databricks

Databricks 101

Getting Started Series

Crystal Chang

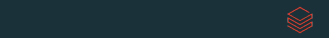
What is Databricks?

What is a Lakehouse?

How does it work?

What does it look like?

How can I get started?



10,000+
global customers

$1.5B+
in revenue

$4B
in investment

Inventor of the **lakehouse**
&
Pioneer of **generative AI**

databricks
The data and AI company

Gartner-recognized Leader
Database Management Systems
Data Science and Machine Learning Platforms

Creator of

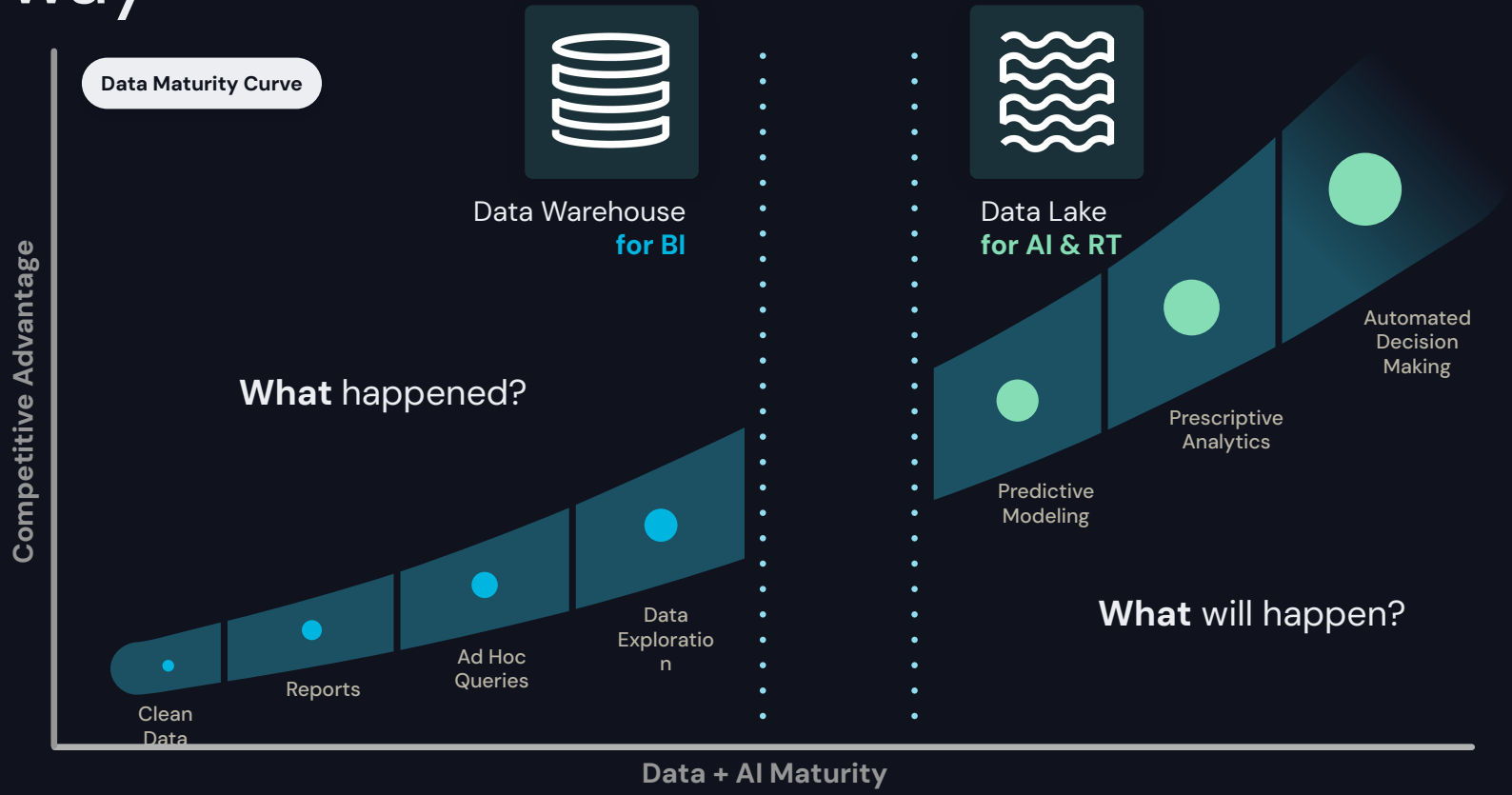
DELTA LAKE

mlflow

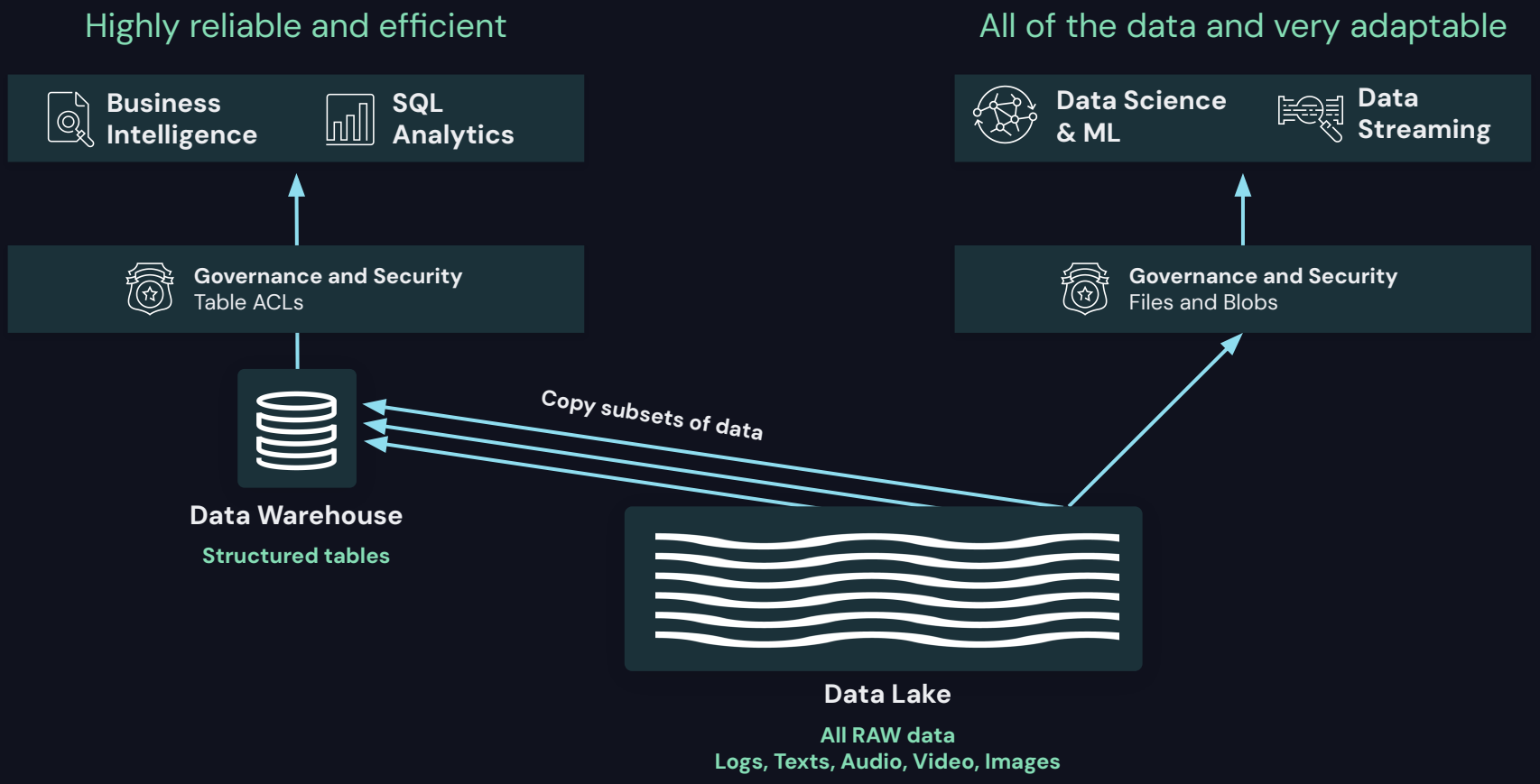
APACHE Spark

Lakehouse?

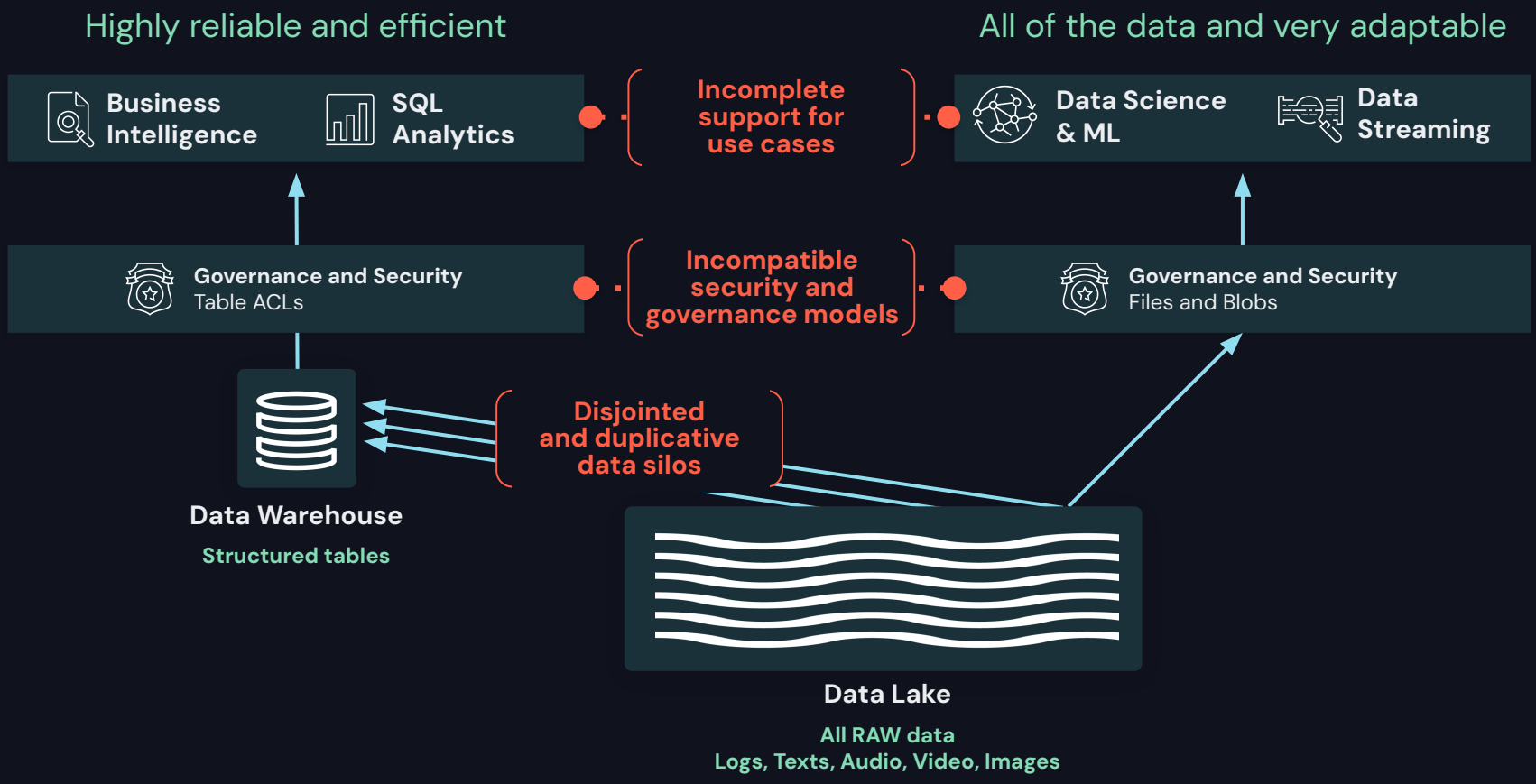
Two incompatible architectures get in the way



