IBM Db2: The AI database

Built for and powered by AI with an open data and AI platform that runs on any cloud

Highlights

- ML query optimization and confidence-based querying
- Native support for Graph, Blockchain, and many popular programming languages
- Data virtualization, built-in governance and data science
- Massively Parallel Processing, active compression and data skipping
- Available on IBM Cloud Pak for Data and standalone; on premises and on cloud

IBM® Db2® databases are built to address current data management needs and provide an advantage as companies begin to incorporate AI. Db2 databases are powered by AI in order to optimize and improve the data management process with machine learning query optimization, confidence-based querying and adaptive workload management. Furthermore, they are built for AI in order to ensure data users can effectively analyze and build models with support for Graph, blockchain, and popular languages and APIs such as REST. All this is supported by enterprise-grade features like BLU Acceleration® massively parallel processing, active compression and data skipping alongside robust security, availability and recovery.

Db2 products also offer great deployment flexibility on IBM Cloud Pak® for Data and IBM Cloud Pak for Data as a Service. Their underlying Red Hat® OpenShift® architecture enables deployment on any cloud and their open and extensible data and AI platform delivers built-in data virtualization, governance and data science.

Db2 has deployment flexibility

IBM Db2 on IBM Cloud Pak for Data

IBM Cloud Pak for Data is the best deployment option for Db2 databases. It is an open extensible data and AI platform that runs on any cloud.

The platform is available as-a-Service for organizations that would like to avoid managing the underlying infrastructure of the platform and focus more on AI-driven outcomes. Fully managed on the IBM Cloud, IBM Cloud Pak for Data as a Service contains all of the same integrated features and benefits of the platform listed above, while also supporting almost all the features in the Db2 database.[1] Depending on the needs of your business, you can choose to deploy the IBM Cloud Pak for Data software on any cloud of your choice or select and scale the services you need as you grow with the fully managed, IBM Cloud Pak for Data as a Service.

Data virtualization
Connect to all data sources quickly and efficiently across all locations from a single access point with data virtualization: a combination of data federation and an abstraction layer. Because data is processed where it resides, data movement and related expenses can be eliminated.

Multicloud capabilities
98% of companies[2] predict they will use multiple hybrid clouds within the next three years. The underlying Red Hat OpenShift architecture in IBM Cloud Pak for Data allows it to be deployed everywhere OpenShift can, including any cloud, and redeploy or relocate more easily, helping avoid vendor lock-in.

Built-in governance and integration
Governance is built into IBM Cloud Pak for Data with IBM Watson® Knowledge Catalog. It uses an intelligent metadata catalog to:

- Define data in business terms
- Track data lineage
- Allow visual data exploration
- Identify and remediate issues
- Collect information for audits
- Prevent miscommunication across departments

Watson Knowledge Catalog's key features include:

- Automated data discovery and metadata generation
- ML-extracted business glossaries
- Automated scanning and risk assessments of unstructured data
- Automated data protection rules enforcement to anonymize and restrict sensitive data access

In addition to Db2 and Watson Knowledge Catalog, the IBM DataStage® extension can be added to your deployment of IBM Cloud Pak for Data for data integration, providing in-line data quality and active metadata and policy enforcements. Its automation capabilities make high-quality data available throughout the enterprise, generating greater self-service access.

Data science
IBM Cloud Pak for Data's built-in data science draws upon the rich AI capabilities of Watson technology, including:

- IBM Watson Machine Learning Deploy self-learning models into production at scale.
- IBM Watson Studio Build and train AI models, gaining visibility, control and the ability to improve them across their lifecycle.
- IBM Watson AIOps Drive efficiency in operations to help resolve problems quickly in dynamic, data-intensive environments.
- IBM Watson Discovery Find answers and uncover insight in complex business content.
- IBM Watson Assistant Build conversational interfaces into any application, device, or channel for easier use.

IBM Watson Studio Premium can also be added and includes AutoAI, a capability that automates data preparation and modeling.

IBM Db2 on Cloud

IBM Db2 on Cloud is used for cloud-native development, Dev/test, and cloud failover. It encrypts data at rest and in flight, provides data access restriction and has security standards and auditing processes. Daily backups held for 14 days, 99.99% uptime SLA, seamless failover, and rolling updates are also available.

Db2 on Cloud also provides independent scaling of RAM, storage, and compute cores to meet peak workload demand without the expense of always carrying excess capacity and is deployable on AWS.

IBM Db2 on-premises

The standalone on-premises version of IBM Db2 products remains available for those who choose not to deploy on IBM Cloud Pak for Data. It is still built for and powered by AI with the usual Db2 features such as BLU Acceleration, MPP and active compression but forgoes the IBM Cloud Pak for Data platform's benefits such as data virtualization and built-in governance and data science capabilities.

