Lambda architecture design using Azure Databricks for advanced analytics

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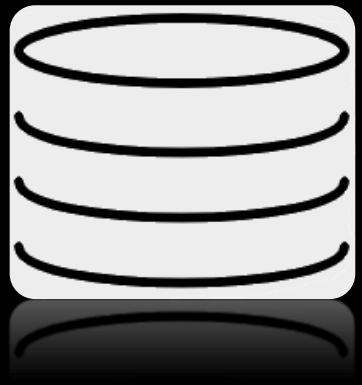
Linked In	https://www.linkedin.com/in/lucas-feiock
Twitter	@LucasFeiock
Blog	https://sql-stack.com
GitHub	https://github.com/sqlstack
Work	Lucas.Feiock@kizan.com



Agenda

1. Who, what, and why of Spark and 
2. Lambda Architecture: Design Principles
3. Implementation: Solution Architectures
4. Databricks Delta: Demo

Open source data processing engine built around **speed**, **ease of use**, and **sophisticated analytics**

10-100x faster than MapReduce (Hadoop)	Easier to program Python, SQL, R, Java, Scala	APIs for SQL, machine learning, deep learning, streaming, graph
Storage agnostic, allowing federation & simple data access	More interactive data exploration	1000+ contributors across 250+ companies

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Do you know Databricks?

Databricks makes building big data and AI applications simple, fast, easy, and collaborative with our **Unified Analytics Platform** powered by Apache Spark™ and built for cloud.

Apache Spark™ provides a **single processing engine** for your big data and AI workloads including batch/ETL, streaming, SQL, graph, machine learning and deep learning workloads on petabytes of data on cloud data lakes. The result is higher productivity and faster time to insights and outcomes for your clients.

Databricks' founders are the original creators of Apache Spark™ and we have engineered our **platform as a service** for the cloud to improve elasticity, ease of use, performance, reliability, and cost-effectiveness compared to alternatives.

Get more from Big Data & AI Projects

- Do More -
Higher productivity
without DevOps or cluster administration

- With More Data -
At scale (volume and variety)
with better cost/performance and elasticity

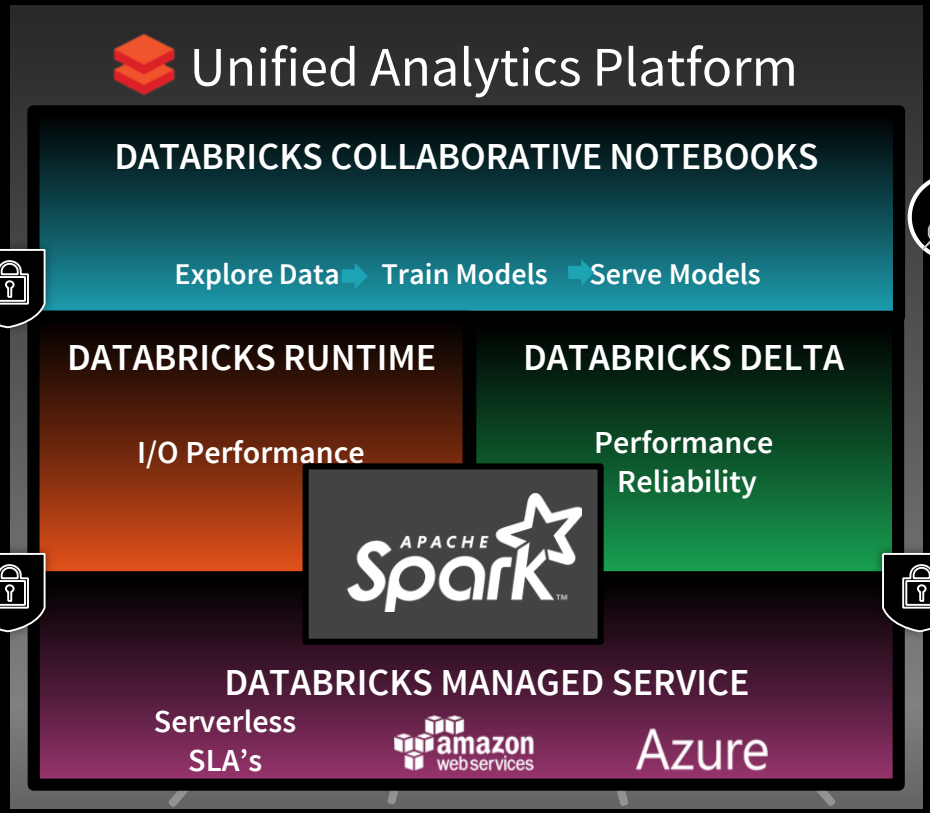
- More Reliably -
Avoid project delays due to bugs/breaks
and simplified data pipelines

