IBM Db2 Update

April, 2021

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Director, Db2 LUW Development

Pillars of Db2 Strategy

Build for and Powered by AI/ML

- Python UDF
- In-DB Machine Learning
- Db2 Graph – Tech Preview
- ML Optimizer – Tech Preview

Hybrid Cloud Ready and Developer Inclusive

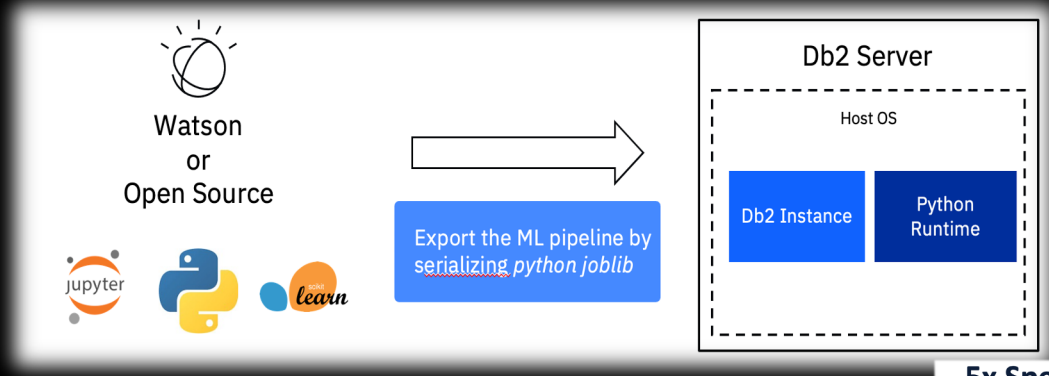
- REST API
- Visual Studio Code Extension
- Db2 Operators
- Click2 Containerize

Enterprise Grade & Resilient

- Faster Database Activation
- Compact VARCHAR
- Pacemaker/CoroSync Automated HADR
- SSO with JWT Token

Build for and Powered by AI/ML

Python UDF : Scoring Python Models via Db2



5x Speed up of Inferencing with IBM Db2

Model & Dataset

Logistic Regression (scikit-learn) Model

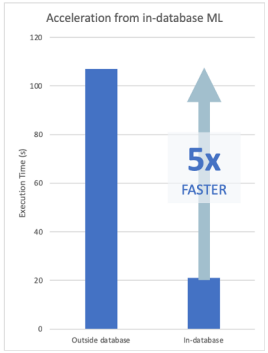
Batch size: 800k rows

Scoring on a Separate System

Data retrieved (over network) from Db2, scored, and written back to Db2: **1m47s**

