IBM DB2 10.5 with BLU Acceleration

Multi-workload database software for the big data era

Highlights

- Dramatically faster reporting and analytics
- Upgrade to in-memory speed and simplicity on existing infrastructure
- New level of data compression: clients have reported compression rates of 10 times in IBM® DB2® with BLU Acceleration versus uncompressed tables.[1]
- Online rolling upgrades designed for no planned downtime
- In DB2 10.5, IBM DB2 pureScale® HADR is designed to achieve failover in seconds;[2] HADR helps disaster recovery of pureScale clusters over distances of thousands of kilometers.[3]
- DB2 pureScale provides transparent scalability beyond 100 nodes.[4]
- Business-grade NoSQL and IBM Mobile Database for greater application flexibility

In this era of big data, business and IT leaders across all industries are looking for ways to easily and cost-effectively unlock the value of enterprise data that resides in both transactional processing and data warehouse systems. They are trying to quickly implement new solutions to gain additional insight from this data to improve outcomes across all areas of the business, while simultaneously optimizing resource utilization and reducing costs.

IBM DB2 for Linux, UNIX and Windows is a multi-workload database management solution built for these challenges. Providing new, innovative capabilities to meet demanding data processing requirements, DB2 is designed to help ensure that your data systems are fast, always available, scalable and flexible—while also supporting a wide variety of new mobile, social and analytical applications.

DB2 10.5 includes several capabilities to help organizations tackle the challenges presented by big data:

- Analytics at the speed of thought, including new BLU Acceleration
- Always-available transactions
- Future-proof versatility
- Unprecedented affordability
- Streamlined packaging

Analytics at the speed of thought

The effectiveness and speed of data analytics are often hindered by infrastructures that are unable to keep pace with the rate of data growth and change. DB2 with BLU Acceleration offers a huge step forward in analytic workload processing by combining proven in-memory and columnar data store capabilities with advanced compression and hardware exploitation techniques. The result: reliably faster analytic query processing for a variety of online analytical workloads—without the limitations of in-memory-only systems.

Developed by the IBM Research and Development Labs, DB2 with BLU Acceleration represents a new generation of data management. Innovations include:

- **Dynamic in-memory columnar processing** with dynamic movement of unused data to storage
- **Actionable Compression** to preserve order so that the data can be used without decompression
- **Parallel vector processing** for delivering multi-core and Single Instruction Multiple Data (SIMD)
- **Data skipping** to bypass unnecessary processing of irrelevant data

BLU Acceleration adds an extra storage engine and integrated runtime directly into the core DB2 system to support the storage and analysis of column-organized tables. This processing runs parallel to traditional row-based table processing, enabling DB2 to process both row-based and column-based tables in the same system (see Figure 1). The potential results include significantly improved performance, massive storage savings and ease of implementation and management for both transactional and analytic data workloads.

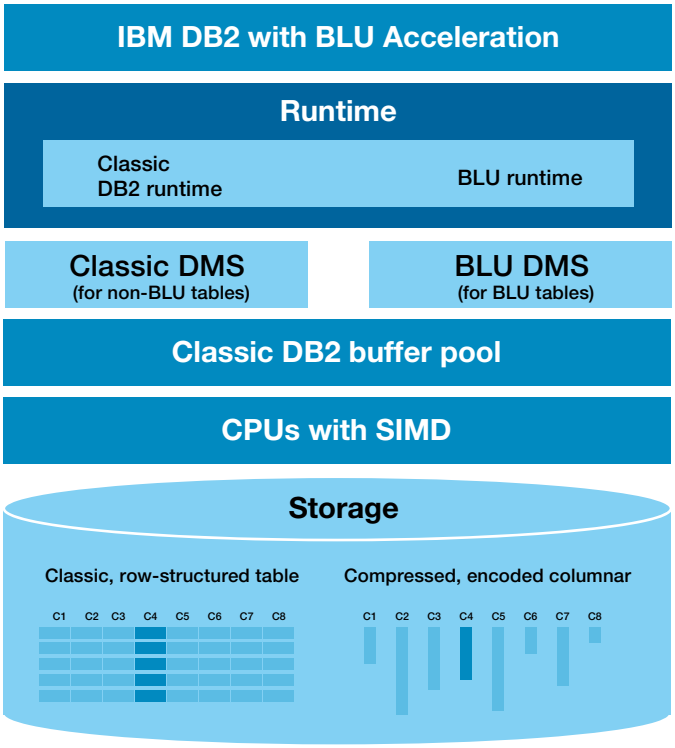

Figure 1: DB2 can now process both row-based and column-based tables in the same system, resulting in significantly improved performance.