Db2 is powered by AI

Machine learning query optimization

DBAs may spend up to a quarter of their time tuning queries.[3] Db2 databases alleviate this bottleneck by monitoring SQL performance over time and correlating it with queries using machine learning algorithms. This allows models to be created and optimized for specific SQL statements, resulting in more efficient access paths being used, faster query execution and reduced resource consumption. Db2 users are more likely to beat competitors to insight, increase query throughput to get more answers, and respond to consumer needs more quickly.

Confidence-based querying

Db2 databases use machine learning to score the accuracy of historic SQL query results and use those scores to prioritize and reorder future query results based on degrees of confidence. In this way, users can quickly identify and deliver the most accurate insights for the business without having to rely solely on experience or instinct.

Adaptive workload management

Adaptive workload management uses machine learning to create a feedback loop based on the actual runtime of workloads. In Db2 products, this information is used to adjust ongoing workloads and predict utilization trends, enabling preemptive problem correction. Overall database performance improvements up to 30% have been observed[4] and the automation saves time DBAs can put toward more valuable activities.

Db2 is built for AI

Multi-model data management with Graph

Graph databases connect nodes (objects) and represent relationships that can be retrieved using queries – storing complex sets of data and supporting dynamic multidimensional data management. The native graph functionality in Db2 databases enables multi-model database management, reducing the expense of data duplication, migration, multiple databases and data transfer fees.

Native blockchain support

Blockchain data is heavily compressed, and usually very difficult to view and analyze. The Db2 Blockchain Connector breaks down this silo by presenting blockchain data as a Db2 relational table, allowing blockchain data to be analyzed alongside other Db2 data. A cache table is also created to improve query performance while allowing quick new data acquisition. The connector allows AI developers to use blockchain data as a primary source for apps or additional detail supporting data sets already in use.

Language support

Db2 products support languages such as PYTHON and GO, architectures such as JSON and collaborative development environments including Jupyter Notebooks. Db2 resources can also be accessed from your web, mobile, or cloud application through a set of scalable APIs to create, discover, execute, and manage user-defined services. A good example is Representational State Transfer (REST) APIs, which can be used with recurring tasks to run queries on the database based on pre-defined criteria; the REST service will provide notifications whenever changes in the data meet the predetermined criteria.

This means Db2 developers can access and utilize data science features to drive deeper insights, and data scientists can rely upon the performance, dependability, and general enterprise-readiness of Db2 resources, building applications that utilize Db2 products for the data management.

Db2 is enterprise grade

BLU Acceleration

IBM BLU Acceleration increases processing speed by simplifying or eliminating steps that slow analysis. Advantages include timelier answers for quicker action, massive storage savings with actionable compression, and ease of implementation and management for both transactional and analytic workloads.

In-memory computing
Db2 databases support in-memory computing on existing infrastructures along with deeper analytics. They dynamically optimize movement of data from storage to system memory to CPU memory and are optimized for SAP applications, transactional and analytics workloads, and workloads migrated from Oracle databases, where Db2 technology provides an average of 98 percent compatibility.

Massively Parallel Processing (MPP)
The MPP-based cluster architecture in Db2 products enhances query response time to better provide insight from real-time operational and historical data. Multi-core and single-instruction multiple-data (SIMD) processing are also available.

Actionable compression and data skipping
Compression reduces the size of stored data while preserving its order. This allows for analytics without decompression, saving time and storage costs. By assessing data's relevance to a query and bypassing irrelevant data, Db2 products also forego unnecessary processing and save time.

Column-based Db2 shadow tables
BLU Acceleration technology uses an extra storage engine and integrated runtime directly in the core Db2 system to support storage and analysis of column organized tables in parallel to traditional row-based tables. This enables analytics on operational data directly within a transactional environment without compromising transactional performance. Furthermore, it avoids disruptions by allowing investments in existing enterprise resource planning (ERP) environments and skills to be maintained.

Backups and recovery

Db2 databases help increase availability with IBM Db2 pureScale® clustering technology, designed to avoid planned and unplanned outages with Geographically Dispersed Db2 pureScale Clusters (GDPCs) over multiple sites that are far enough apart to be on separate power grids. This feature can mean virtually no costly downtime, even during maintenance.

Setup and deployment for pureScale clusters is possible in hours with push-button installation. Backup and log compression acceleration is available as well. Db2 also supports all sync modes (SYNC, NEARSYNC, ASYNC and SASYNC) between clusters for high availability/disaster recovery (HADR) locally, across long distances or in the cloud. Additional HADR support is available through change-queue-based replication and change data capture (CDC) replication.