Almost all cloud deployments are two-tiered, Require 5+ Platforms



Complex duplicated architecture



Lakehouse simplifies data, analytics, and AI

Support for all use cases

Data Science & Machine Learning

Data Streaming

SQL Analytics

Business Intelligence

One **security** and **governance** approach for all data

Governance and Security
Files, Blobs, and Table ACLs

Open, reliable data storage to for data types

Data Lakehouse

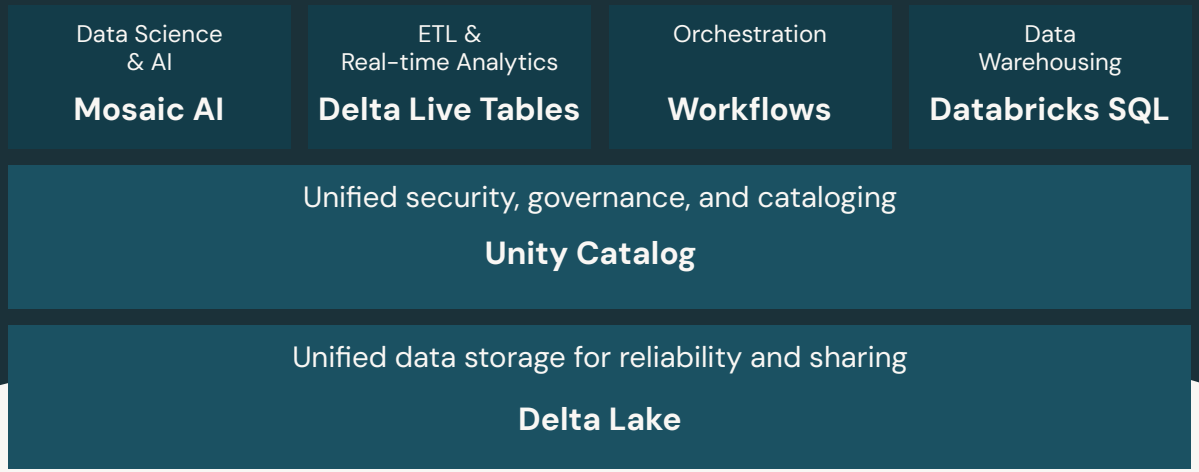
Structured tables and unstructured files

The four functional areas and sub-disciplines of data, analytics, and AI

The 4Ds of Databricks

Databricks Data Intelligence Platform

An open, unified foundation for all your data



Open Data Lake All structured, semi-structured, unstructured data (Logs, texts, audio, video, images, etc.)

The Data Lakehouse

An open, unified foundation for all your data

Data Science & AI	ETL & Real-time Analytics	Orchestration	Data Warehousing
Mosaic AI	**Delta Live Tables**	**Workflows**	**Databricks SQL**

Unified security, governance, and cataloging

Unity Catalog

Unified data storage for reliability and sharing

Delta Lake

Open Data Lake

All raw data
(Logs, texts, audio, video, images)

2020

Databricks pioneered the lakehouse architecture

TODAY

74% of global enterprises have adopted lakehouse

MIT Technology Review Insights, 2023

Databricks Data Intelligence Platform

Data-centric AI

Gen AI

- Custom models
- Model serving
- RAG

End-to-end AI

- MLOps (MLflow)
- AutoML
- Monitoring
- Governance

Mosaic AI
Create, tune, and serve custom LLMs

Delta Live Tables
Automated data quality

Workflows
Job cost optimized based on past runs

Databricks SQL
Text-to-SQL

The AI powered data intelligence engine to understand the semantics of your data

DatabricksIQ

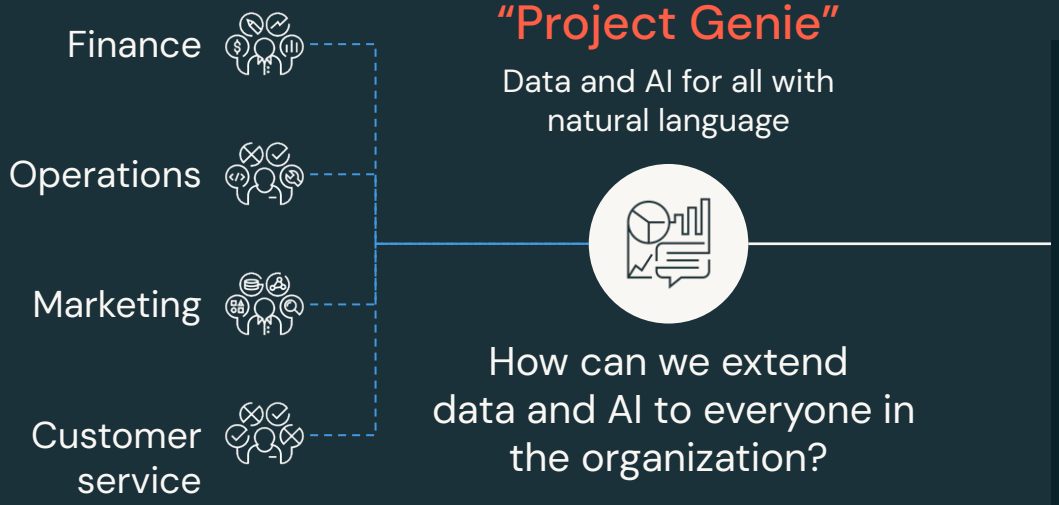
Unity Catalog
Securely get insights in natural language

Delta Lake 12
Data layout is automatically optimized based on usage patterns

Open Data Lake

All raw data
(Logs, texts, audio, video, images)

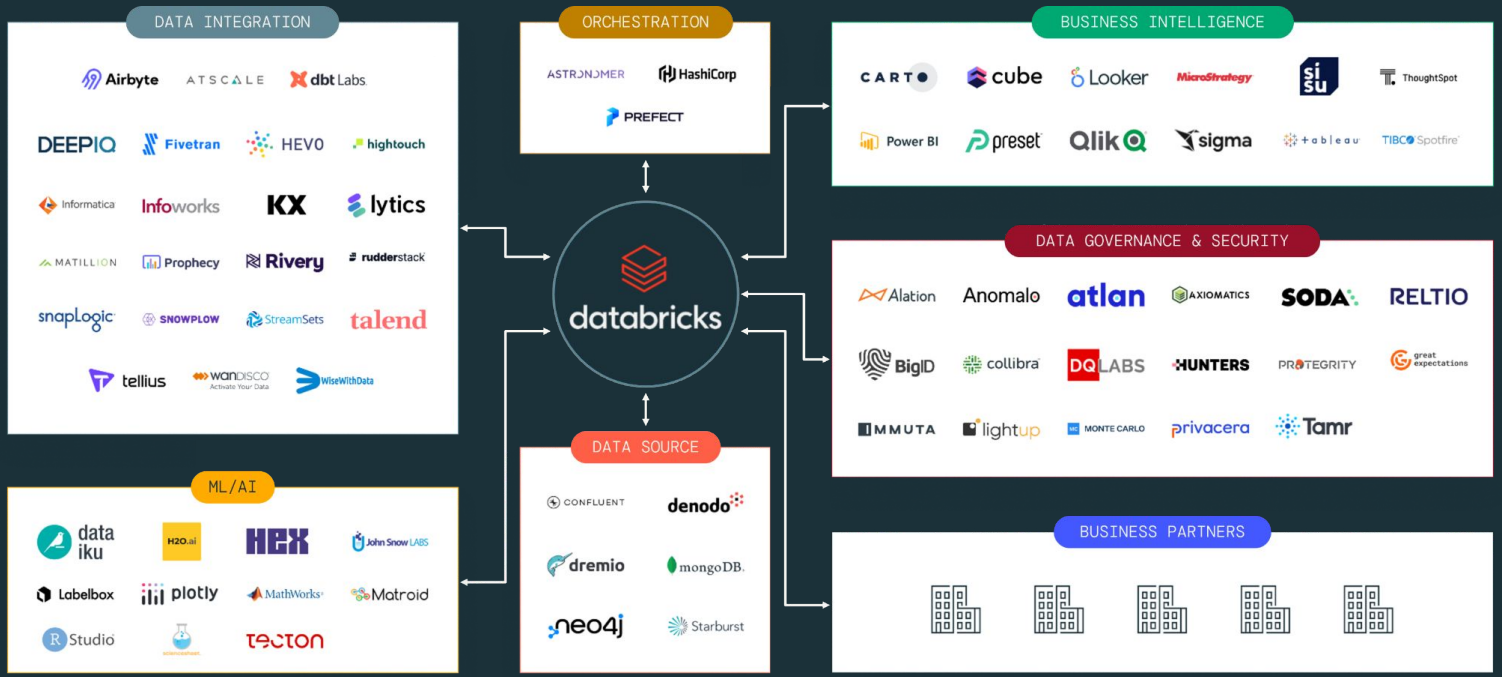
Databricks Data Intelligence Platform



Open Data Lake

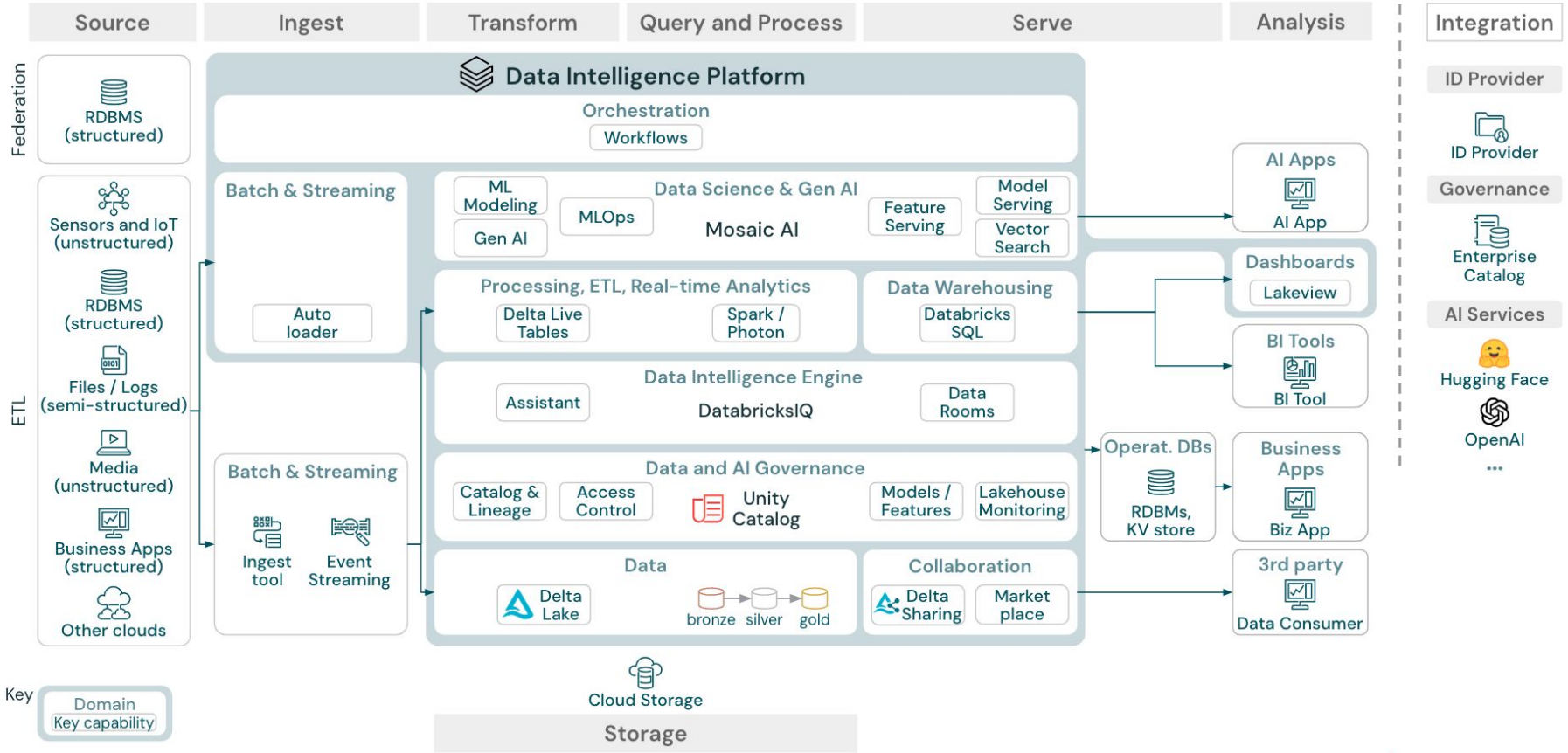
Built on an open foundation

Easily integrate with the entire data and AI ecosystem



How does it fit in with my current architecture?