In DB2 10.5 with BLU Acceleration, IBM observed performance improvements ranging from 8 to 25 times for typical analytic workloads.[5]

Increase performance, not cost, with dynamic in-memory use

DB2 uses a superior approach to storage management, which delivers all the benefits of in-memory processing without the performance penalties that occur in other systems when you run out of memory. DB2 uses all the server memory made available to it, and extends those resources by using disk arrays and other resources as needed. If a table exceeds allocated memory, for example, the system continues processing without the overhead of swapping data between the RAM and storage disks—which provides superior performance.

Gain deeper insight with Actionable Compression

The combination of in-memory, columnar and compression technologies in DB2 help you run faster queries so you can ask more questions and gain more insight than ever before. Advanced encoding maximizes compression while preserving the order of encoding so compressed data can be quickly analyzed without the overhead of decompression. This results in efficient use of the CPU and RAM, as well as reduced I/O—which translates to faster performance and lower storage costs.

Enable faster processing with parallel vector processing

DB2 helps improve processing efficiency by incorporating the latest advances in hardware, such as SIMD, to perform several tasks in just one instruction. Work can be spread across multiple processor cores to greatly accelerate performance, helping decision makers get the answers they need quickly.

Process data efficiently with data skipping

DB2 eliminates unnecessary processing by automatically detecting and skipping large sections of data that do not qualify for a query. This enables more efficient data processing and faster performance.

Minimize IT workload with enhanced ease-of-use features

IBM simplifies the process of extracting value from data while minimizing demands on your IT staff. With DB2 with BLU Acceleration, there is no need for building and maintaining indexes, reorganizations or other maintenance tasks that are typically associated with traditional data warehouses.

Always-available transactions with enhanced DB2 pureScale reliability

As your business grows and workloads increase, the availability and scalability of complex transaction processing can suffer. DB2 pureScale technology helps reduce this risk with built-in database cluster technology based on IBM DB2 for z/OS® and takes advantage of IBM System z® Sysplex expertise. A shared disk cluster architecture that runs on both UNIX (IBM AIX®) and Linux (x86), DB2 pureScale technology enables the database to scale with no application changes. DB2 pureScale is always available, helping to ensure that transactional workloads—including online transactions, queries and other tasks—continue uninterrupted in the case of planned or unforeseen downtime.

DB2 10.5 offers several enhancements that, along with pureScale technology, help deliver the ultimate in availability and disaster recovery protection for your mission-critical transactional workloads.

Integrate high availability disaster recovery capabilities

DB2 pureScale is fully integrated with DB2 high availability disaster recovery (HADR) functionality. This allows you to mirror data from your primary pureScale cluster to a second local or remote standby pureScale cluster (see Figure 2). In the event of failure, the standby cluster will take over in seconds,[6] ensuring minimal impact to your business.

Ease manual administration as you scale

Online fix pack updates allow you to perform fix pack maintenance operations on individual members running in a pureScale cluster with minimal impact to users. You can also back up and restore from pureScale to a single server.

Protect data while meeting regulatory compliance mandates

Going beyond reliable authentication, authorization and multilevel access control, DB2 provides row and column access control (RCAC) without creating multiple data views to reduce duplication. RCAC provides easy and flexible control over data access based on roles and lines of business. Encryption capabilities protect specific fields if data is accidentally released or accessed without authorization.

Help reduce the cost and complexity of compliance

DB2 Time Travel Query functionality provides point-in-time information, keeping a history of data changes and enabling users to query data as it appeared at different points in time. This feature helps to reduce the costs and complexities associated with maintaining audit trails and meeting regulatory compliance guidelines.