- With a Lower TCO -
Lower cloud and personnel costs
and pay only for what you use

- More Secure -
Satisfies industry security requirements
(e.g. GDPR, HIPAA, and PCI)

- Enable AI & ML -
Reach the potential of AI & ML use cases

Accelerate Innovation with Databricks



Increases Data Science Productivity by 5x

Improves Performance by 10-20X over Vanilla Spark

Removes Devops & Infrastructure Complexity

Open Extensible API's

tableau looker

Power BI

Higher Performance & Reliability for your Data Lake

Databricks Enterprise Security

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IoT / STREAMING DATA

CLOUD STORAGE

DATA WAREHOUSES

HADOOP STORAGE

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What is Lambda Architecture

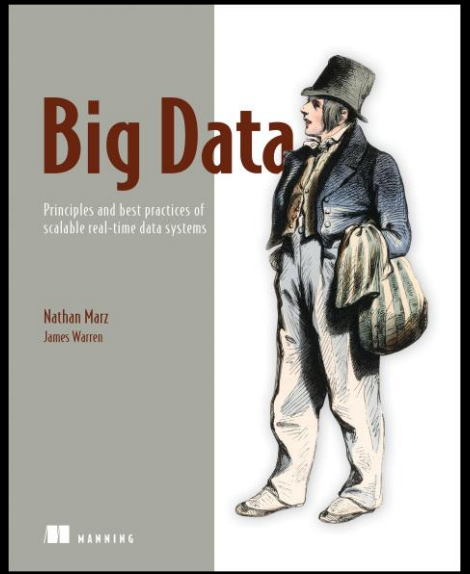
Data processing architecture

Generic, scalable, fault-tolerant

Low-latency reads, updates, ad-hoc queries

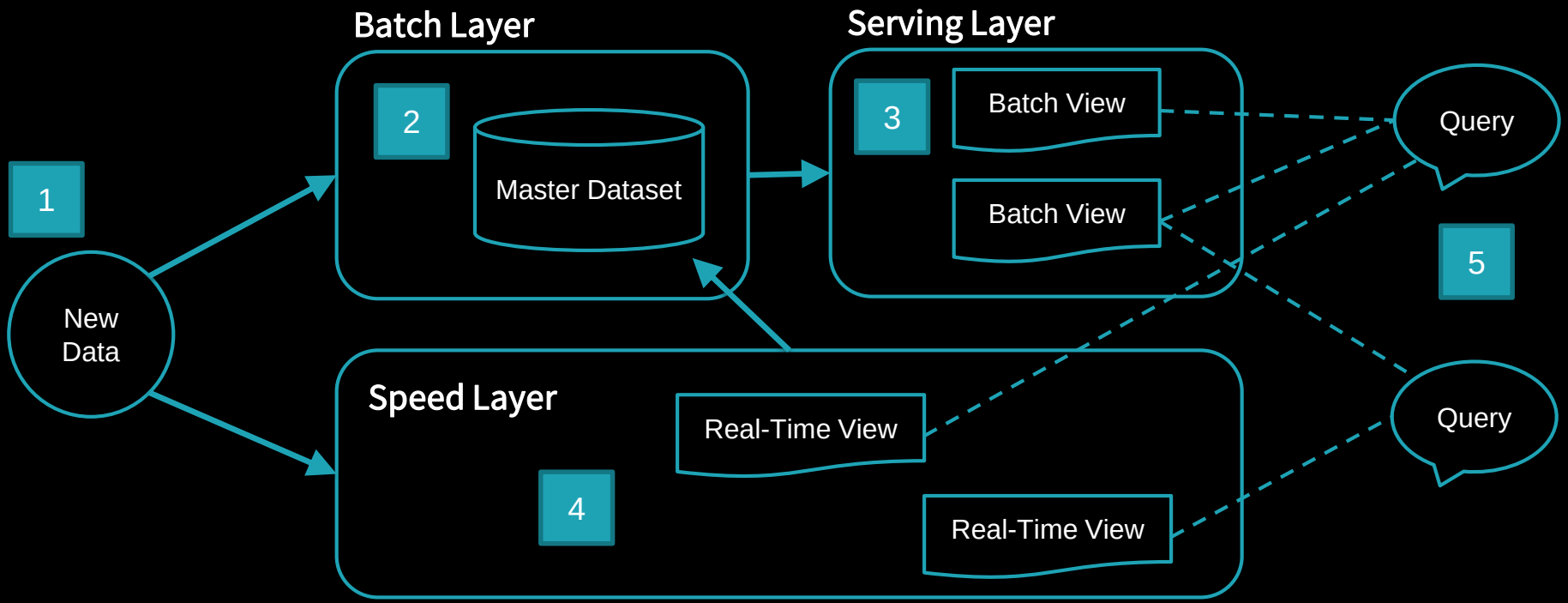
Nathan Marz - Apache Storm @ Twitter

Principles and best practices of scalable real-time data systems