Databricks Data Intelligence Platform

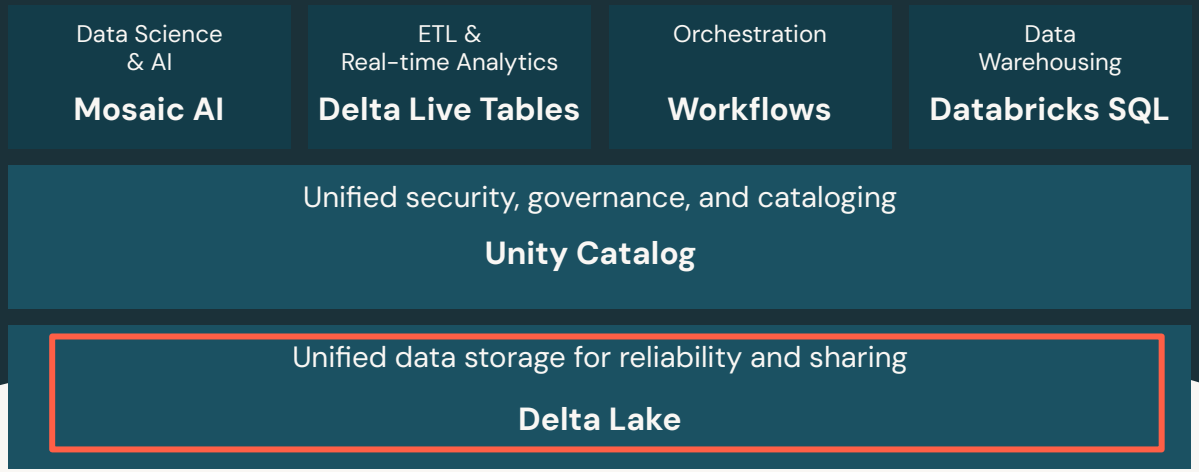


Peeling the onion:

How does it work?

Databricks Data Intelligence Platform

An open, unified foundation for all your data



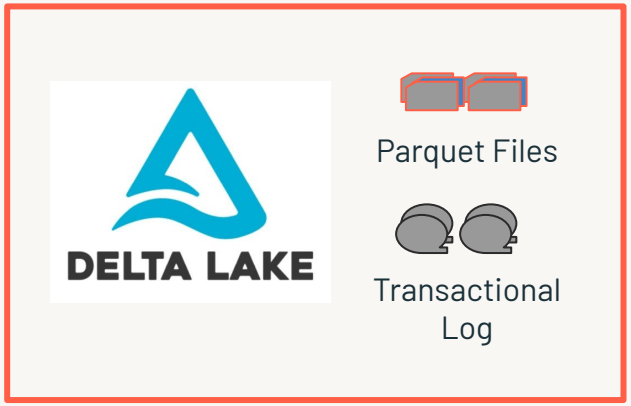
Open Data Lake All structured, semi-structured, unstructured data (Logs, texts, audio, video, images, etc.)

Delta Format

Batch

Streaming

Updates/Deletes

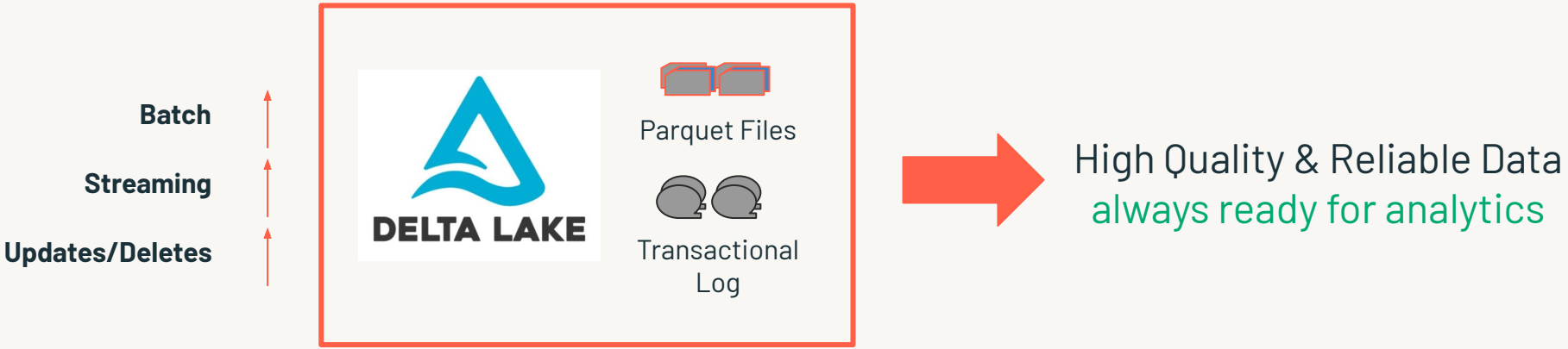


Transaction Log

Data Files

```
table_name1/
  _delta_log/
    00000.json
    00001.json
    ....
  file1.parquet
  file2.parquet
  ....
```

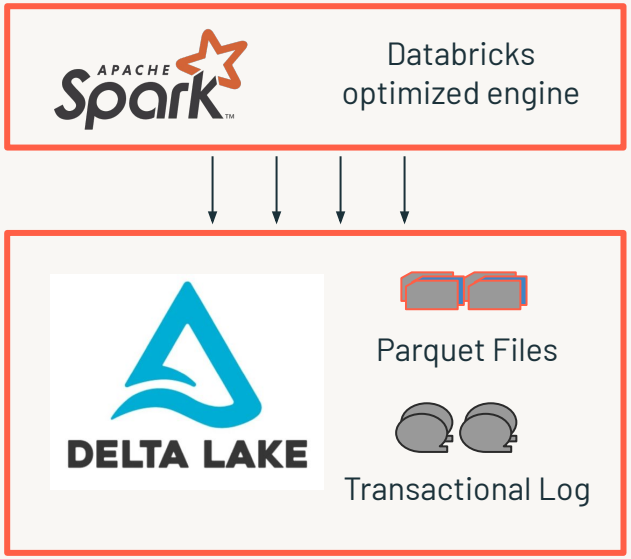
Delta Lake ensures data reliability



Key Features

- ACID Transactions
- Schema Enforcement
- Unified Batch & Streaming
- Time Travel/Data Snapshots

Delta Lake optimizes performance



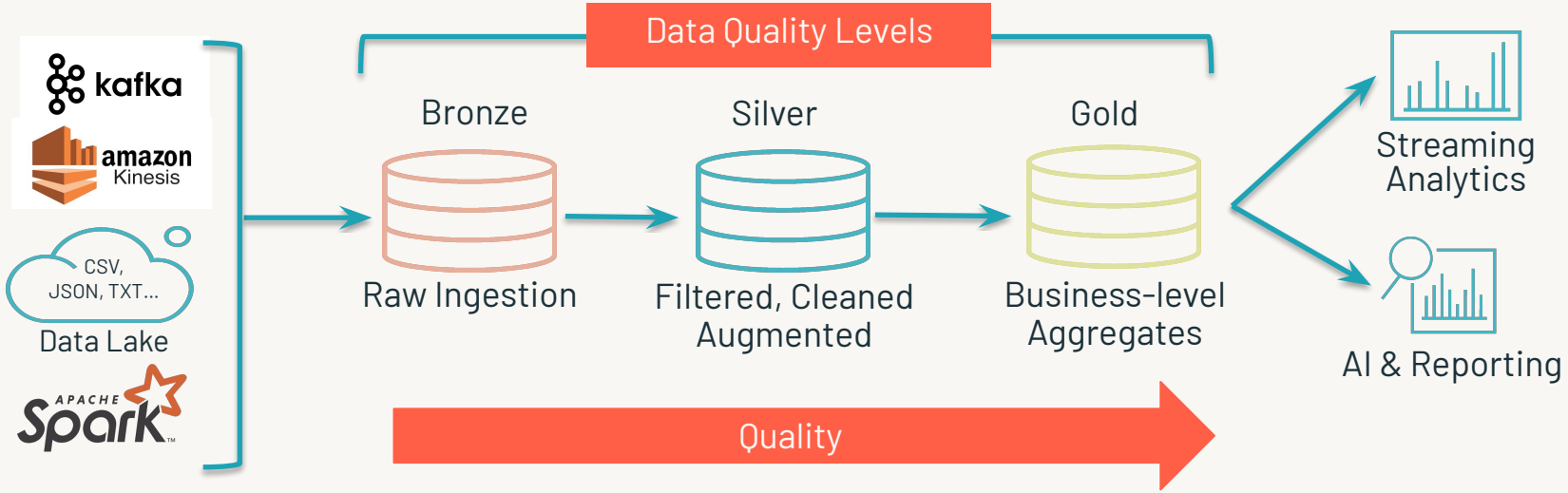
Highly Performant queries at scale

Automatically managed through databricks

Key Features

- Caching
- Compaction
- Data skipping
- Z-ordering

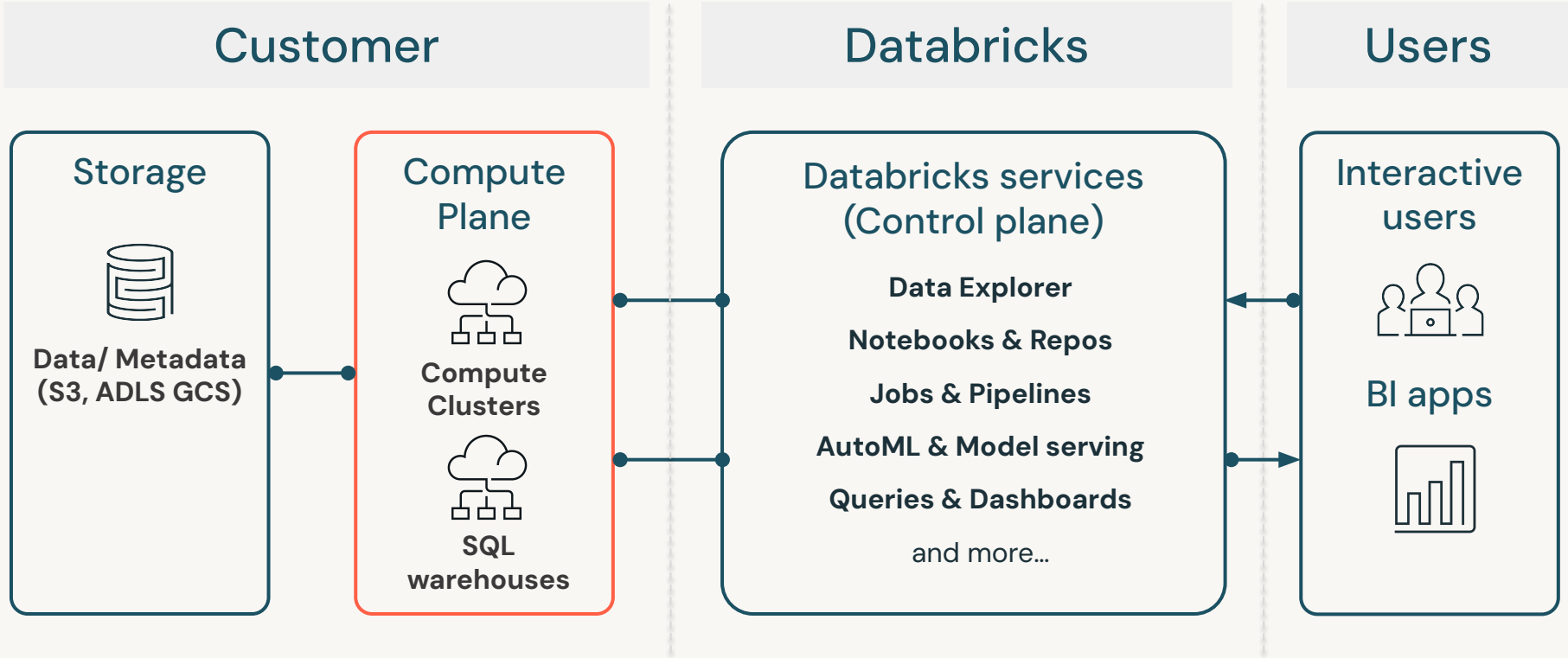
The Delta Lake



Delta Lake allows you to *incrementally* improve the quality of your data until it is ready for consumption.