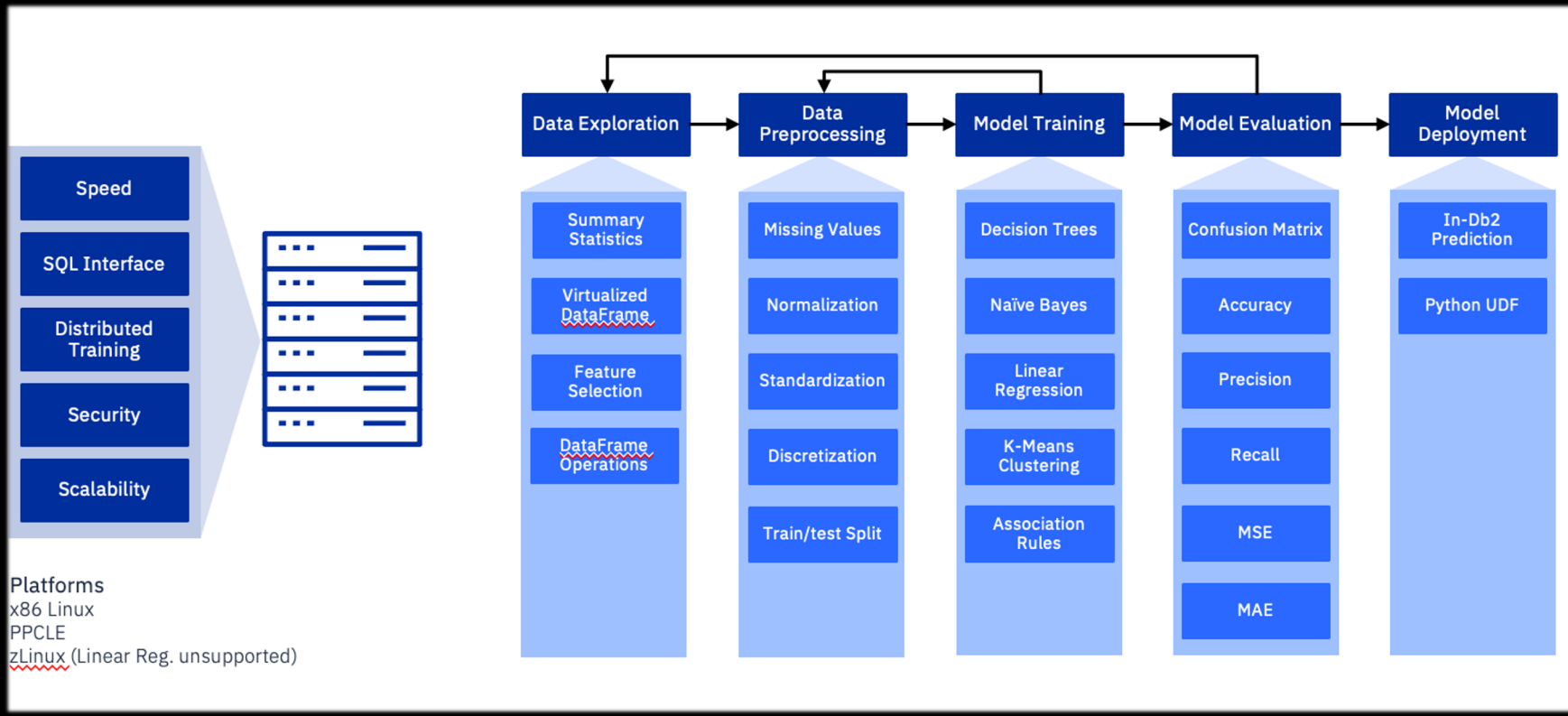
Scoring with Db2

Data retrieved, scored, and written back inside Db2: **21s**



Build for and Powered by AI/ML

In DB Machine Learning



Db2 Graph

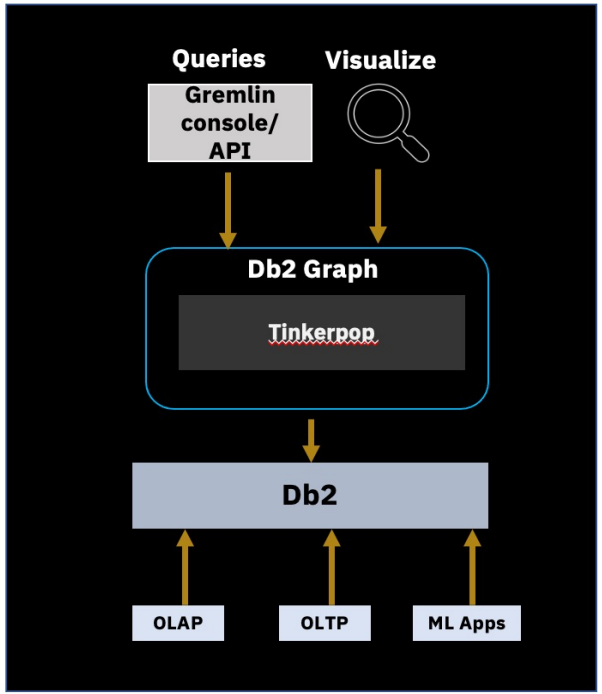
Db2 Graph - Tech Preview

Your data remains in Db2

- Continue to read and make updates to your data, without any impact on performance
- Leave your applications as they are

Simply “overlay” a virtual property graph over your Db2 data

- Uses the referential information to automatically create the Graph schema
- You can map tables or create views to map them into graph vertices and edges
- Add more relationships by editing the Graph schema, as long as the underlying data exists in Db2



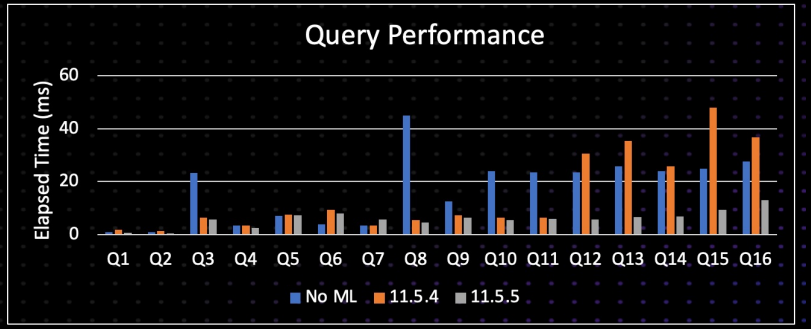
Build for and Powered by AI/ML

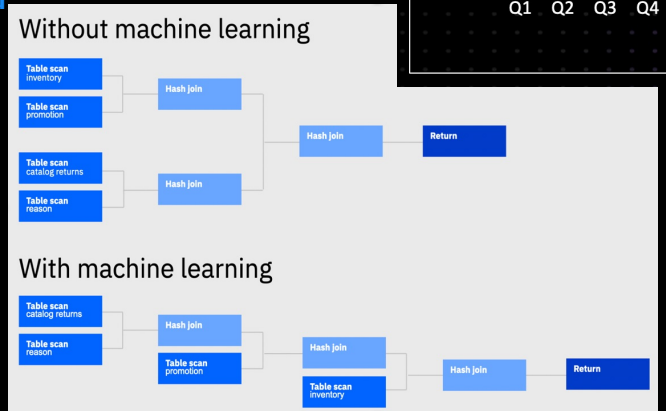
ML based Query Optimization

Get intelligent query processing with ML-based optimizer that uses ML and Neural networks to learn from past experience

- Uses ML to learn from experience and **improve decisions using feedback** from query execution and statistics
- Applies ML to better **estimate cardinalities and predicate filtering**, which is key to better query performance
- **Optimizes** memory and compute capacity resources and database resources

Get up to 10x better query performance with Db2 v11.5.5



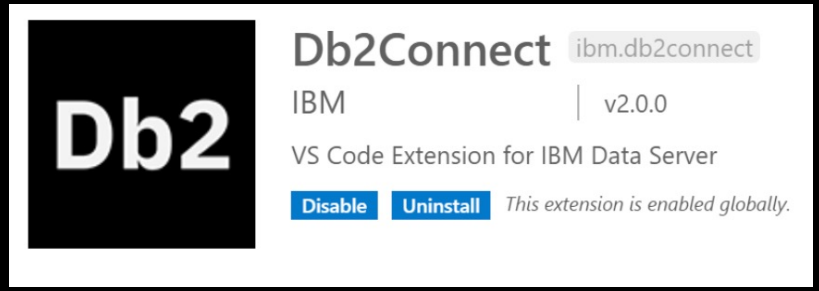


Hybrid Cloud Ready and Developer Inclusive

Visual Studio Code Extension & Drivers

New and Improved Db2 VS Code Extension with features including:

- Connection Manager for your connections
- Explore Database objects via UI Explorer
- Create/Open/Edit in local machine or from database
  - SQL Scripts
  - Stored Procedures
  - UDFs
  - Triggers
  - Views
  - Alias
  - Table
- Deploy Stored Procedure, UDFs, Triggers to the database.
- Export Results as CSV, JSON and XML.
- Keyboard shortcut support for different activities



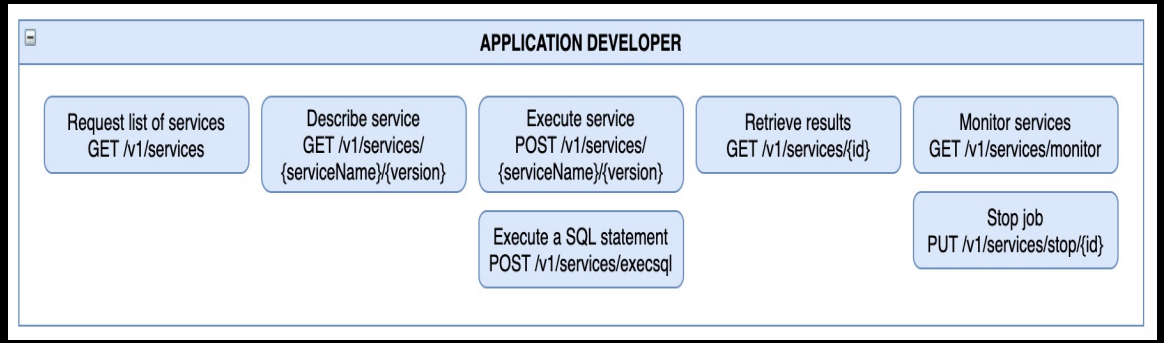
Driver	Updates with 11.5.5
.NET	.NET 3.1 .NET 4.8 .NET5 (Dec 2020)
Python	Python 3.9
Java	JDBC 4.3 and Open JDK 13 Runtime
Node.js	15.x
Ruby	2.7.x

