BLU Acceleration changes the game

Executive summary

Born from new advances in data processing from IBM Research, IBM® DB2® with BLU Acceleration is a leap forward in database technology that raises the bar for performance and value. BLU Acceleration uses patented technologies to deliver a unique combination of performance, ease of use and cost-efficiency—with 8 to 25 times faster reporting and analytics[1] and cases of more than 1,000 times faster answers to queries.[2] BLU Acceleration also complements in-memory Dynamic Cubes in IBM Cognos® Business Intelligence with 24 times faster query performance.[3]

Today, while memory for applications may be an unlimited resource from a system design perspective, the reality is an organization's budget is not an unlimited resource. Even though memory prices continue to fall, data continues to grow even faster, making systems that require all data in memory unsustainable and uneconomical. BLU Acceleration delivers in-memory performance even when active data is larger than available memory space. With BLU Acceleration, clients have reported 10 times storage space savings (as seen during beta tests), which further improves performance and reduces storage costs.[4] BLU Acceleration runs on existing infrastructure and provides clients with the choice to optimize their system configuration and service levels for maximum cost-efficiency.

The new DB2 with BLU Acceleration deeply integrates these latest technological advances to deliver breakthrough performance at a far lower cost than competitors. While BLU Acceleration is a revolutionary innovation, the real innovation is how easy it is to adopt and even easier to use.

DB2 with BLU Acceleration has the pedigree of a benchmark champion, while competing products often are unproven or a conglomeration of acquired legacy products, none of which have a proven history of performance leadership.

Business value

DB2 with BLU Acceleration runs on and extends the use of existing infrastructure to increase the return on investment. It enables clients to optimize the system configuration—operating system, memory, storage—for cost and service levels, without rigid hardware configurations or requirements, dramatically lowering costs as data volumes increase. It also offers clients the choice of IBM POWER® or x86 processor architectures. The Advanced Workload Management capabilities of DB2 with BLU Acceleration deliver proven, consistent and predictable performance for transactional and analytics applications, supporting more concurrent users and achieving higher service levels for a wider range of queries.

Business-proven

BLU Acceleration is built on the proven performance, reliability and security of DB2 and leverages technologies such as advanced memory management and query optimization. DB2 is real-world proven for online transactional processing (OLTP) and online analytic processing (OLAP) workloads, as well as mixed OLTP and OLAP workloads, in some of the world's most demanding enterprises. DB2 has decades of recognized high-availability and disaster recovery experience, and recovery with zero loss of committed data. DB2 provides flexible scalability—up and out—for both transactional and analytical applications.

DB2 is the database software of choice at over 3,000 SAP clients running approximately 30,000 instances. As a multi-workload database system, DB2 has a distinguished history of high-performing benchmarks both for OLTP and OLAP. It has consistently posted top benchmark results in industry-standard database benchmarks such as TPC, and vendor-specific benchmarks such as SAP SD, while other vendors make unsubstantiated performance claims without benchmarks to support them. Some vendors claim a single test system proves scaling to 100 TB, but DB2 runs systems larger than 100 TB in production every day—not to mention the Guinness Book world-record data warehouse at 3 PB. The mixed-workload capabilities of DB2 have been available in an appliance form since 2009, rendering false any competitive claims of being the first database or appliance to support both OLTP and OLAP.

Innovation leadership

IBM has led the industry in patents for the last 20 years, and has been a pioneer in parallel processing research and systems— helping to solve some of the world's most challenging problems, such as unraveling the human genome with systems like IBM Blue Gene®. Blue Gene focused not only on breakthrough performance, but also on achieving performance targets at a reasonable cost and making such massively parallel machines more usable. Similarly, the goal of BLU Acceleration was not only breakthrough performance, but high usability and high performance at a reasonable cost for clients.

BLU Acceleration innovations

BLU Acceleration is delivered in the latest release of DB2. As DB2 has done throughout its history, the new version provides increased performance, reliability and value for clients by incorporating the latest IBM Research innovations. DB2 has also supported a variety of in-database processing capabilities for years, including stored procedures, triggers, table functions, user-defined functions and advanced SQL capabilities.

IBM has consistently leveraged the latest advances in hardware and software technology, optimizing for individual processor caching, register sets and new storage technologies, including columnar storage. DB2 with BLU Acceleration continues this tradition by delivering the following technological advances: Dynamic In-Memory, Actionable Compression, Parallel Vector Processing and Data Skipping.

Dynamic In-Memory

There has been a lot of clamor and subsequently a lot of claims labeling products as "in-memory." So what is in-memory? The classic definition of in-memory requires all data to be in DRAM. While some vendors might think that simply telling their clients to buy ever-larger amounts of memory is acceptable, IBM has always been focused on delivering not just performance to clients, but value and price-performance. Furthermore, delivering the highest performance requires more than just having the data in system memory—it also requires the most efficient use of the memory within today's advanced processors (CPUs).

While some vendors continue to suggest that all business data can fit in memory, data continues to grow faster than memory prices are falling, making systems that require all data in memory or purport to put all data in memory unsustainable and uneconomical. Perhaps in recognition of this fact, some vendors who have previously touted all in-memory databases now allow data larger than memory, while at the same time cautioning against dramatic decreases in performance. Such compromises make labeling such products as an "in-memory database" inaccurate or misleading.

BLU Acceleration was designed with Dynamic In-Memory for highly efficient processing of data at in-memory speed even if it does not fit entirely in memory. Building on the decades of virtual memory, bufferpool and memory management expertise built into DB2, BLU Acceleration further expands this highly efficient use of memory to pre-fetch and stream data into the processing engine—advancing beyond system memory to in-CPU memory optimization. This allows DB2 with BLU Acceleration to process data that is substantially larger than memory at in-memory speeds, delivering superior value for clients. DB2 with BLU Acceleration has no inherent limits on data size.