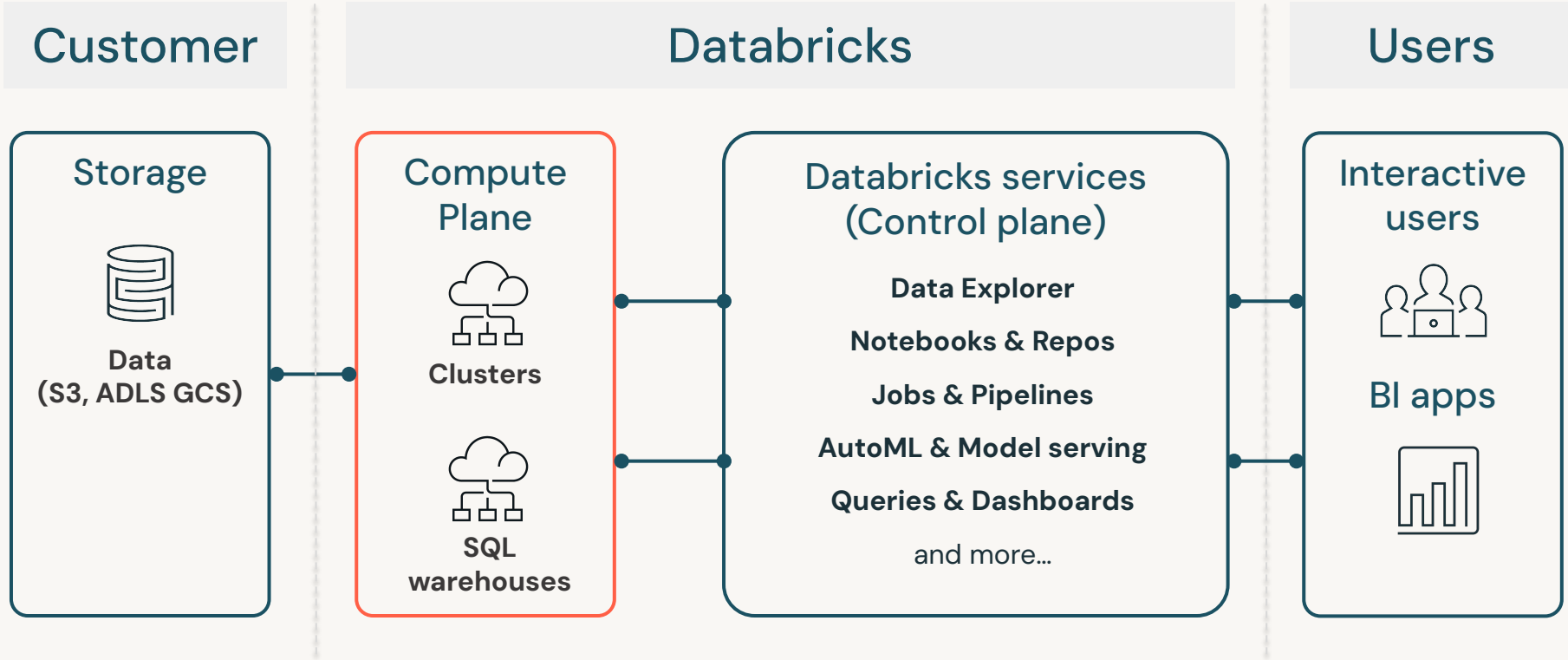
Compute on Databricks

Past and present architecture



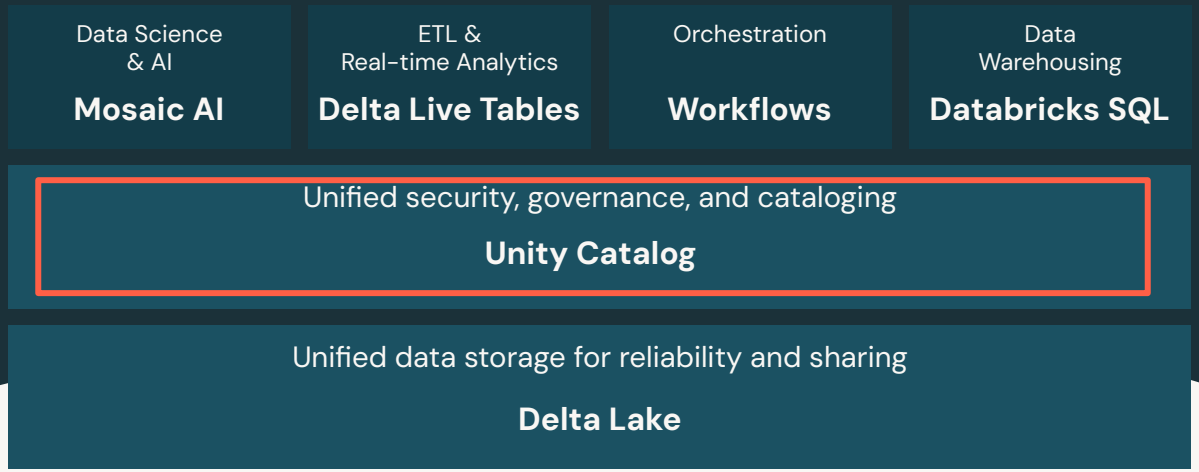
How will Compute work in future?

Serverless Architecture



Databricks Data Intelligence Platform

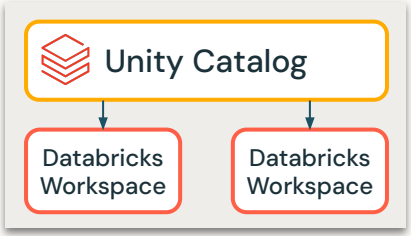
An open, unified foundation for all your data



Open Data Lake All structured, semi-structured, unstructured data (Logs, texts, audio, video, images, etc.)

Unity Catalog – Key Capabilities

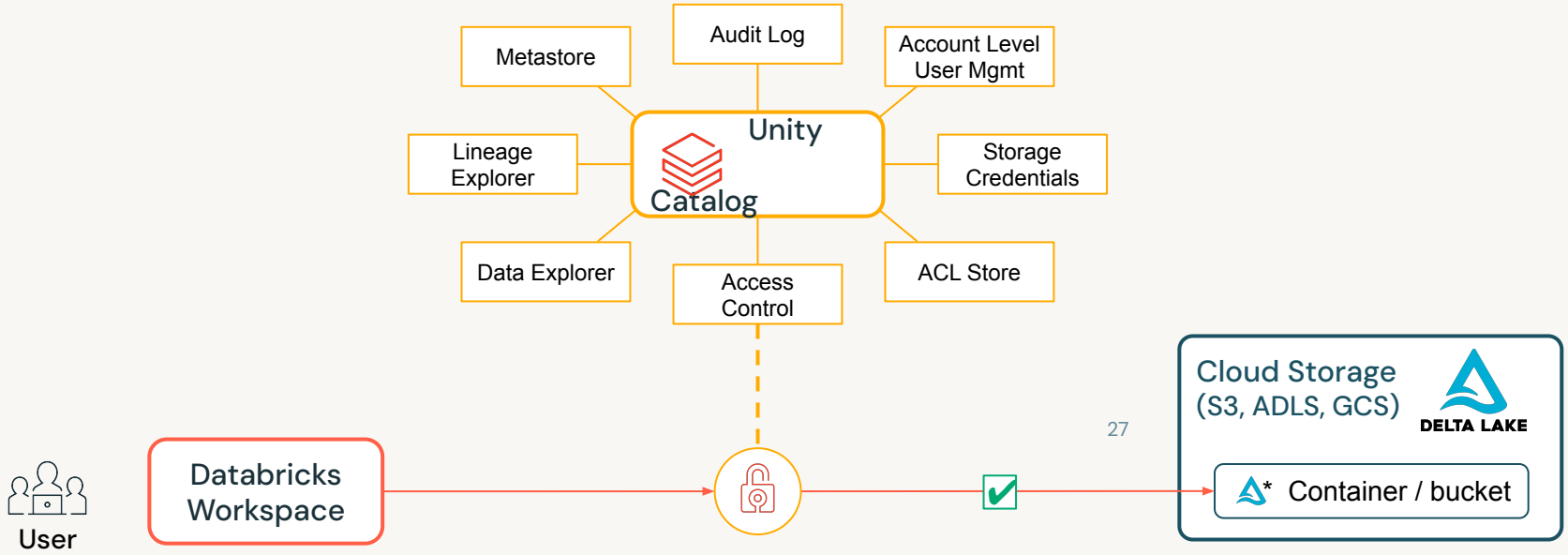
- Centralized metadata and user management
- Centralized data access controls
- Data lineage
- Data access auditing
- Data search and discovery
- Secure data sharing with Delta Sharing




```
GRANT ... ON ... TO ...
REVOKE ... ON ... FROM ...
```

Catalogs, Databases (schemas), Tables, Views, Storage credentials, External locations

Unity Catalog – Architecture



* Unity Catalog will support any data format (table or raw files)

Centralized Access Controls

Centrally grant and manage access permissions across workloads

Using ANSI SQL DCL

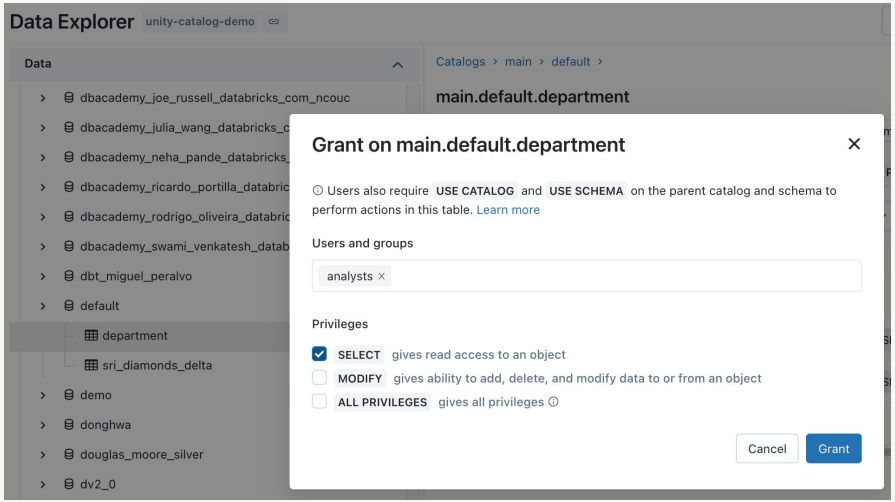
```
GRANT <privilege> ON <securable_type>
<securable_name> TO `<principal>`

GRANT SELECT ON iot.events TO engineers
```

Choose permission level

'Table'= collection of files in S3/ADLS

Sync groups from your identity provider

Using UI



Row Level Security and Column Level Masking

Provide differential fine grained access to datasets

Only show specific rows

```
CREATE FUNCTION <name> ( <parameter_name >
<parameter_type> .. )
RETURN {filter clause whose output must be a boolean}


CREATE FUNCTION us_filter(region STRING)
RETURN IF(IS_MEMBER('admin'), true, region="US");

ALTER TABLE sales SET ROW FILTER us_filter ON region;
```