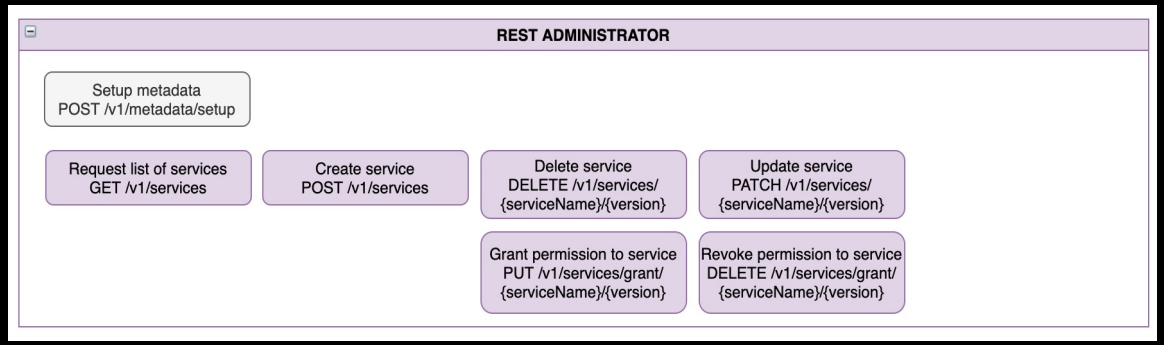
Supported Framework	Updates with 11.5.4
Django	Django 2.2, Django 3.1 (Jan 2020)
Rails	Rails 6.0
.NET Entity Framework	6.4 (Dec 2020), .NET5 Core(Dec 2020)

Hybrid Cloud Ready and Developer Inclusive

Db2 REST API Service

- Provides the application developer with APIs to **create**, **discover** and **execute** their own end-points, referred to as services.
- Each **developer-defined service** is associated with a single SQL statement.
- Services can be executed synchronously or asynchronously, as a job that supports result paging.
- **Db2 REST** is deployed as a docker container supporting Db2 11.5 (and 11.1).
- Authenticated users can use the REST end-points from any REST HTTP client **without installing Db2 drivers**.
- The Db2 REST server accepts an HTTP request, processes the request body and returns results in **JSON** format.



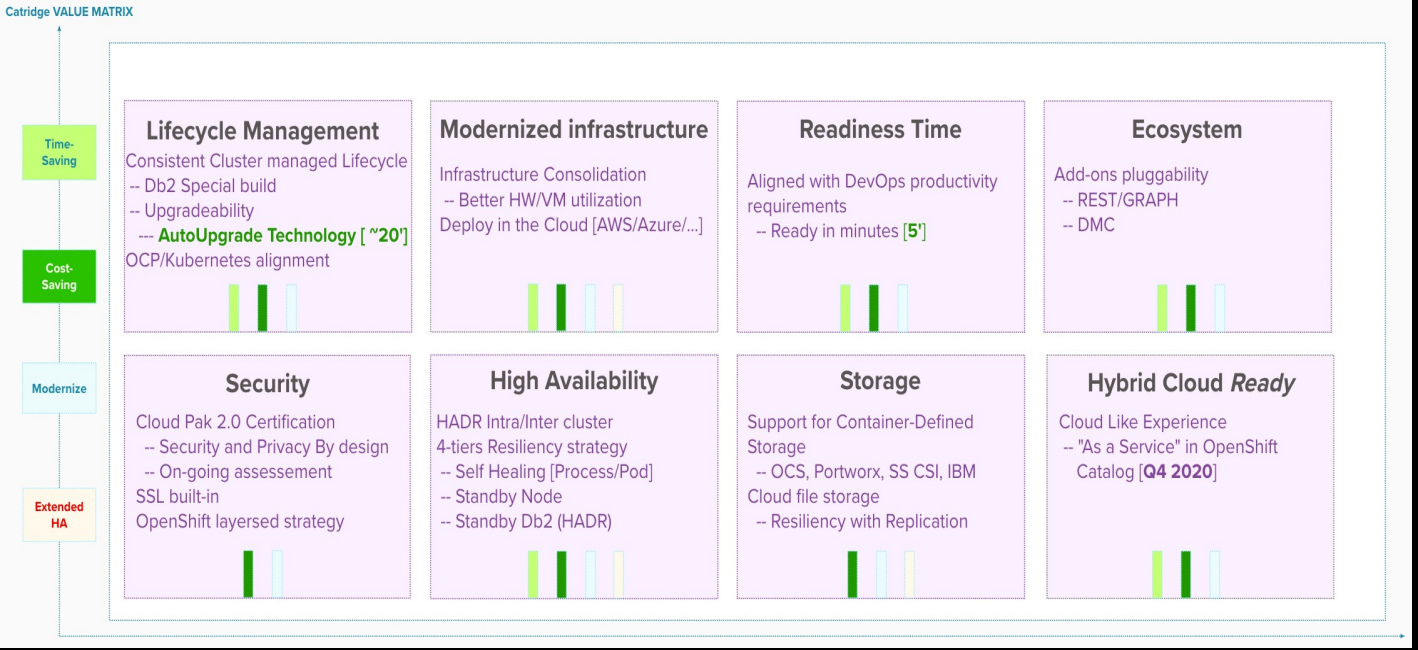


Hybrid Cloud Ready and Developer Inclusive

Db2 Universal Container (Db2U) Operators

Red Hat OpenShift

The Db2 Cartridge



Certification standards

- Runs on OpenShift
- Certified operators
- Fully containerized
- T1-T3 support
- Vulnerability scans

Capabilities level

- Basic install
- Seamless upgrades
- Full lifecycle
- Deep insights
- Auto pilot

Hybrid Cloud Ready and Developer Inclusive

Db2 Universal Container (Db2U) Operators Performance Evaluation

Red Hat OpenShift

All Performance Results for **Db2U on RHOS**

Metrics	Db2U on RHOS
Install Time	[Automated & includes instance/Database Creation] Time: ~ 2' to 4' (Db2)
Upgrade Time	[Automated] Time: 20'
HADR Takeover time	[Automated] Time: 2-4' minute
Recovery on Db2 Failure	[Automated] Time: 3 minutes + Partial Crash Recovery time* (observed < 1 min on SMALL)
Recovery on Hardware Failure	[Automated] Time: 6 minutes + Partial Crash Recovery time*
Scaling Compute	Time: 2 minutes