Actionable Compression

While data compression is another often-used term, the amount of compression, its ease of use and the ability to operate on compressed data varies greatly. IBM has long employed data compression in its database and storage systems. The encoded compression in BLU Acceleration represents a significant advance in technology by preserving order in encoded form, which allows a wide variety of comparative operations to be performed without decompression—and with highly efficient use of CPU memory (cache) and registers.

This allows the most common comparisons in SQL predicates to be performed on encoded values without decompressing data—accelerating evaluations, reducing memory requirements and dramatically lowering processing needs for queries at runtime. While compression technologies from competitors may allow simple equality comparisons on compressed data, these more rudimentary methods require data to be decompressed for comparison, increasing infrastructure costs to support this less-efficient operation.

Parallel Vector Processing

DB2 has employed both inter-node and intra-node parallel processing for decades. BLU Acceleration extends the parallel processing capabilities of DB2 to utilize the single instruction, multiple data (SIMD) instructions and associated registers in Intel, AMD and POWER processors. These SIMD instructions allow vectors of values to be evaluated in parallel, and in conjunction with the advanced encoding of BLU Acceleration, enables the evaluation of as many as 128 values in a single instruction.

While competing database systems may also utilize SIMD instructions for operations such as decompressing values, BLU Acceleration fully utilizes the SIMD registers by matching its encoding to the registers in conjunction with Actionable

Compression. In addition, BLU Acceleration utilizes all available processor cores, CPU memory and threads for maximum parallelization and throughput, and maximizes the value of your investment in hardware. While BLU Acceleration raises the performance bar among x86-based solutions, it fully exploits the superior in-memory architecture of IBM Power Systems™, whose leadership in CPU memory (cache), memory bandwidth and parallel processing threads delivers performance unmatched by alternatives.

Data Skipping

Data Skipping is another technology advance in BLU Acceleration that allows vast amounts of data to be traversed in a highly efficient manner without examining each block of data. With Data Skipping, only the blocks of data necessary to answer the question are examined, allowing the total data to scale significantly without requiring a corresponding increase in memory or processor resources. As data volumes grow, the value of this innovation continues to grow.

Alone, each of these innovations provides a compelling value. When combined in BLU Acceleration, they deliver a powerful leap forward in speed, simplicity and affordability.

Easy to adopt, easier to use

While BLU Acceleration delivers a new level of performance, the real breakthrough is how easy it is to adopt and even easier to use. Adopting some competing database technologies requires a risky simultaneous migration of platform, database software and application requiring significant planning and resources. Adopting and using BLU Acceleration is simple. Since BLU Acceleration is integrated in DB2, adoption can be at your own speed—evolutionary, choosing to convert one table at a time, or revolutionary, converting all tables to column-based BLU tables. DB2 includes tools that help assess the impact of using BLU tables to guide decisions.
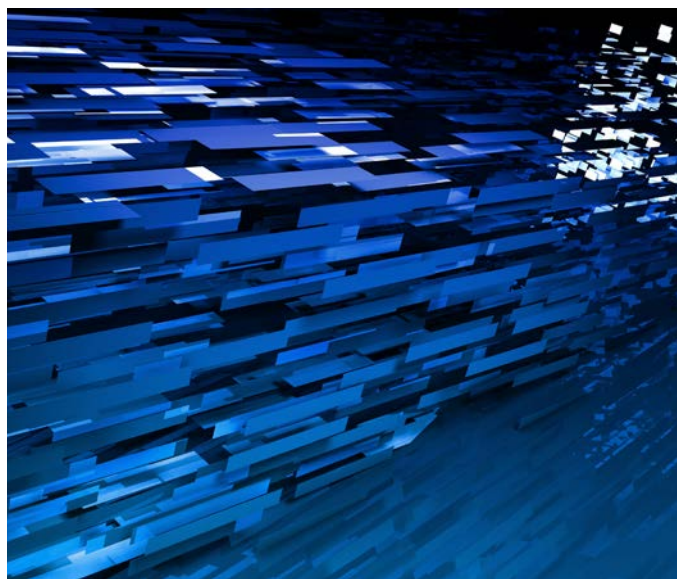
Platform for big data

BLU Acceleration is the latest addition to the IBM big data platform—a portfolio of capabilities that enables organizations to integrate, govern and leverage all of the data in their business systems and make it available to them from anywhere. Only IBM has delivered game-changing innovations such as IBM Watson™, BLU Acceleration, stream processing analytics and expert integrated IBM PureSystems™.

Only IBM can provide these business-ready big data and analytics capabilities, integrated and hardened for serious use, with flexible deployment options. IBM knows how to turn data into value through its unmatched experience with clients, technical expertise and deep industry knowledge.

For more information

To learn more about BLU Acceleration, please contact your IBM representative or IBM Business Partner, or visit: **ibm.com/**blu

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1 Based on internal IBM testing of sample analytic 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.

2 Based on internal IBM tests of analytic workloads comparing queries accessing row-based tables on DB2 10.1 vs. columnar tables on DB2 10.5. Results not typical. Individual results will vary depending on individual workloads, configurations and conditions, including size and content of the table, and number of elements being queried from a given table.

3 Performance is based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput or performance that any user will experience will vary depending upon many factors, including considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration and the workload processed. Therefore, no assurance can be given that an individual user will achieve results similar to those stated here.

4 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.

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