Security and encryption

Db2 technology integrates with centralized enterprise key managers that support Key Management Interoperability Protocol 1.1 (KMIP 1.1), such as IBM Security™ Key Lifecycle Manager. This enhances security and reduces user complexity, saving time. In addition, Db2 databases can be hosted in IBM data centers around the world to meet regulatory requirements for keeping data in specific regions or countries.

Very Large Database (VLDB) improvements

Increasing growth in data volume and sources means OLTP systems may contain hundreds of terabytes, something the Db2 family addresses with:

- Concurrency and scalability for recently and commonly referenced pages
- Higher throughput
- Performing online table reorganization tasks at the partition level
- IBM Db2 Database Partitioning Feature (DPF)
- Db2 Workload Management

These features drive scalability and processing speeds necessary to handle the growing volume and diversity of data. Without them businesses might not be able to collect all the data available to them and forego timely insight opportunities that could help them in the market.

Explore Db2 and talk to our experts

IBM Db2 products are prepared not only to help your business optimize current operations but facilitate your Journey to AI whenever you're ready. Powered by AI, built for AI and available on a data and AI platform, Db2 technology is the best choice for data management now and in the future.

The vast capabilities of Db2 and IBM Cloud Pak for Data open many opportunities and prompt many ideas and questions as well. If you would like additional information on any of the subjects covered here reach out to one of our experts who are happy to have a free, one-on-one call with you.

If you'd like to explore the capabilities of Db2 on your own for an unlimited amount of time, you can download a trial of the standalone version of Db2 for free. The trial contains all of the features of Db2 and is only limited to 4 cores and 16 gigabytes of RAM. And those seeking to get the most value by deploying IBM Db2 on IBM Cloud Pak for Data can get started with a free trial for the Cloud Pak for Data platform.

Appendix

Db2 deployment comparison chart

	Db2 on IBM Cloud Pak for Data	Db2 on IBM Cloud Pak for Data as a Service	Db2 on Cloud (Standalone)	Db2 (Standalone)
Cloud availability	All clouds	IBM Cloud® infrastructure	IBM Cloud and AWS	NA
Graph support	Yes	No	No	No
Built-in governance and data science	Yes	Yes	No	No
Data virtualization	Yes	Yes	No	No

Additional Db2 capabilities

Feature	Description or function
Continuous data ingest	Loads data continuously from multiple sources throughout the organization to support faster decision-making.
IBM Database Partitioning Feature (DPF)	Enables massively 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.
Federation Server	Supports federation between Db2 databases and other databases. It includes federation between Db2 and Oracle Database and Microsoft SQL Server for staged migration or long-term coexistence strategies.
Materialized query tables (MQTs)	Improves the performance of complex queries with precomputed results of the whole query or parts of queries.
MQ replication/Change data capture (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 storage tiering and the ability to transfer data in real time between different types of storage media.
Column store	Improves performance and reduces consumption of processor, memory and I/O resources for analytics workloads by directing scans to values in a specific column or columns, avoiding the need to process all data in a table.

Additional Db2 tools

Tools	Description or function
IBM Data Management Console	IBM Db2 Data Management Console is a new browser-based console that helps you administer, monitor, manage and optimize the performance of IBM Db2 for Linux®, UNIX and Windows databases. Db2 Data Management Console is packaged with all IBM Db2 editions at no extra charge.
IBM Advanced Recovery Feature	IBM Db2 Advanced Recovery Feature combines three Db2 tools for advanced database backup, recovery and data extraction. These tools help improve data availability, accelerate crucial administrative tasks and mitigate the risk of downtime, which can be very costly.
IBM Db2 Connect	IBM Db2 Connect helps manage access to your enterprise information, whether on premises or on cloud. For agile enterprises, it can deliver improved application enablement and a robust, highly scalable communications infrastructure for connecting data to web, Windows, UNIX and Linux applications.
IBM Data Studio	IBM Data Studio provides an integrated, modular environment to facilitate database development and IBM Db2 administration. It also offers improved collaboration through an open source integrated environment and database development tools for Db2 for z/OS®, Db2 for i, IBM Informix® and Db2 Big SQL.
IBM InfoSphere Data Architect	IBM InfoSphere® Data Architect is a collaborative enterprise data modeling and design solution that can simplify and accelerate integration design for initiatives related to business intelligence, master data management and service-oriented architecture.

For more information about IBM database management solutions for Db2, visit: ibm.com/analytics/db2/tools.

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IBM Corporation
New Orchard Road, Armonk, NY 10504

Produced in the United States of America
March 2021

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1 Graph capabilities are on the roadmap

2 https://www.ibm.com/downloads/cas/EXLAL23W

3 Based on internal tests and reported client experience from 28 September 2011 to 07 March 2012.

4 Based on IBM internal testing