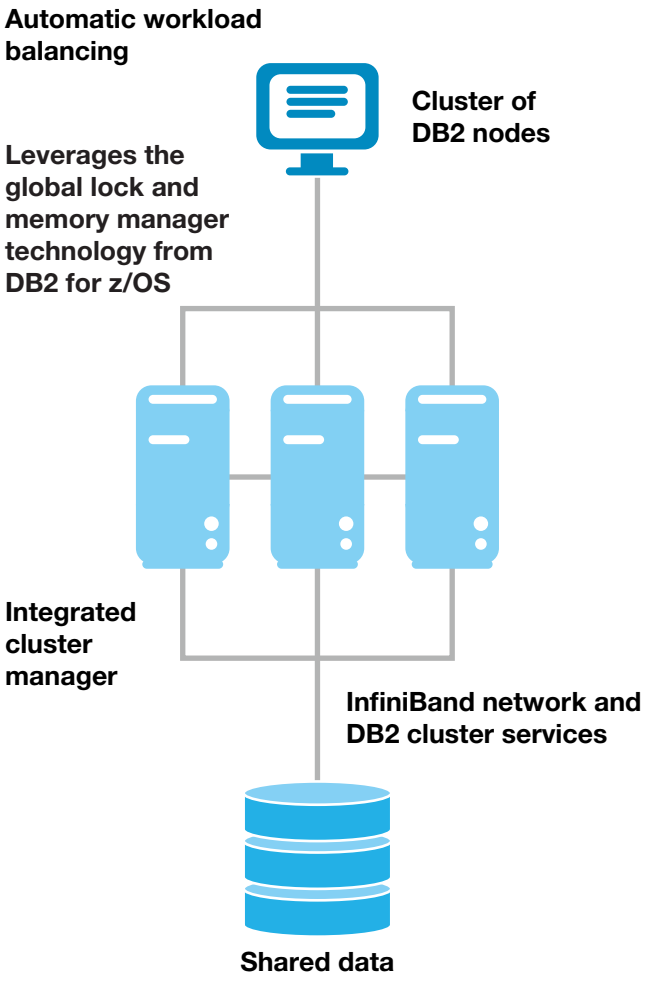

Figure 2: DB2 offers HADR protection for mission-critical transactional workloads.

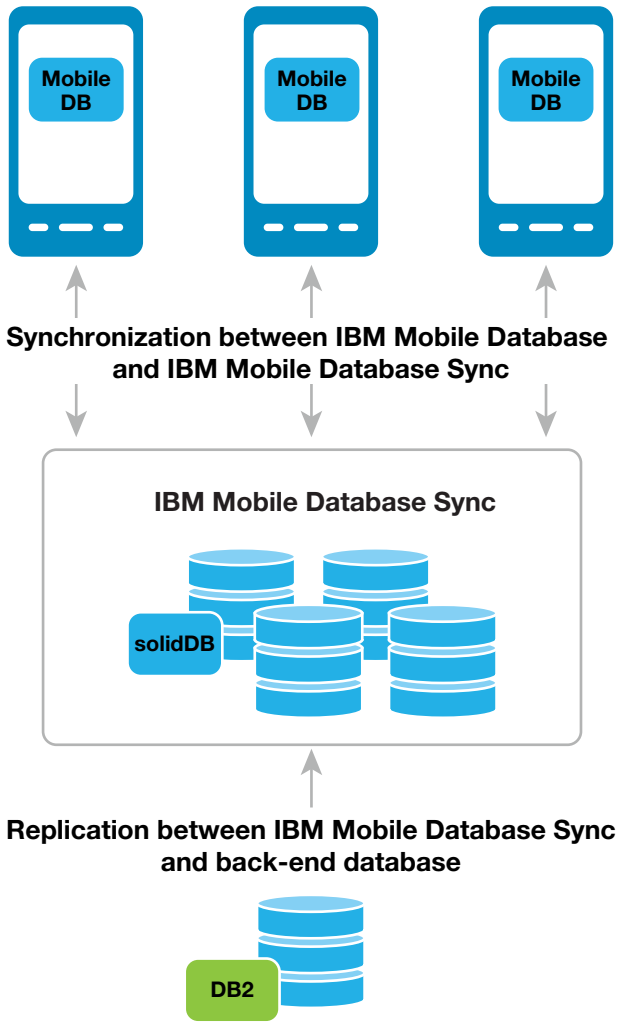

Figure 3: DB2 provides key capabilities for supporting mobile applications.

Future-proof versatility

In today's quickly changing business environment, organizations must ensure that the infrastructure they put in place will not only meet today's needs, but will also be robust enough to address the needs of the future. This means selecting open, flexible solutions. DB2 10.5 includes enhanced features that help organizations expand and modernize existing applications as well as easily create new applications to support mobile and cloud-based environments.