Test for group membership

Assign reusable filter to table

Specify filter predicates

Mask or redact sensitive columns

```
CREATE FUNCTION <name> (<parameter_name>,
<parameter_type>, [, <column>...])
RETURN {expression with the same type as the first
parameter}

CREATE FUNCTION ssn_mask(ssn STRING)
RETURN IF(IS_MEMBER('admin'), ssn, "****");

ALTER TABLE users ALTER COLUMN table_ssn SET MASK
ssn_mask;
```


Test for group membership

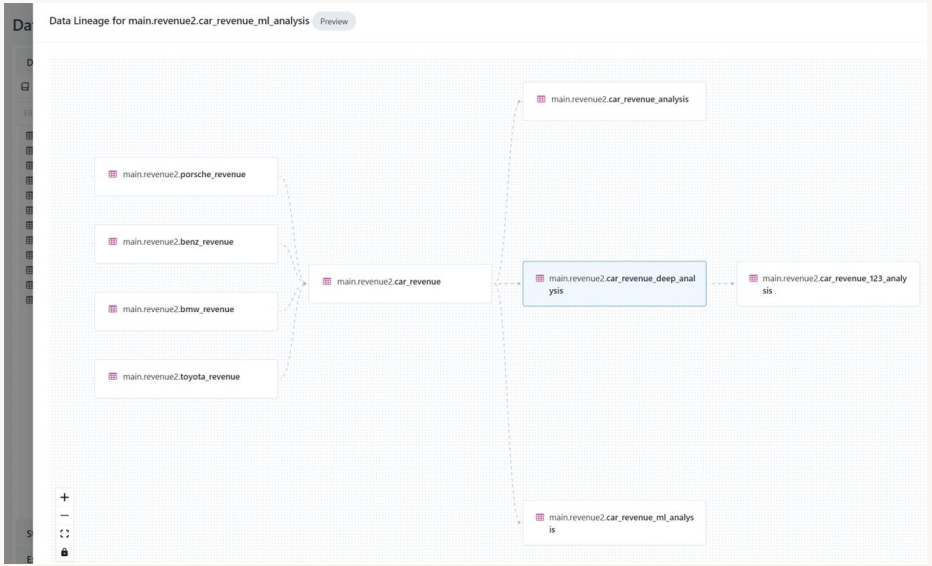
Assign reusable mask to column

Specify mask or function to mask

Automated lineage for all workloads

End-to-end visibility into how data flows and consumed in your organization

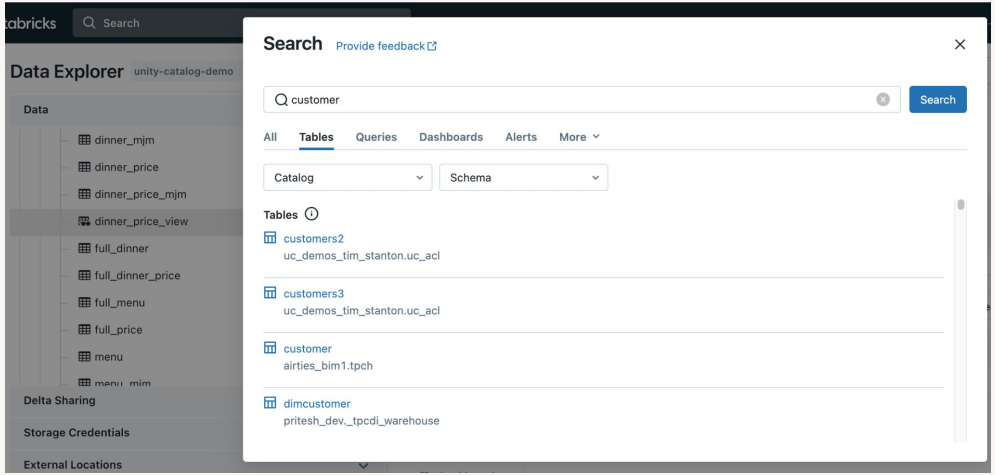
- Auto-capture runtime data lineage on a Databricks cluster or SQL warehouse
- Track lineage down to the table and column level
- Leverage common permission model from Unity Catalog
- Lineage across tables, dashboards, workflows, notebooks



Built-in search and discovery

Accelerate time to value with low latency data discovery

- UI to search for data assets stored in Unity Catalog
- Unified UI across DSML + DBSQL
- Leverage common permission model from Unity Catalog
- Apply semantic tags to data and search across tags



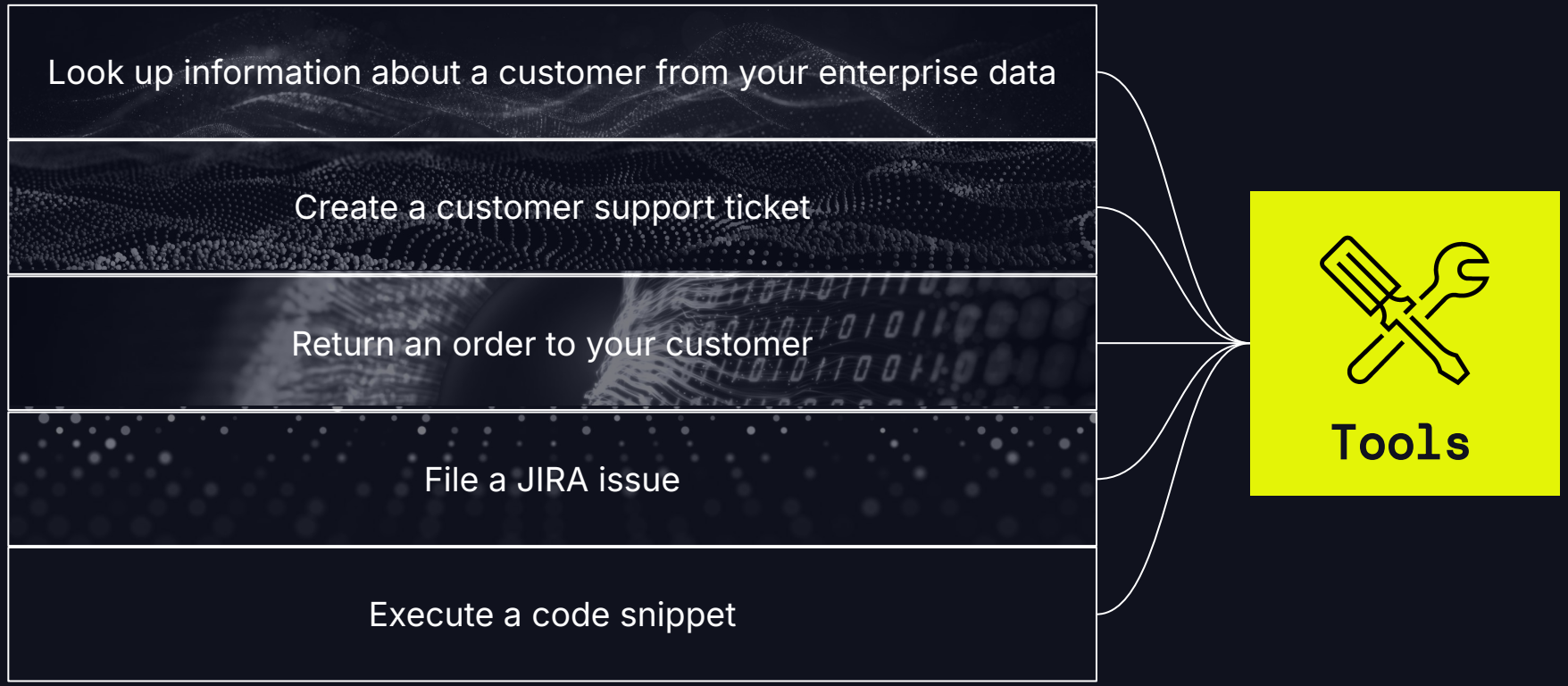
Let’s take a test drive

Imagine I’m working for a family restaurant chain in Singapore called Just Eat Lah!

Craft my marketing campaign:

Send a *personalised* push notification to predicted churn users to get them to spend at least $50 again

What if your AI could do more?



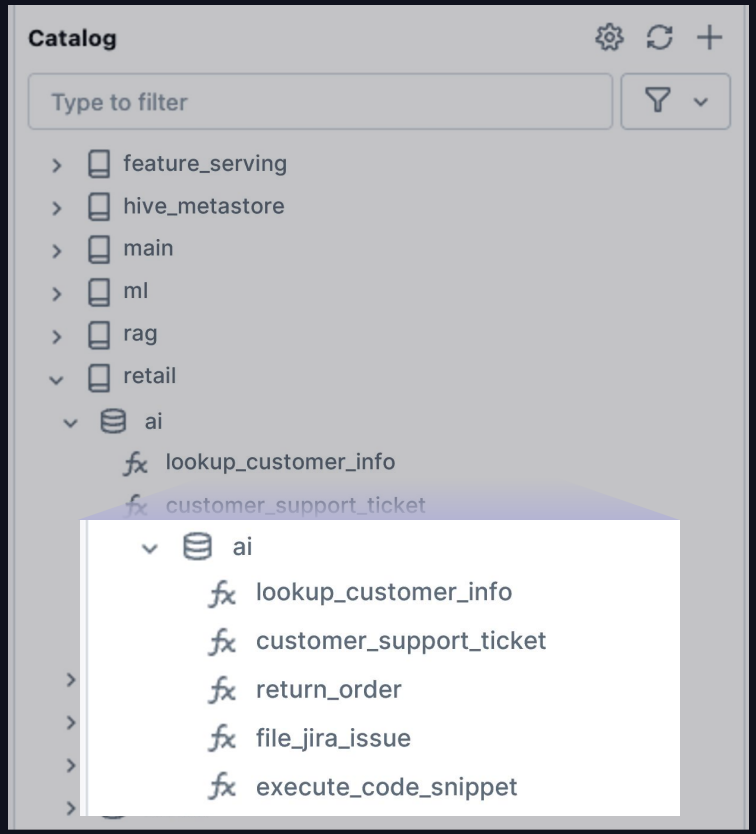
ANNOUNCING

Mosaic AI Tool Catalog

Author, publish and share enterprise AI tools

Leverage trusted compute and credential management

Fully integrated into Unity Catalog



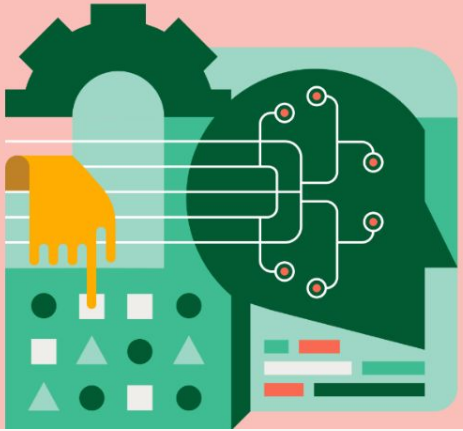
Deploy

How do I get started?

Asia Pacific Virtual Workshops

Data + AI Professional Workshop Series

Build your data engineering, analytics, data science and AI skills



Join us at the upcoming sessions!