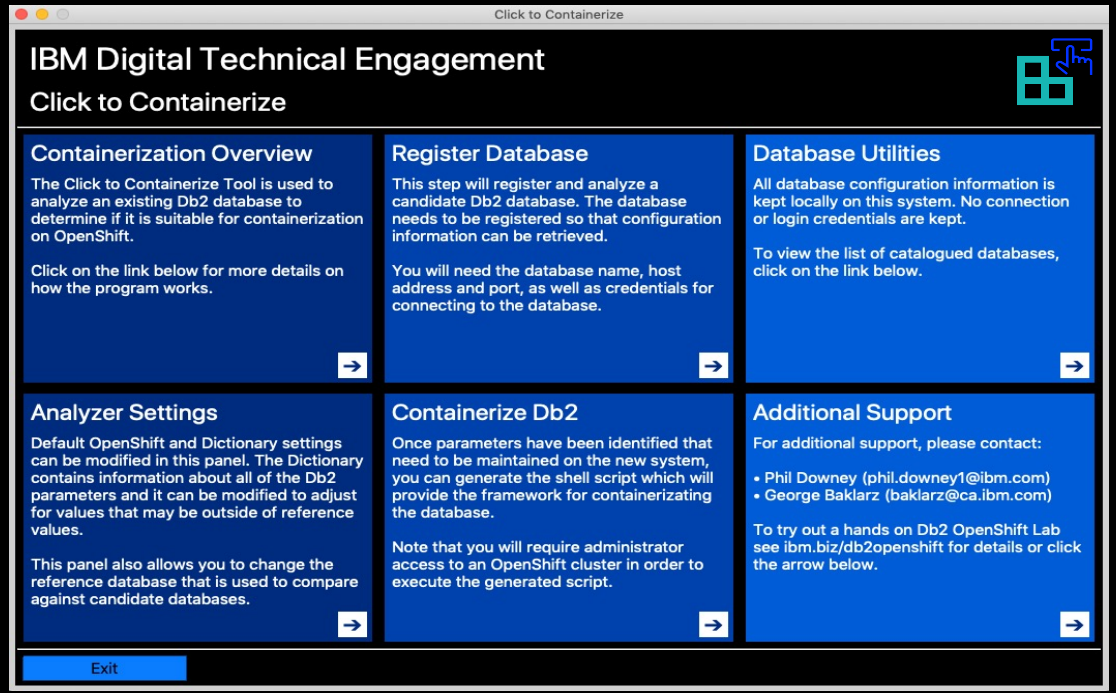
- Partial Crash Recovery time*: Usually complete in minutes with worst case at 20/30 minutes

Reference architecture - https://www.redhat.com/en/resources/IBM-Db2-Warehouse-MPP-on-OpenShift-Container-Storage-detail

Hybrid Cloud Ready and Developer Inclusive

Db2 C2C (Click2Containerize)

- It's **Containerization**
  - *NOT Migration*
  - No Backup Restore
  - No Export / Import
  - No Reconfiguration
  - Data Handled Securely

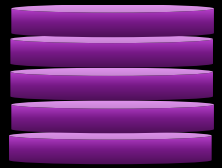


Hybrid Cloud Ready and Developer Inclusive

Db2 C2C (Click2Containerize)

Db2 On Prem

Db2 on Linux

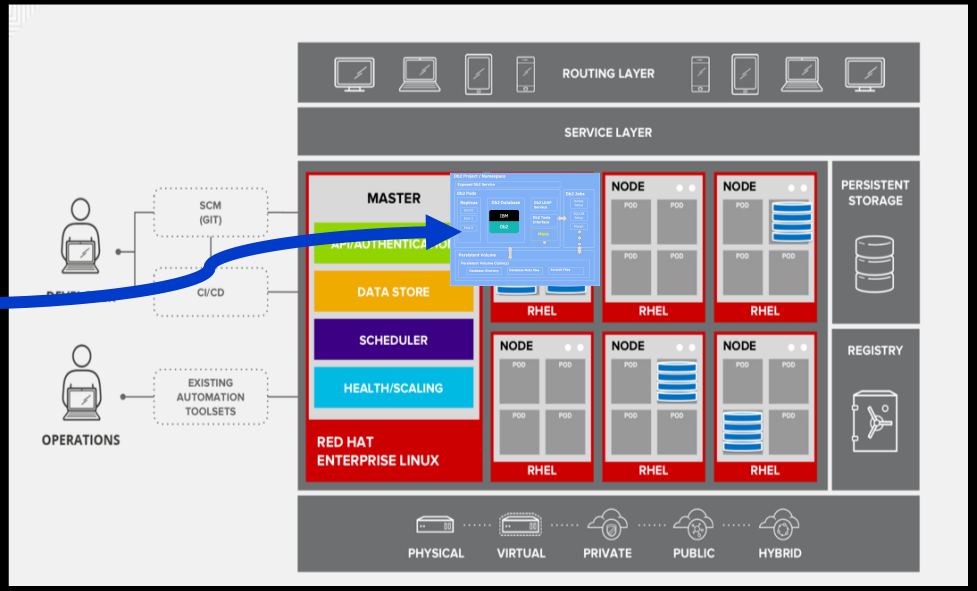


Oc Client

Internet/ Network

- Logs
- Mirror Logs
- Storage Path
- Storage Path X
- External UDFs
- DB Config Files
- KeyStore