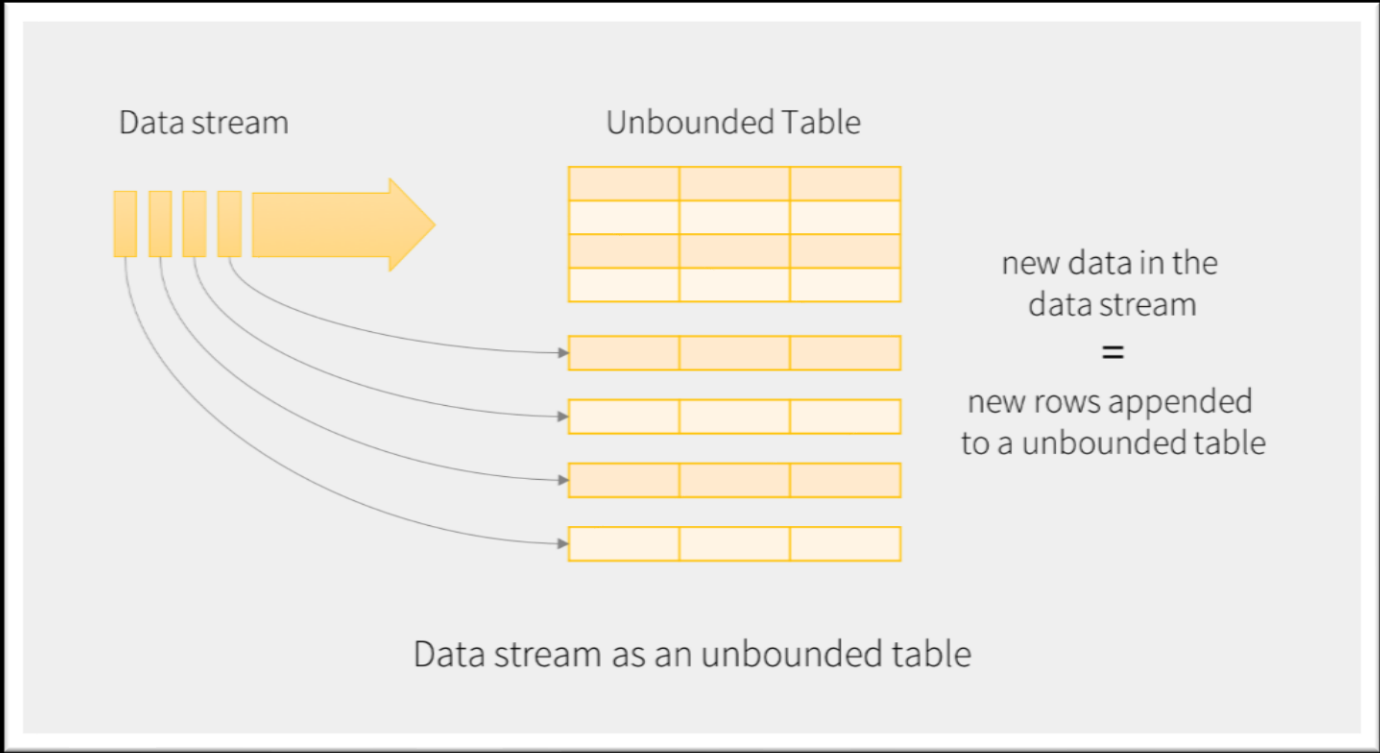
Lambda Architecture

Design Principles



Lambda Architecture

Databricks Structured Streaming



Lambda Architecture

Real World Examples

Fault / Fraud detection

Manufacturing / Machine Logs / Robotics

Network / Security monitoring

Digital Marketing / Websites Clicks / Telemetry

Portfolio Management / Algorithmic Trading

IOT / Connected devices

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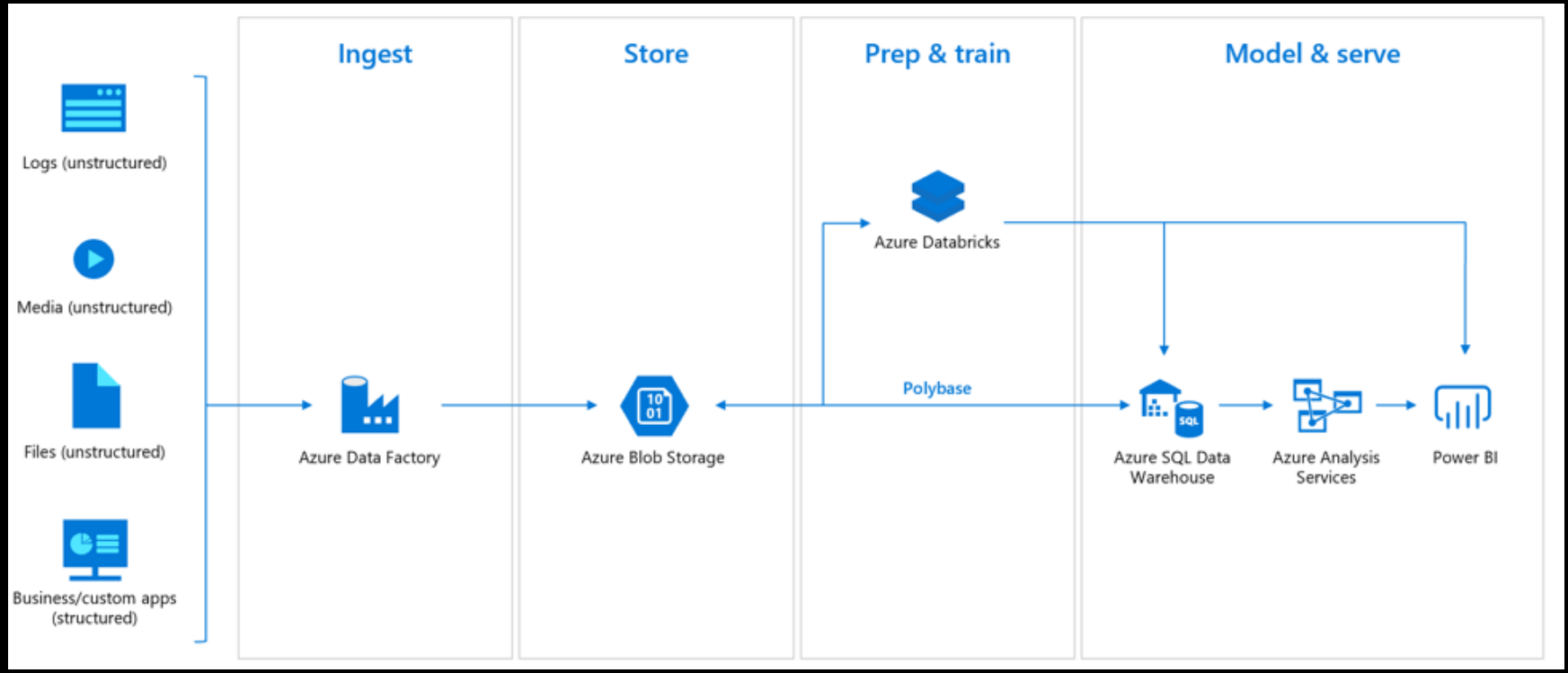
Databricks Example Architecture