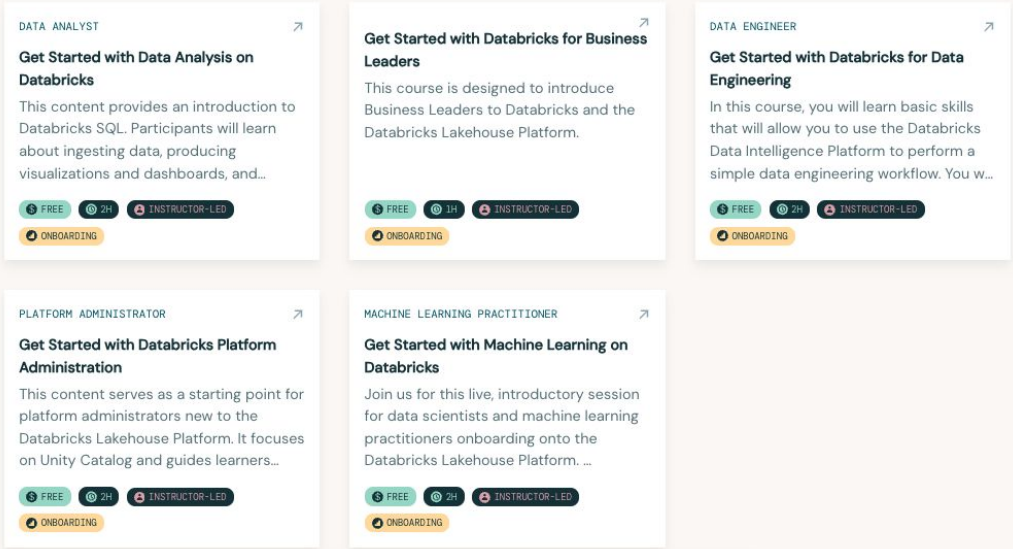
- **Well Architected Lakehouse**
- **Data Engineering Optimization Best Practices**
- **Gen AI in Action: Build your first LLM App**
- **Security and Governance for Data + AI**
- **Simplify Your Streaming With Delta Live Tables**
- **Gen AI in Action: Accelerate LLM App to Production**

Scan to register

Take a training course

Register for a free instructor-led 2h fundamentals course

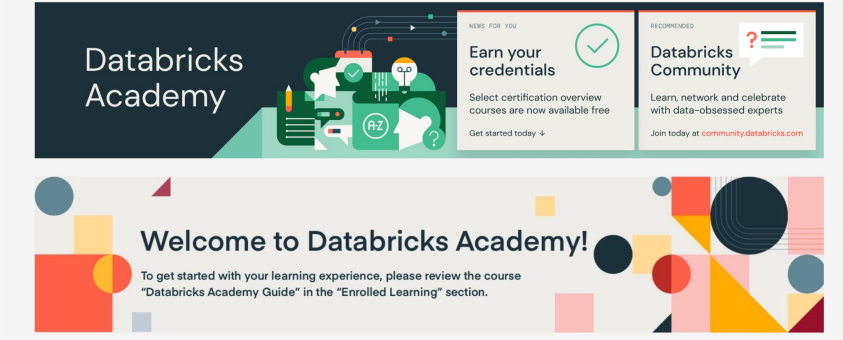
- Data Engineering
- Data Analysis
- Machine Learning
- Platform Administration



Databricks Academy

Visit **academy.databricks.com** for:

- Foundational e-learning **free** for our customers
- Featuring curated self-paced curriculums for each persona
- For users who want to prove their knowledge of the platform, we have a number of certifications



Click here for registration instruction

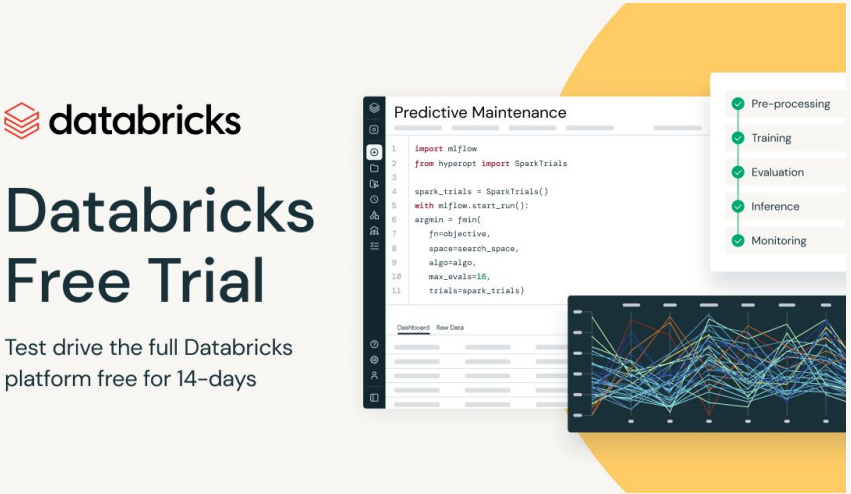
Start Building!

Create your Databricks Free Trial Account

- How to Deploy your Databricks environment
  - AWS Docs Video | Azure | GCP

Connect with the Community

- Join the Databricks Community where you can discover latest features, collaborate with peers, get help from experts
- Customer-exclusive **Office Hours** connect you directly with experts through a live Q&A where you can ask all your Databricks questions
- Discover events in your area



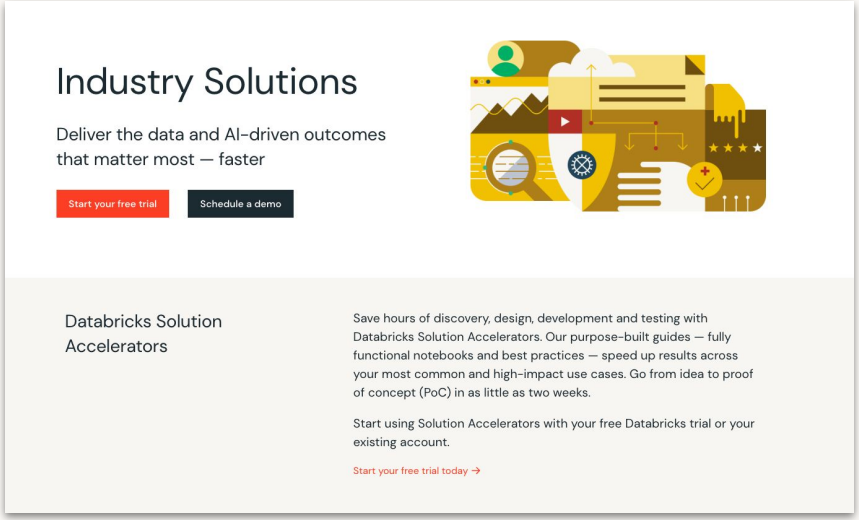
Databricks Solution Accelerators

Deliver data analytics and AI value faster

Fully functional set of resources for tackling the most common, high-impact use cases

Designed to help Databricks customers go from idea to proof-of-concept (PoC) in less than two weeks

Includes: Notebook, webpage, explainer video, blog, etc



80+ Solution Accelerators

Financial Services

- Transaction Embeddings for Personalization
- Model Risk Management
- Risk Management (VaR)
- Regulatory Reporting
- Real-time Fraud Detection
- Modern Investment Platform w/Time Series
- ESG Performance Analytics
- Smart Claims
- NLP for Customer Service Analytics
- *...and others*

Healthcare & Life Sciences

- Abstracting RWE w/OMOP
- Automated PHI Removal
- Adverse Drug Event Detection
- Genomic Pipelines (GWAS)
- R&D Optimization w/Knowledge Graphs
- Digital Pathology Image Analysis
- FHIR & HL7 Interop.
- Price Transparency
- LLM for Biomedical Literature
- LLM for Clinical Notes Summarization
- *...and others*

Comm, Media & Entertainment

- Multi-touch Attribution
- Real-time Bidding Optimization
- Media Mix Modeling
- Sales Forecasting & Ad Attribution
- Toxicity Detection in Gaming
- Responsible Gaming
- Video Quality of Experience
- Subscriber Churn Prediction
- Telco Network Analytics
- *...and others*

Retail & Consumer Goods

- Customer Identify Resolution
- Customer Segmentation
- Propensity Scoring
- Survival Analysis & LTV
- Recommenders
- Demand Forecasting
- Real-time Point of Sale Analytics
- On-shelf Availability
- Safety Stock Analysis
- Pricing Analytics with Redkite
- LLM for Retail - Search, Review Summary, Image or Copy Generation
- *...and others*

Manufacturing & Energy

- Digital Twin
- Predictive Maintenance (IoT)
- OEE: Equipment Monitoring
- Computer Vision Foundations
- Part Forecasting
- Quality Inspection w/Computer Vision
- Supply Chain Optimization
- Grid-Edge Analytics
- Managing Recalls with Barcode Traceability
- *...and others*

Cross-Industry & Public Sector

LLM

- LLM - Customer Service & Knowledge Base
- Product Search
- Personalized Recommendations
- Review Summarization
- Visual Concept Design
- Copy Generation

Cyber

- Splunk Connector
- Threat Detection w/DNS
- Incident Investigation using Graphistry
- IOC Matching & Multi-cloud Federation

Public Sector

- Entity Resolution
- Automated Record Liking

https://www.databricks.com/solutions/accelerators

80+ Solution Accelerators

Financial Services

- Merchant Classification for Personalization
- Transaction Embedding for Personalization
- Model Risk Management
- Risk Management (VaR)
- Regulatory Reporting
- Reputation Risk
- Geospatial Analytics to Identify Fraud
- Real-time Financial Fraud Protection
- Anti-Money Laundering
- Modern Investment Platform w/Time Series
- ESG Performance Analytics
- Smart Claims
- NLP for Customer Service Analytics
- LLM for Customer Service & Knowledge Base

Healthcare & Life Sciences

- Abstracting RWE: OMOP, PSM, and Survival Analysis
- Real-World Data Extraction w/NLP (eg., for Oncology)
- Automated PHI Removal
- Adverse Drug Event Detection
- Genome-Wide Association Studies (Target Identification)
- Cohort Building w/Knowledge Graphs
- R&D Optimization w/Knowledge Graphs
- Digital Pathology Image Analysis
- Patient / Disease Risk Prediction
- Disease Profiling with TCGA
- FHIR Interoperability
- Ingest Streaming HL7 for Patient Analytics
- Medicare Risk Adjustment
- Price Transparency
- Social Determinants of Health
- HEDIS Engine with ApolloMed
- Scaling Geospatial Nearest Neighbor Searches
- LLM for Biomedical Literature
- LLM for Clinical Notes Summarization

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- Multi-touch Attribution
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- Subscriber Churn Prediction
- Telco Customer Churn Prediction
- Telco Network Analytics
- Enhancing CDP (Amperity) with Personalized Recommendations
- LLM for Customer Service & Knowledge Base

Retail & Consumer Goods

- Customer Identify Resolution
- Customer Lifetime Value
- Customer Segmentation
- Recency, Frequency & Monetary (RFM) Segmentation
- Propensity Scoring
- Survival Analysis & LTV
- Recommendation Engines
- Retention Management
- Demand Forecasting
- Real-time Point of Sale Analytics
- On-shelf Availability
- Order Picking Optimization
- Scalable Route Generation
- Item / Product (Fuzzy) Matching
- Safety Stock Analysis
- Pricing Analytics with Redkite
- Enhancing CDP (Amperity) with Personalized Recommendations
- LLM for Customer Service & Knowledge Base
- LLM for Retail - Product Search, Recommendations, Product Review Summary

Manufacturing & Energy

- Digital Twin
- Predictive Maintenance (IoT)
- OEE: Equipment Monitoring
- Computer Vision Foundations
- Part Forecasting
- Quality Inspection w/Computer Vision
- Supply Chain Optimization
- Grid-Edge Analytics
- Computer Vision for Power & Utility Inspection
- Managing Recalls with Barcode Traceability
- LLM for Manufacturing - Q&A over custom datasets

Cross-Industry & Public Sector

LLM

- LLM for Customer Service & Knowledge Base
- Product Search
- Personalized Recommendations
- Product Review Summarization
- Visual Concept Design
- Product Copy Generation

Cyber

- Cyber Analytics (Splunk Connector)
- Threat Detection with DNS
- Incident Investigation using Graphistry
- IOC Matching and Multicloud Query Federation

Public Sector

- Entity Resolution
- Automated Record Liking

https://www.databricks.com/solutions/accelerators

Learning Resources

- Databricks Academy - See these instructions on how to access and view self-paced training videos.
  - Course Catalog Create an account using your company email address
- Databricks Academy Github - Get the code to follow along
- Databricks Certifications - Get certified using Databricks
- Databricks Demo Hub - Watch short demos of Databricks products!
- DBDemos.AI - Install demos in your workspaces with best practices, ready to go.
- Instructor Led Training (if purchased) - be sure to check out the learning paths!