Deliver applications rapidly with NoSQL capabilities

DB2 offers extreme flexibility for developers by providing two enterprise-class NoSQL database capabilities—Resource Description Framework (RDF) Graph and XML—that enable web and mobile application data to be stored in its native form in DB2. Support for flexible schemas allows developers to deliver applications rapidly using existing skills and leverage the enterprise strengths of DB2: scalability, security, reliable transaction processing and operational tools.

Experience true enterprise mobility

Meeting growing enterprise demand, DB2 provides the key capabilities needed to support mobile applications. DB2 10.5 includes support for IBM Mobile Database and IBM Mobile Database Sync (see Figure 3). Together, they enable:

- Persistent storage on mobile devices to compensate for inconsistent network connections
- User-based authentication, access rights and encryption to securely store enterprise data on mobile devices
- Seamless integration with enterprise data through bidirectional data synchronization
- Automated application administration with easy installation and automatic updates
- Application development tools such as Apache Cordova

Help reduce application migration cost and risk

The DB2 SQL compatibility feature can greatly reduce the cost and risk of moving legacy applications built for Oracle Database to DB2. Applications built to run on Oracle databases require few or no code changes to run on DB2, which means IT staff generally spend less time tuning and adjusting the database after it is moved to DB2. In fact, DB2 achieves an average of 98 percent compatibility with Oracle PL/SQL.[7]

DB2 includes extensive native support for the PL/SQL procedural language as well as new data types, scalar functions, improved concurrency, built-in packages, Oracle Call Interface (OCI), SQL*Plus and more. New enhancements in DB2 10.5 include pipelined table functions and support for row sizes greater than 32 KB.

Unprecedented affordability

Businesses with large volumes of data know how expensive data storage can be. A full range of features enables DB2 to help reduce the costs of managing data by increasing storage efficiency, improving performance and simplifying the administration of both transactional and warehouse databases.

Promote storage and cost-efficiency with deep and adaptive compression

DB2 can dramatically reduce storage cost with industry-leading deep compression technologies that compress tables, indexes, archive logs, temporary space, LOBs, XML and backup data. Compression allows DB2 to keep more data in memory, thereby avoiding performance-robbing disk I/O. By combining compression with multi-temperature data management, DB2 provides the ideal set of capabilities for cost-effectively optimizing and allocating your data storage environment.

DB2 Adaptive Compression features further enhances storage efficiency by incorporating classic row compression with other techniques such as table-wide and page-level compression for maximum impact. Adaptive Compression has provided 7 times or greater overall space savings for more than one DB2 customer, with some tables achieving 10 times space savings.[8]

Optimize compute resources with columnar and encoded data compression

Compute-friendly columnar and encoded data compression provides massive storage savings, less I/O, better memory utilization and more effective use of the CPU.

Testing has shown storage savings of 1.6 times to 2.6 times, as compared to DB2 10.1 with full compression, using DB2 with BLU Acceleration,[9] and clients have reported compression rates of 10 times in DB2 with BLU Acceleration versus uncompressed tables.[10]

Target infrastructure costs with virtualization

For businesses with multiple database servers that fail to utilize full hardware capacity, the cost-saving benefits of virtualization are clear: server consolidation, space savings and reduced power and cooling expenses. IBM helps businesses enjoy these savings with flexible licensing terms that allow DB2 to be deployed in a virtualized environment.

Simplify administration with self-healing capabilities

DB2 Health Center continually monitors the database, searching for potential problems. If Health Center discovers an issue, such as the database running low on memory, it automatically notifies administrators by email or text message. The software also suggests solutions for the problem to help speed resolution.

Deliver the full value of DB2 with updated database management solutions

A comprehensive set of database management solutions offers a complete range of capabilities for both developers and DBAs to help develop, manage and deploy both transactional and warehouse databases with greater efficiency, performance and availability. To help you accelerate adoption and enhance the value of key DB2 features, all tools have been updated to support BLU Acceleration, compression and pureScale capabilities.

For more information about IBM database management solutions for DB2, visit ibm.com/software/data/db2/linux-unix-windows/tools or download the IBM e-book: http://ibm.co/YHacub

---

Save time with automatic configuration capabilities

DB2 Configuration Advisor can save database administrators time by automatically configuring a database for use—setting the processor speed, the amount of memory that needs to be allocated and the number of users on the system. A related capability, the self-tuning memory manager (STMM), simplifies memory configuration by automatically setting values for several critical parameters during database startup and runtime. System performance benefits when memory is adaptively tuned based on workload requirements.