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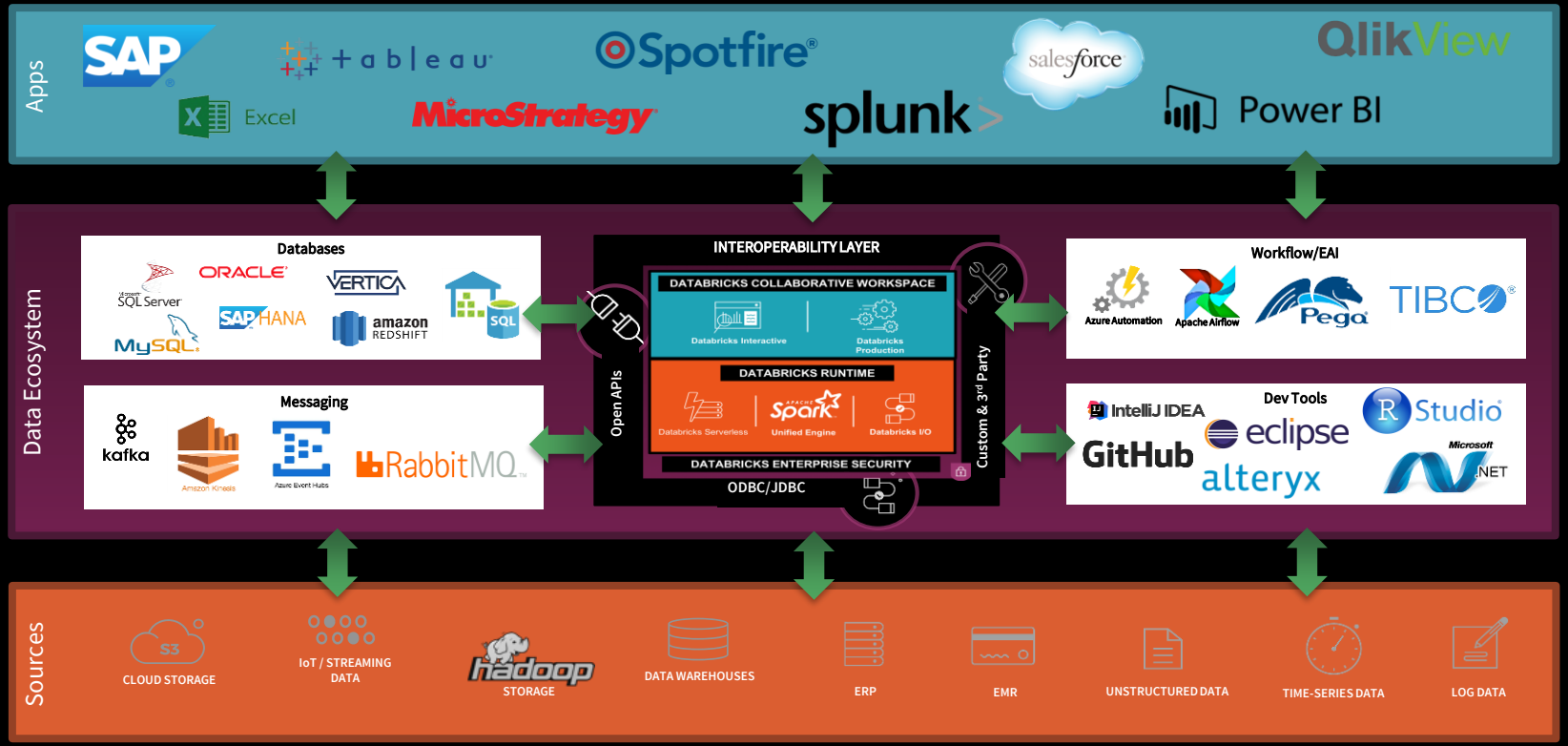
Databricks Ecosystem Reference Architecture