Tested over 15,000 km Internet connection



Containerized Db2 Hybrid Cloud Service

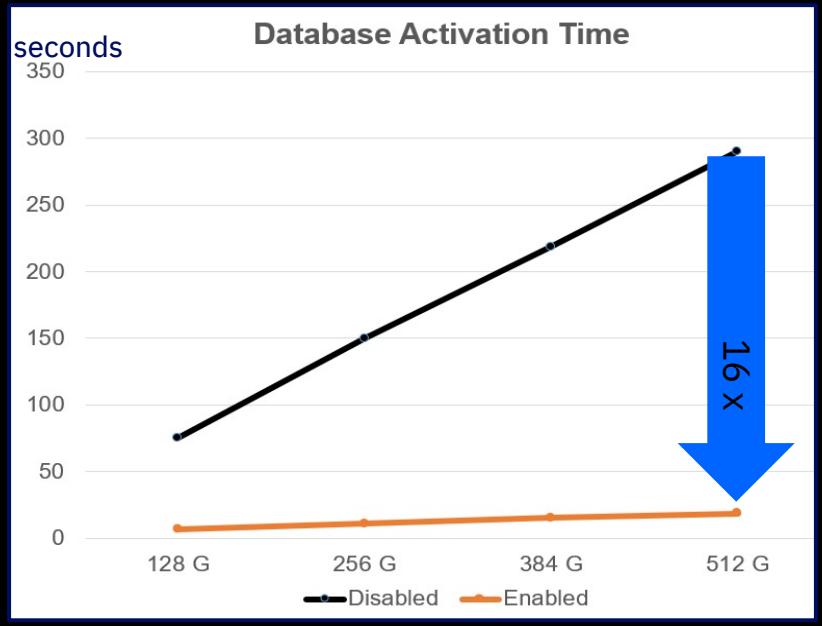
Tunable Parallel Data Transfer
Data Compression
Fully Auditable

Enterprise Grade & Resilient

Faster Database Activation

- Applicable in all – Upgrade , Crash Recovery scenarios
- The buffer pools are committed to memory using an Asynchronous Process
- Tests with SAP Db2 database on AIX system

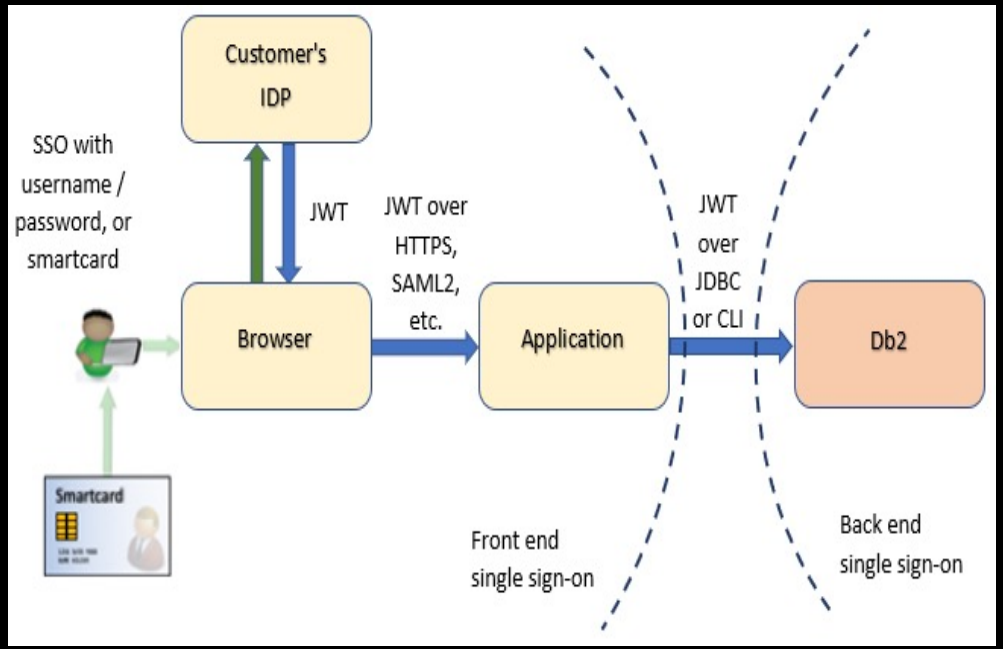
➔ Up to factor **16x faster**



Enterprise Grade & Resilient

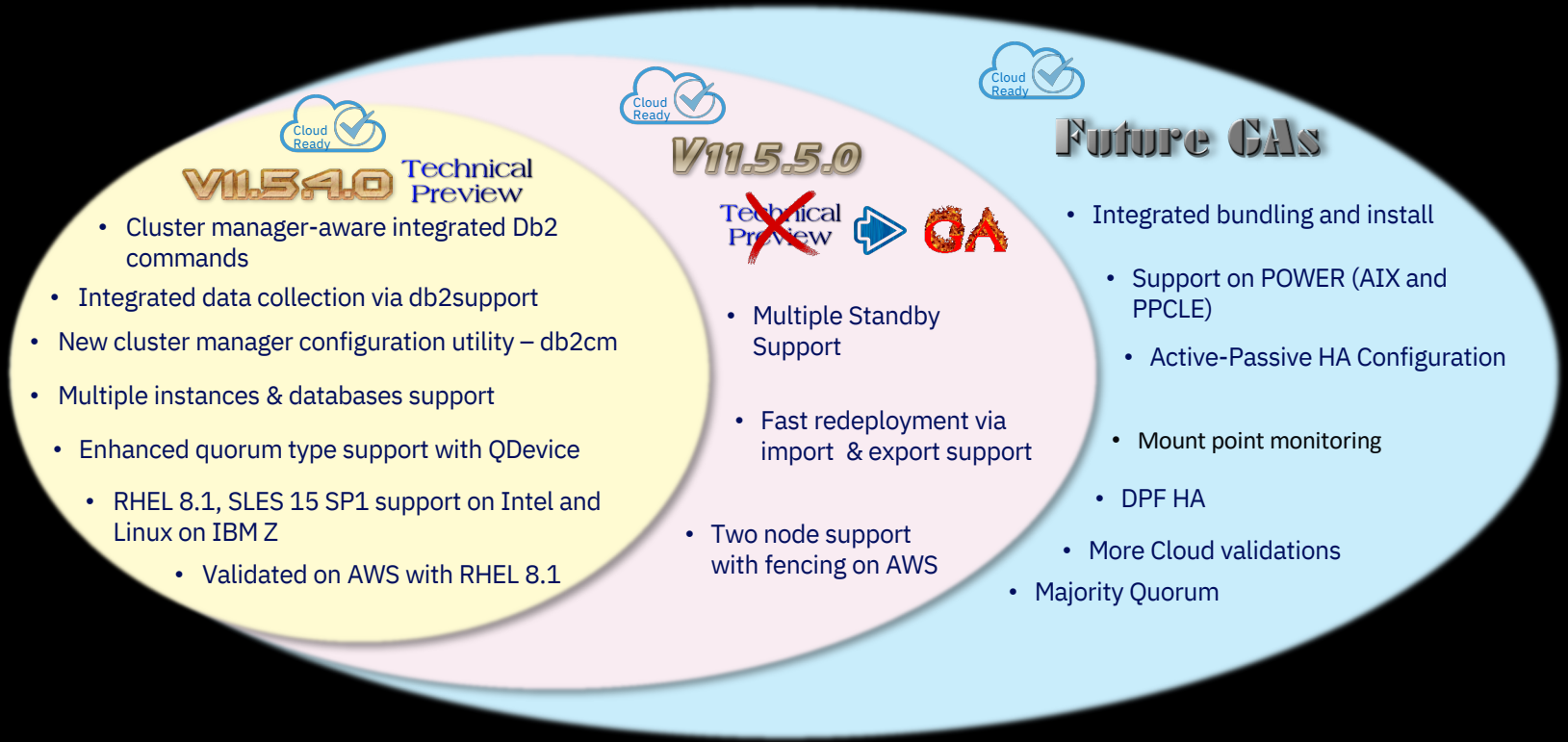
Single Sign-ON with JWT (JSON Web Token)