Useful Resources

Developing on Databricks with Python	
Developing with Python in Databricks	AWS, Azure
Uploading Python Libraries	AWS, Azure
Visualizations in Python	AWS, Azure
Introduction to DataFrames	AWS, Azure
Pandas User-Defined Functions	AWS, Azure
Migrate Single Node Workloads to Databricks	AWS, Azure
Databricks Connect	AWS, Azure
Pandas APIs on Apache Spark	Apache Spark Docs, AWS, Azure
Using BI tools with Databricks	
Connecting Business Intelligence Applications	AWS, Azure
SQL on Databricks	AWS, Azure

ETL & Streaming	
Delta Lake Official Documentation	AWS, Azure
Delta Lake Best Practices	AWS, Azure
Structured Streaming Guide	AWS, Azure
Simplify Streaming Stock Data Analysis Using Databricks Delta	Blogpost
Designing ETL Pipelines with Structured Streaming and Delta Lake	Video
Workflows and Jobs	
Databricks Workflows	AWS, Azure
Databricks Jobs	AWS, Azure
Delta Live Tables	AWS, Azure

Generative AI World Cup

So you think you can hack

bit.ly/genai-world-cup-roadmap

Ready to launch your AI game to new heights? Join this virtual hackathon and stand to win amazing prizes, including $50,000 in total cash prizes, featured blogs and potential speaking opportunity at events, and a world cup trophy.

SUBMISSIONS DUE **OCTOBER 18 2024**

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Live Q&A

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Appendix

Crystal Chang

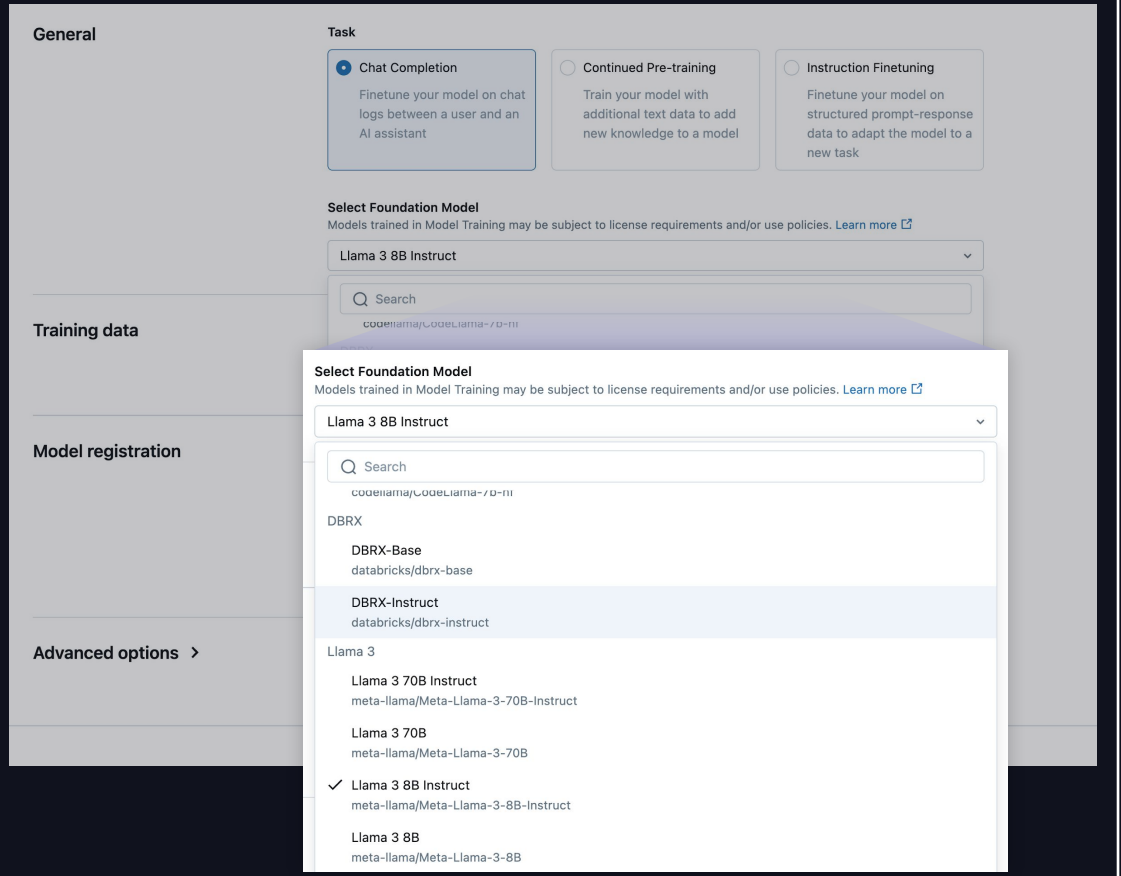
28 March 2024

ANNOUNCING

Mosaic AI Model Training Fine-tuning

No-code fine-tuning based on OSS models

Serve on Databricks in one click

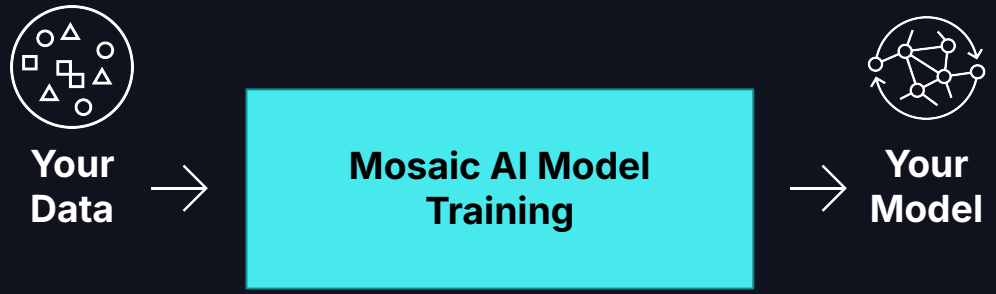


Build

Mosaic AI Model Training

Pre-training

Build custom LLMs with your enterprise data at 10x lower costs



Build

Data Warehouses

Pros

- Great for Business Intelligence (BI) applications

Cons

- Limited support for Machine Learning (ML) workloads
- Proprietary systems with only a SQL interface

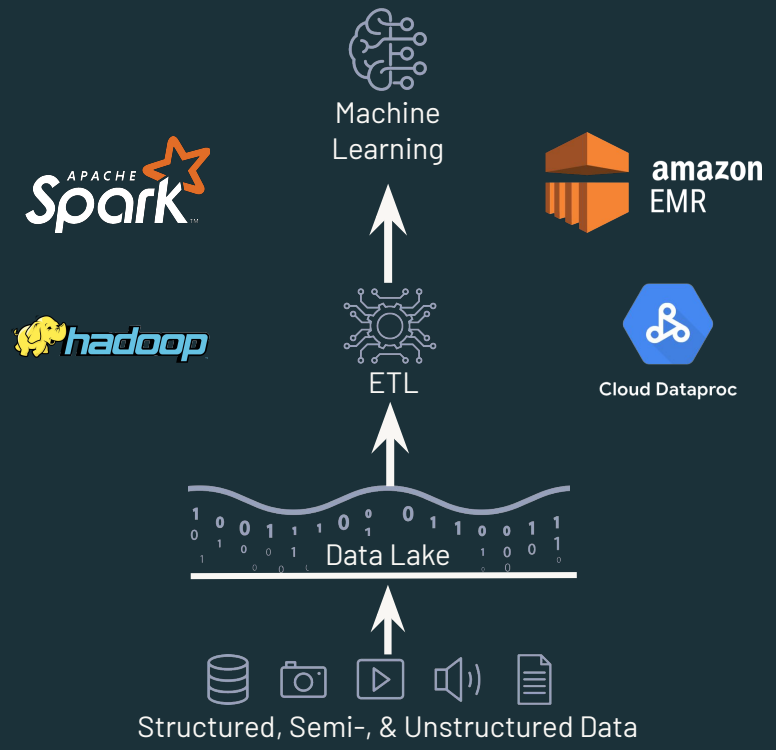
Data Lakes

Pros

- Supports ML
- Open formats and big ecosystem

Cons

- Poor support for BI
- Complex data quality problems



7-Eleven uses Databricks to build customer-centric solutions that drive revenue from personalization and the optimization of supply chain operations.

Challenge

- Data silos made cross-team collaboration difficult
- Analysts were working 16 hour days to respond to business demands
- Data infrastructure couldn't match the speed of the business

Solution

- Lakehouse democratizes access to data and expands DSML teams' capacity
- Analysts rapidly execute queries using Databricks SQL with reliable and complete real-time data
- The elimination of complexity improves data quality and reliability

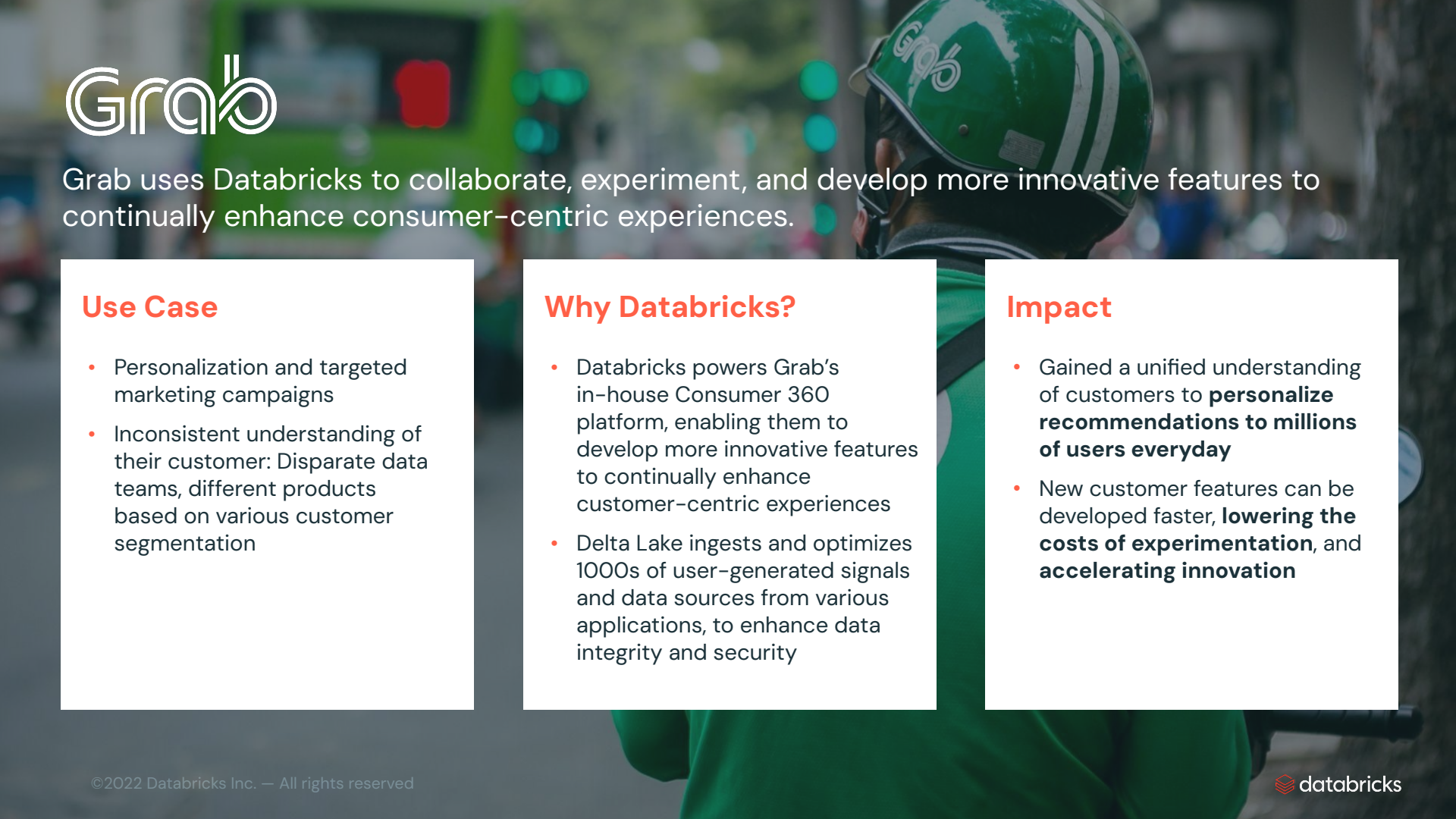
Impact

$109M
in accelerated revenue through Customer 360

$3M
saved annually in cloud compute costs

35%
increase in data team productivity

databricks



Grab uses Databricks to collaborate, experiment, and develop more innovative features to continually enhance consumer-centric experiences.