Streamlined packaging and hassle-free upgrades

DB2 offers a simple packaging structure with seven editions and an optional DB2 Advanced Recovery feature. Select DB2 10.5 editions now share a common install image with previous editions of DB2, so moves between editions can be as simple as a license key update. The simplified packaging means you have fewer editions to deploy and administer, easy entitlement tracking and greater utilization of DB2 functionality.

DB2 Advanced Enterprise Server Edition offers the functionality and database management solutions needed for large, complex enterprise environments. It is ideal for transactional, analytic and operational analytic workloads. It includes BLU Acceleration, pureScale, DB2 Workload Management, IBM DB2 Database Partitioning Feature (DPF) and other advanced capabilities such as change queue-based replication, change data capture (CDC) replication, IBM solidDB® and solidDB Universal Cache. It can be deployed on servers of any size, from one processor to hundreds of processors, and on both physical and virtual servers.

DB2 Advanced Workgroup Server Edition is ideal for medium-size businesses. It includes most of the same functionality and database management solutions as DB2 Advanced Enterprise Server Edition, and can handle transactional, analytic and operational analytic workloads. This edition does have processor core, socket, memory and terabyte restrictions, and only supports federation between DB2 and IBM Informix® data sources.

DB2 Enterprise Server Edition is designed to meet the needs of medium-to-large businesses and is ideal for transactional and operational analytic workloads. It has no memory, terabyte, socket or core limits and can be deployed on servers of any size, as well as on both physical and virtual servers. It does not include BLU Acceleration, pureScale or DPF deployment modes, but does include some advanced database capabilities such as connection concentrator, materialized query tables (MQTs), multidimensional clustering (MDC), multi-temperature data management, query parallelism, scan sharing and table partitioning.

DB2 Workgroup Server Edition is for transactional database workloads in a departmental, workgroup or medium-size business environment. This edition shares significant functionality with DB2 Enterprise Server Edition, but has processor core and memory restrictions. There is no limit on the cores or memory available to the physical server if the restrictions are observed by the virtual servers running DB2. Therefore, this edition is ideal for consolidating multiple workloads onto a large physical server running DB2 Workgroup Server Edition on multiple virtual servers.

Please note that DB2 Workgroup Server Edition no longer contains the pureScale capability. Existing customers can upgrade their entitlements to restricted DB2 Advanced Workgroup Server entitlements so they may continue to use pureScale functionality.

DB2 Express Edition provides a full-function transactional data server with entry-level pricing that is ideal for small and medium businesses (SMBs). This edition includes security and HADR features and can be deployed in x64 server environments. It is restricted to eight processor cores and 8 GB of memory per physical or, where partitioned, virtual server. Because there is no limit on the cores or memory available to the physical server, it is ideal for consolidating multiple workloads onto a large physical server while running on multiple virtual servers.

DB2 Express-C Edition is a no-charge, entry-level data server edition that is designed for the developer and partner community. It includes self-management features and many of the core database capabilities such as Time Travel Query. The main difference between this edition and the production editions is that you cannot cluster together servers for high availability. Solutions developed using DB2 Express-C can be deployed on more scalable DB2 editions without modifications to the application code.

DB2 Developer Edition is a comprehensive package that includes all of the DB2 capabilities for a single application developer to design, build, test and prototype applications for deployment on any of the DB2 client or server platforms. It requires a separate license for each developer and cannot be used in production systems.

DB2 Advanced Recovery Solution is a software bundle that includes IBM DB2 Merge Backup for Linux, UNIX and Windows V2.1, IBM DB2 Recovery Expert for Linux, UNIX and Windows V4.1 and IBM InfoSphere® Optim™ High Performance Unload for DB2 for Linux, UNIX and Windows V5.1. It helps to improve data availability, mitigate risks and accelerate crucial administrative tasks. DB2 Advanced Recovery is available as a separate purchase and can be used with all DB2 Editions except DB2 Express-C.