- Authentication without username/password via JSON Web Token (JWT)
- IDentity Provider (IDP) signs the token that's passed on to Db2
- Db2 is configured to "trust" IDPs and use their public key to verify the token
- If the token is valid, Db2 uses the identity within the JWT for authentication



Enterprise Grade & Resilient

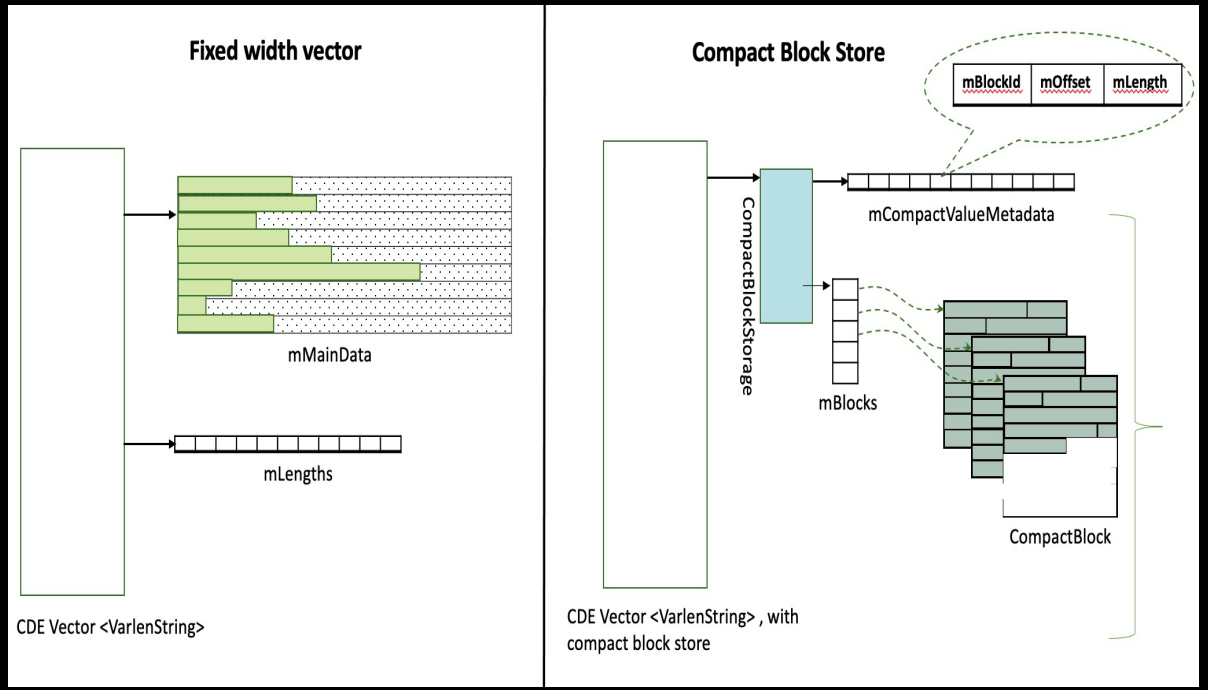
HADR with Pacemaker & Corosync



Enterprise Grade & Resilient

Compact Varchar & Memory Unit for BLU Runtime

- Improved memory efficiency for wide VARCHARs in CDE **Group By and Join queries**
- Reduce memory consumption, spill I/O and OOMs
- Performance improvements
- Increase in concurrency within Group By and Join operators