Use Case

- Personalization and targeted marketing campaigns
- Inconsistent understanding of their customer: Disparate data teams, different products based on various customer segmentation

Why Databricks?

- Databricks powers Grab's in-house Consumer 360 platform, enabling them to develop more innovative features to continually enhance customer-centric experiences
- Delta Lake ingests and optimizes 1000s of user-generated signals and data sources from various applications, to enhance data integrity and security

Impact

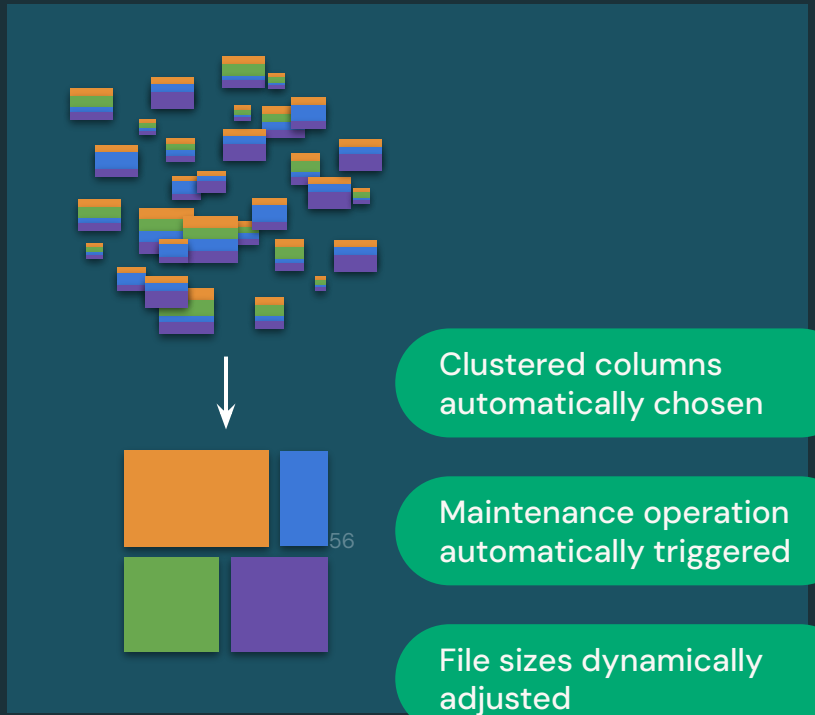
- Gained a unified understanding of customers to **personalize recommendations to millions of users everyday**
- New customer features can be developed faster, **lowering the costs of experimentation**, and **accelerating innovation**

databricks

Intelligence simplifies data management

Easy, automated data management with Delta Lake

- **Focus on your data application**, the intelligence engine tunes your data
- **AI-optimized** data layout for **enhanced performance** in SQL warehouses and clusters
- New data clustered automatically and incrementally optimized to **reduce TCO**
- Adapts to new usage to **reduce risk over time**



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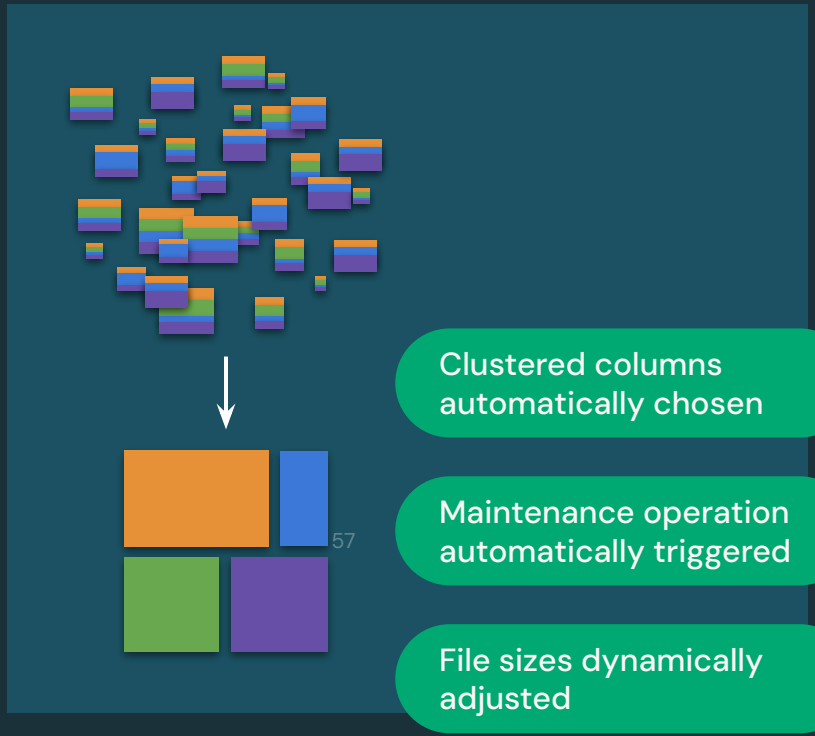


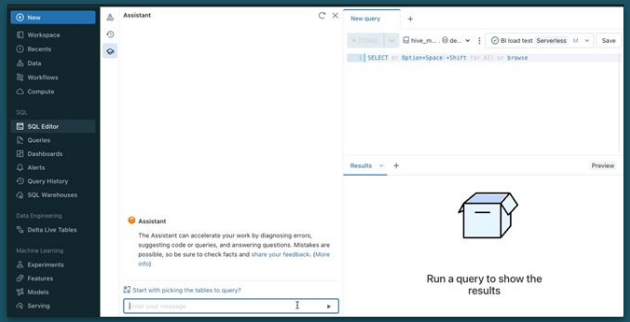
AI-powered Warehousing is fast and simple

Simple

Text-to-SQL
Transforms natural language into actionable insights

Powered by UC
Understands your data, lineage, and dependencies

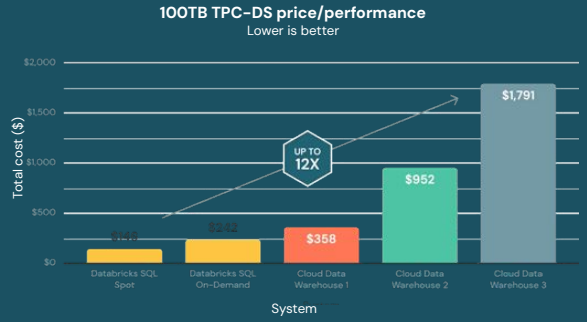
AI-powered assistant
Codes for you, Identifies issues and provides solutions



Fast and affordable

Instant queries
Auto-tuning and predictive IO, scale with data size

Intelligent, serverless workload management
Instant stop and start, route queries to optimize utilization and provide the best TCO



Orchestration with intelligence unlocks data power

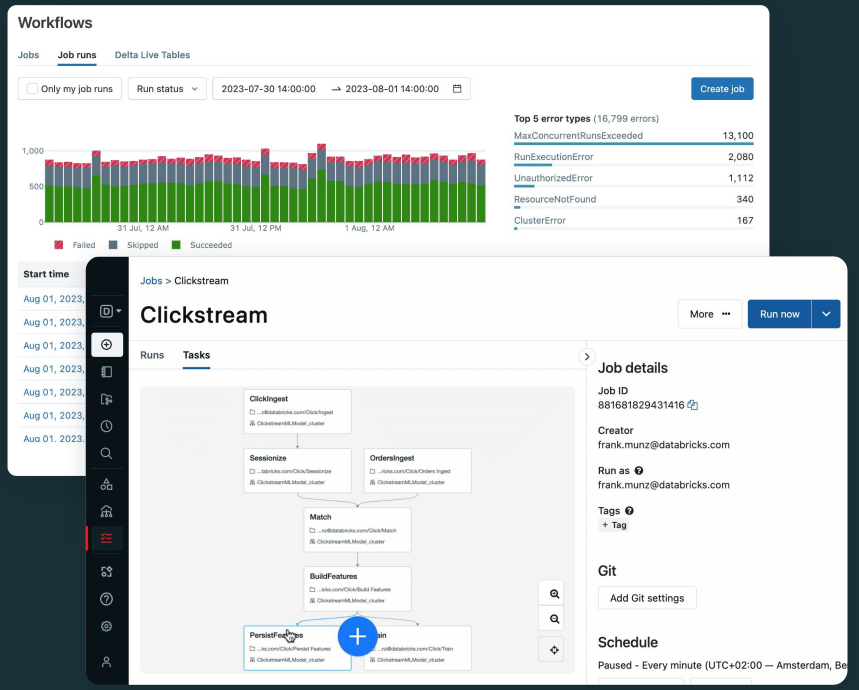
Orchestrate and automate anything, anywhere, anytime

Serverless: instantly trigger ingestion, transform, refresh BI and retrain model altogether

Simple and accessible with **AI-based debugging**

Reliable with automatic checkpoint and recovery
Automatic resource allocation to **reduce** TCO

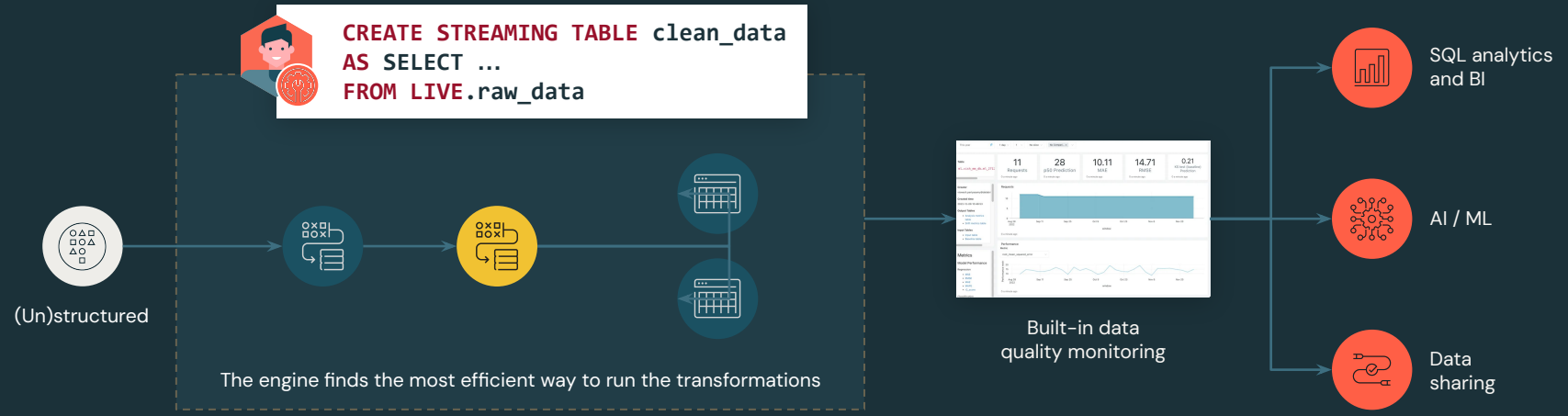
Trust your execution with automatic monitoring and smart alerting (ex: job slower than usual)



Intelligence ensures robust and reliable ETL

Declarative Tables: declare your table with SQL / Python, let the engine be the expert

Robust pipeline for **Citizen Data Engineers,** code creation and debugging **assisted by AI**



Auto-scale to ensure low latency and data freshness

Intelligent incremental ETL provides the best TCO

Reliable data with observability, lineage and traceability

Unlock downstream business applications