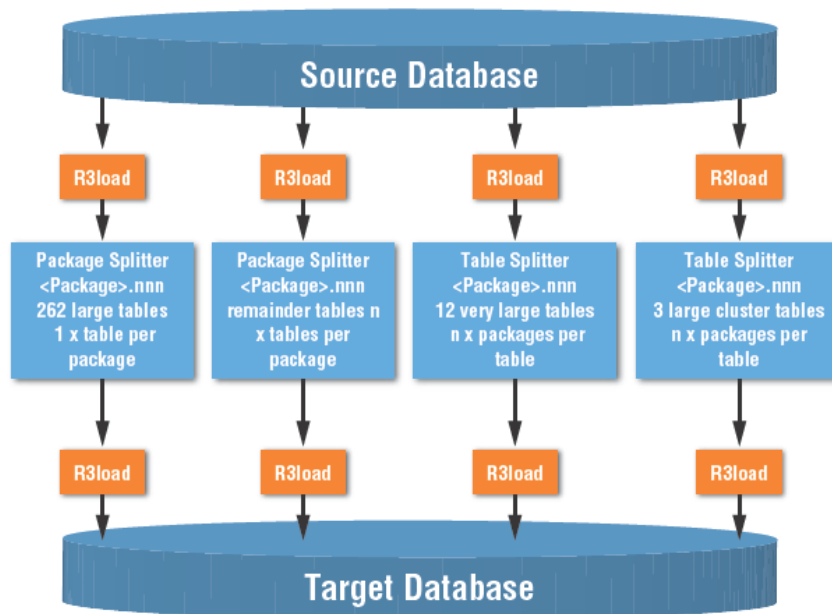
Figure 3: Package and Table splitting.

Non-Compressed Table

ID	First name	Last name	City	State	Zip
8802	Bob	Hutchinson	Los Angeles	California	99009
8899	Mary	Hutchinson	Los Angeles	California	99009

Compressed Table   **Dictionary**

| 8802 | Bob | 01 | 02 |
| 8899 | Mary | 01 | 02 |

| 01 | Hutchinson |
| 02 | Los Angeles, California, 99009 |

Figure 4: Deep Compression.

Database import: DB2 Deep Compression enabled

DB2 9—Storage Optimization feature

The DB2 9 Storage Optimization feature—also called Deep Compression—uses a dictionary-based approach to replace repeating patterns with short symbols. The dictionary stores the patterns that occur most frequently, and indexes them with the corresponding symbols that are used to replace them. Due to the fact that all patterns within a table (not only within a single page) are replaced, impressive compression rates can be achieved (up to 90 percent for single tables).

R3load with DB2 Deep Compression

CCBCC wanted to make use of the benefits that the DB2 Storage Optimization feature offers right away, and decided to switch on Deep Compression during the migration process. Even with the knowledge that the compression rate with R3load version 6.40 might not be optimal, CCBCC decided to go ahead, and was rewarded with a compression rate of 40 percent and an impressive performance improvement. This was achieved despite the fact that only 169 of the larger tables had been compressed.

Enabling DB2 Deep Compression during database migration and/or Unicode conversion is a very smooth way to compress the data at the time it is loaded into the database. The R3load tool provides several ways of deploying DB2 Deep Compression when the data is loaded into the tables. Depending on the version of R3load (that is, version 6.40, or version 7.00 or higher), different options for compression are available, such as the new R3load 7.00 "SAMPLED" option.

This offers optimal data compression while avoiding time-consuming table reorganizations. This paper focuses on the compression feature of R3load version 6.40, as this was the tool used by CCBCC.

R3load 6.40 with compress option

To generate the compression dictionary, R3load first loads a defined number of rows into the table without compressing them. R3load creates the compression dictionary based on these rows by running an off-line reorganization.

CCBCC incremented the value of the environment variable "DB6LOAD_COMPRESSION_THRESHOLD" to define the number of rows that would be initially loaded and used to create the dictionary. The default value for this threshold is 10,000 records, which was too low to provide optimal compression sampling for the larger tables.

By sampling between 10 and 80 percent of the records (depending on the number of rows in the tables), CCBCC was able to set optimal threshold values and achieve very good compression results. The two largest tables (COEP, BSIS) contained more than 130 million records, followed by several tables with between 10 and 70 million records.

CCBCC grouped the compressible transparent tables using the following row count thresholds:

- Group of 20 tables of more than 3 million records
  – threshold = 3 million
- Group of 47 tables of more than 200,000 records
  – threshold = 200,000
- Group of 102 tables of more than 60,000 records
  – threshold = 60,000

Note that not all tables matching the thresholds were flagged for compression and added to those groups. Only the ones that showed good compression results in the test phase were selected.

After the initial import and the creation of the dictionary, R3load imports the remaining rows into the table and DB2 compresses the data based on the dictionary.

Tables that are intended for compression during the load phase must have the compression attribute switched on. Since CCBCC had some tables that should be compressed and others that should not, different template files for the Migration Monitor were used.

CCBCC ran the import with several instances of the Migration Monitor, and used different values for DB6LOAD_COMPRESSION_THRESHOLD for each instance.

Summary

Combining the Unicode upgrade with a database migration paid off for CCBCC—enabling the company to leverage synergies throughout the whole migration process, and eliminate the duplication of processes such as backup and testing. The whole ERP migration project took about eight weeks from start to finish, including the Unicode conversion.

Another essential aspect was the easy transfer of database management skills from Oracle to DB2, and the user-friendliness of DB2. CCBCC had strong in-house Oracle skills, and yet in a matter of weeks the database administrators became fully competent on DB2—a tribute to the ease of transition to DB2 for experienced DBAs, regardless of their technical legacy.

CCBCC was able to benefit right away from the value DB2 offers:

- Lower TCO
- 40 percent reduction in database size
- Better performance—manufacturing runs are over 65 percent faster
- Better integration of the database in SAP tools (DBA cockpit for DB2)
- Reduced DBA workload to manage and administer DB2

With DB2 in place, CCBCC is well prepared for the upcoming upgrade to SAP ERP 6.0, which can now be performed much more smoothly and rapidly. The reduction in database size by 40 percent will result in faster backup and shorter runtimes for the SAP software upgrade.

For more information

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—Dave Laverty, Vice President, Marketing
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