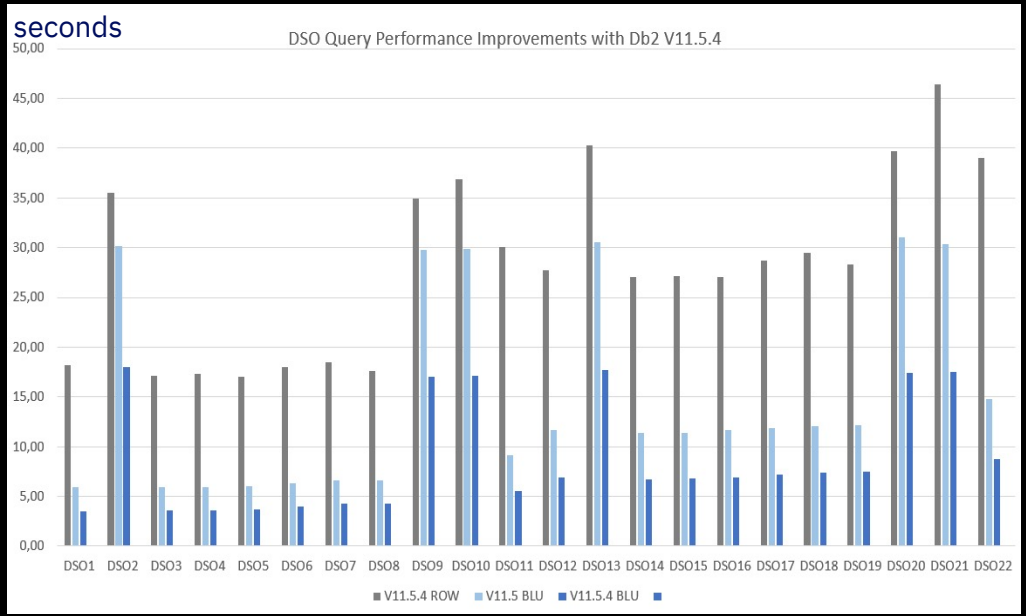


Enterprise Grade & Resilient

Compact Varchar for BLU Runtime – Results

Db2 runtime optimizations for Group By and HSJN with string data types

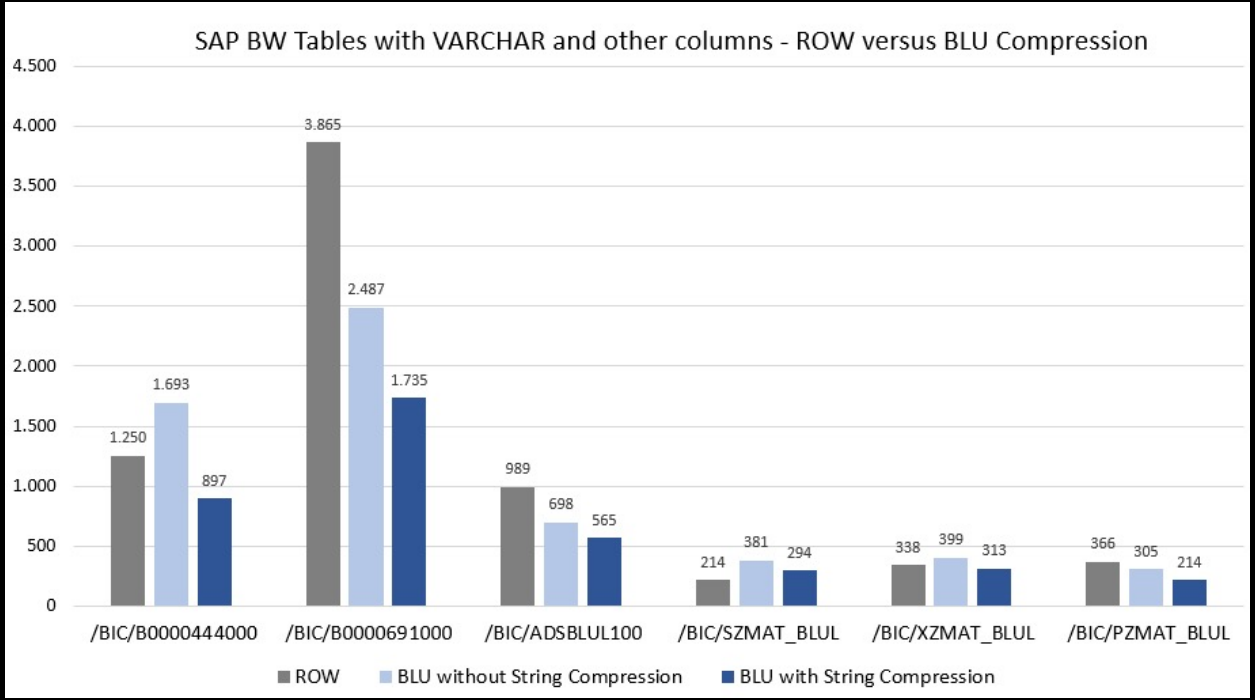
➔ SAP DSO queries run between **factor 1.6 and 1.8 faster** with Db2 11.5.4 compared to 11.5 GA



Enterprise Grade & Resilient

Columnar Page-Based String Compression Results

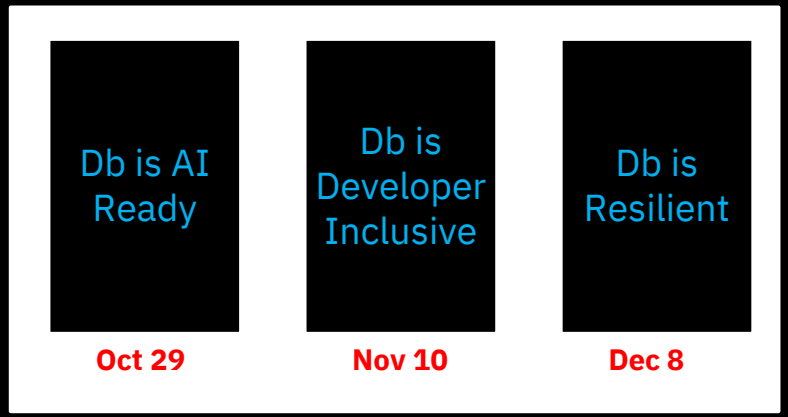
SAP BW tables **40%-90% better** compression then Db2 v11.5 GA



Market Awareness and Enablement

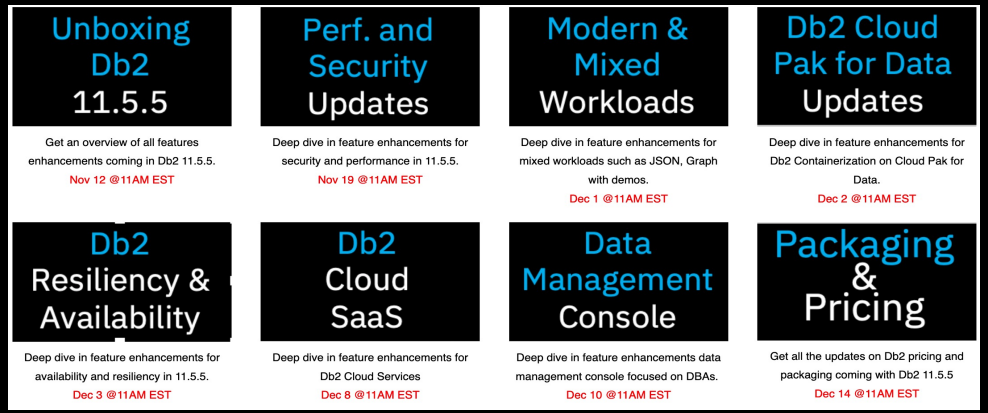
Completed webinars series – 1,000+ signups!

Db2 Everywhere Information Webinar Series
3 Sessions (Oct 29 – Dec 8)



Signup: ibm.biz/Db2isDeveloper-inclusive

Db2 11.5.5 Technical Webinar Series
8 Sessions (Nov 12 - Dec 14)



Signup: ibm.biz/db2webinar

Market Awareness and Enablement

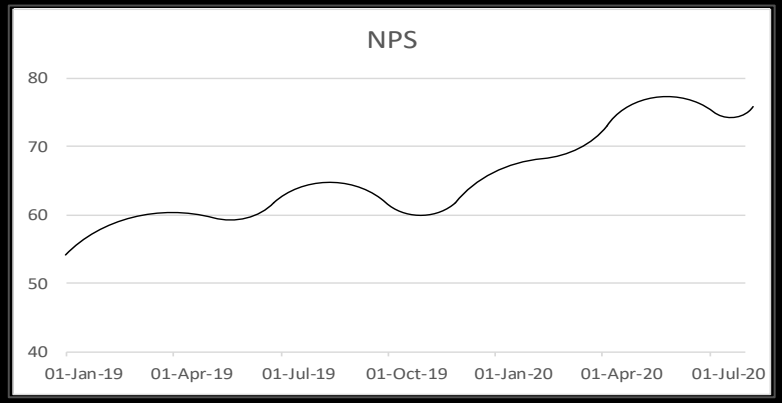
Db2 Client Success & Recognitions 2020!