In addition, multiple compatible database management solutions are included in DB2 Developer, DB2 Advanced Workgroup Server and DB2 Advanced Enterprise Server and are available as a for-purchase add-on with other editions:

- **InfoSphere Data Architect:** Provides a collaborative data design solution to discover, model, visualize, relate and standardize diverse and distributed data assets; limited to 10 users.
- **InfoSphere Optim Configuration Manager:** Offers centralized management of database and client configurations.
- **InfoSphere Optim Performance Manager Extended Edition:** Helps DBAs and IT staff manage performance proactively and prevent problems before they impact the business.
- **InfoSphere Optim Query Workload Tuner:** Provides expert recommendations to help improve the performance of query workloads.
- **InfoSphere Optim pureQuery® Runtime:** Provides a data access platform that enables improved performance, security and manageability of database client applications.
- **IBM InfoSphere Warehouse Design Studio:** Provides a graphical user interface to design, model, reverse-engineer and validate physical database schemas.
- **IBM Warehouse SQL Warehousing Tool (SQW):** Generates SQL for warehouse maintenance and administration. SQW is part of Design Studio.
- **Warehouse mining and text analytics:** Helps business users work with current data and deliver analytics in real time to quickly discover revenue opportunities.
- **Warehouse cubing services:** Provides multidimensional data analysis without extracting data from the warehouse.
- **IBM Cognos® BI 10.2 (five users):** Enables users to access and analyze the information they need to make the decisions that lead to better business outcomes.

Advanced DB2 10.5 capabilities

Feature	Description/Function
BLU Acceleration	In-memory hybrid column-organized table technology that offers a significant speed advantage for analytical queries that must scan through large sets of data.
Compression	Helps reduce storage needs and increase performance using multiple techniques, including table and index compression with page-level compression and DB2 with BLU Acceleration with advanced encoding, to maximize compression of columnar tables.
Continuous data ingest	Loads data continuously from multiple sources throughout the organization to support faster decision making.
IBM Data Partitioning Feature (DPF)	Enables massive parallel processing by transparently splitting the database across multiple partitions and using the power of multiple servers to satisfy requests for large amounts of information.
IBM DB2 Connect™	Accesses DB2 data that resides on DB2 for IBM i5/OS™, IBM zVM®, IBM zVSE® and z/OS operating systems.
DB2 pureScale	Transparently delivers high availability and exceptional scalability to applications.
DB2 Workload Management	Enables fine-grain resource allocation, monitoring and management of workloads based on service classes, workload characteristics, elapsed time, time of day and more.
Materialized query tables (MQTs)	Improves the performance of complex queries with the pre-computed results of the whole or parts of queries in MQTs.
MQ replication/CDC	Replicates large volumes of data at very low levels of latency.
Multi-temperature data management	Helps maximize performance and reduce overall media costs with automated storage tiering and the ability to transfer data in real time between different types of drives.
IBM solidDB and solidDB Universal Cache	Synchronizes data between the mobile database and a back-end database. Data between the solidDB server and the back-end database is synchronized using the Universal Cache feature.

For more information

To learn more about the capabilities of each DB2 10.5 for Linux, UNIX and Windows edition, please contact your IBM representative or IBM Business Partner, or visit: **ibm.com**/db2/luw/

[1] Client-reported testing results in DB2 10.5 early release program. Individual results will vary depending on individual workloads, configurations and conditions, including table size and content.

[2] Based on IBM design for normal operation under typical workload using HADR and pureScale clusters. Individual results will vary depending on individual workloads, configurations and conditions, network availability and bandwidth.

[3] Based on IBM design for normal operation under typical workload. Individual results will vary depending on individual workloads, configurations and conditions, network availability and bandwidth.

[4] Available with DB2 Advanced Enterprise Server Edition.

[5] Based on internal IBM testing of sample analytic workloads (not including transactional or OLAP workloads) comparing queries accessing row-based tables on DB2 10.1 vs. columnar tables on DB2 10.5. Performance improvement figures are cumulative of all queries in the workload. Individual results will vary depending on individual workloads, configurations and conditions.

[6] Based on IBM design for normal operation under typical workload using HADR and pureScale clusters. Individual results will vary depending on individual workloads, configurations and conditions, network availability and bandwidth.

[7] Based on internal tests and reported client experience from 28 Sep 2011 to 07 Mar 2012.

[8] Based on client testing in the DB2 10 Early Access Program.

[9] Based on IBM internal testing and reported beta client testing. Individual results will vary depending on individual workloads, configurations and conditions, including table size and content.

[10] Client-reported testing results in DB2 10.5 early release program. Individual results will vary depending on individual workloads, configurations and conditions, including table size and content.

IBM Corporation
Software Group
Route 100
Somers, NY 10589

Printed in the United States of America
April 2013

IMD14435-USEN-00