Gartner peerinsights customers' choice 2020™

- Support NPS YTD – **73 (Highest-ever)**
- Over **80%** of surveys are **Promotors**
- **50%** of surveys are a ***Perfect 10***
- Providing solutions **20% quicker**

reddot winner 2020

Nikkei Computer Magazine (Japan) ranks IBM Db2 #1 in customer satisfaction for database software



1. Overall Satisfaction
2. Performance/Function
3. Reliability
4. Operability
5. Cost
6. Support
7. Inclination for Continued Usage
8. Number of valid answers

順位（前回）	会社名		1 総合満足度	2 性能・機能	3 信頼性	4 運用性	5 コスト	6 サポート	7 継続意向度	8 有効回答数
	重視度	Importance		61.7	73.2	49.2	49.5	23.5		
	全社平均（「有効回答数」は合計値）	Overall average	64.6	75.1	74.5	65.6	41.9	52.2	61.7	1072
1（1）	日本IBM（Db2（旧：DB2）、Informixなど）	IBM	71.9	79.2	81.4	73.3	51.0	64.0	66.6	56
2（2）	日本マイクロソフト（SQL Serverなど）	Microsoft	68.9	75.1	75.5	72.4	54.7	55.5	68.4	393
3（3）	日本オラクル（Oracle Databaseなど）	Oracle	59.2	76.3	74.4	58.6	22.1	46.6	53.4	432
4（4）	富士通（Symfowareなど）	Fujitsu	59.1	56.5	67.7	55.6	54.1	56.8	54.7	40

Cloud Pak for Data + Db2

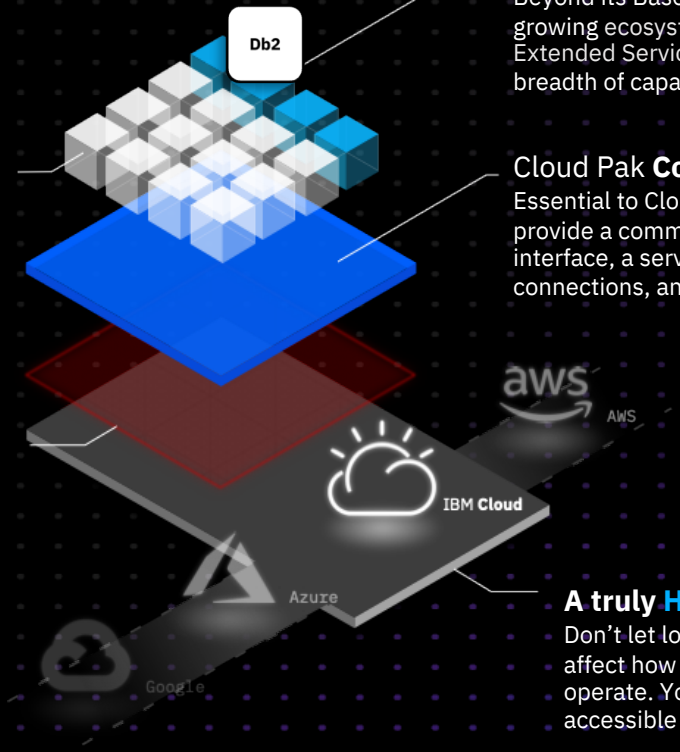
Simplifies, unifies and automates your journey to AI

Extended Services

Beyond its Base Services, Cloud Pak for Data has a growing ecosystem of Open Source, Partner, and IBM Extended Services **– including Db2** to expand the breadth of capabilities for teams.

Base Services

Core to Cloud Pak for Data, these Base services fastrack organizations on their **end-to-end data and AI journey** with comprehensive continuum of capabilities.



Cloud Pak **Control Plane**

Essential to Cloud Pak for Data, Foundational Services provide a command-line interface, an administration interface, a services catalog, a central list of connections, and the central user experience.

Red Hat® OpenShift®

A streamlined hybrid-cloud foundation to take advantage of the underlying resource and infrastructure optimization and management. OpenShift license dedicated to run Cloud Pak for Data.

A truly Hybrid-Cloud world

Don’t let lock-in or major IT decisions affect how your Data and AI temas operate. Your work and data should be accessible in any Hybrid-Cloud strategy.

IBM Watson / Data and AI / © 2020 IBM Corporation

IBM Db2 Resources

Information Resources:

- Db2 Roadmap - http://ibm.biz/AnalyticsRoadmaps
- Db2 RFE (Idea) Portal - http://ibm.biz/submitdb2idea
- Get latest Info- Subscribe to Db2 technical newsletter - http://ibm.biz/db2nlsignup
- Connect with the Db2 online community - http://ibm.biz/db2tribe
- Stay up to date with all the new demos on Youtube - http://ibm.biz/db2-youtube
- Interested in getting the latest beta version - http://ibm.biz/getdb2beta

Developer Resources:

- Db2 Developer Page to get started - http://ibm.biz/db2developer
- For Experienced Db2 developers, get your fav Db2 code sample on github - http://ibm.biz/db2github
- Want to try Machine Learning with Db2, check out - http://ibm.biz/learndb2
- Want details on Db2 Python Driver - http://ibm.biz/db2-drivers-python
- Want Details on Db2 PHP Driver - http://ibm.biz/db2-drivers-php
- Want Details on Db2 Node.js Driver - http://ibm.biz/db2-drivers-node
- Download the free Db2 python e-book - http://ibm.biz/db2pythonbook

Additional resources

White paper
IBM Db2 on Cloud Pak for Data

Blog
Easing into your AI journey with IBM Db2 on Cloud Pak for Data

Webinar

Your journey to AI starts with the right database

Optimizing your data management infrastructure with Db2

Hands-on lab
Db2 on Cloud Pak for Data hands-on lab

Video
Introducing Db2 on Cloud Pak for Data

Machine learning SQL optimization with IBM Db2

Machine learning confidence-based query matching with IBM Db2

Graph analytics in IBM Db2