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Databricks Delta

Next-generation engine built on top of Spark

Versioned Parquet Files

Transactional Delta Log

Indexes & Stats

Databricks Delta

Key Features

ACID Transactions

Schema Enforcements

Upserts

Data Versioning

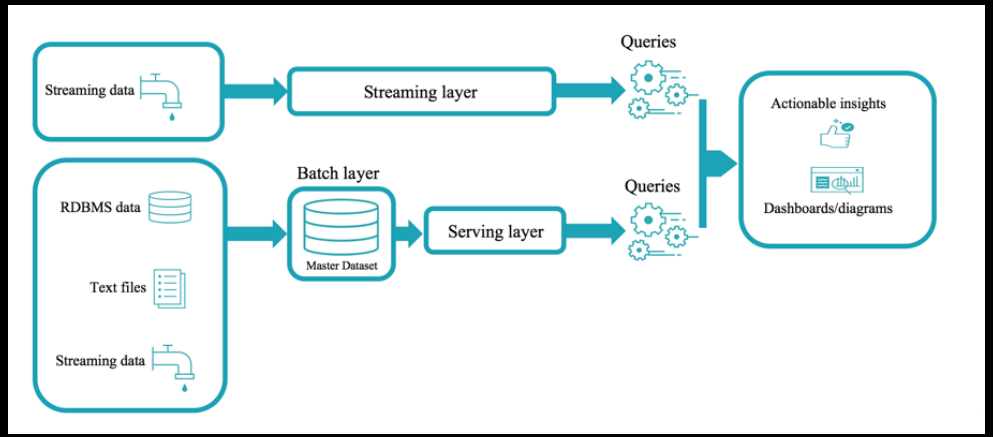
Compaction

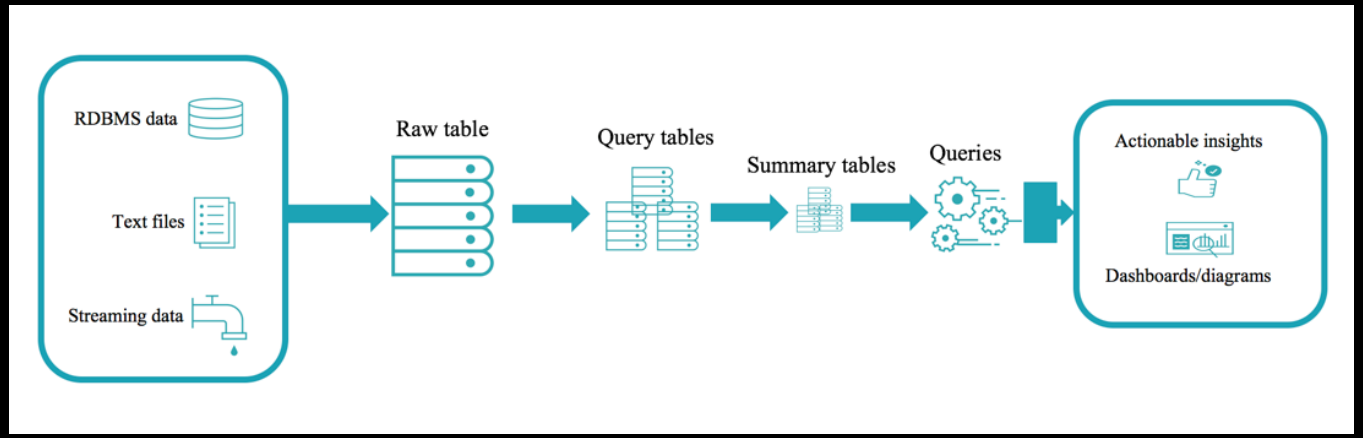
Caching

Data skipping

Z-ordering

Lambda Architecture to Databricks Delta





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Thank you ! Questions?

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Main Links

https://azure.microsoft.com/en-us/services/databricks/
https://spark.apache.org/
https://databricks.com/
https://databricks.com/spark/about
http://lambda-architecture.net/
http://spark.apache.org/powered-by.html
https://www.businesswire.com/news/home/20190131005243/en/Databricks-Named-Visionary-Consecutive-Year-Gartner-Magic

Databricks Community Edition

https://databricks.com/product/faq/community-edition

Free version of the cloud based platform

Hosted on Amazon Web Services

Uses a micro-cluster of one driver with 6 GB of memory

Contains training resources

Great way to get started learning about Apache Spark

Blogs

https://www.desertislesql.com/ - Ginger Grant

https://databricks.com/blog
https://databricks.com/blog/category/engineering
https://databricks.com/blog/category/company
https://curatedsql.com/?s=spark

Videos

https://databricks.com/resources/type/videos
https://www.youtube.com/user/TheApacheSpark/feed
https://www.youtube.com/channel/UC3q8O3Bh2Le8Rj1-Q-_UUbA
https://databricks.com/resources/type/product-videos
https://sparkhub.databricks.com/videos/
https://www.youtube.com/watch?v=TJcEP6AX02U
https://databricks.com/sparkaisummit/north-america/sessions
https://databricks.com/session/jaws-data-warehouse-with-spark-sql
https://databricks.com/azure-databricks-demo
https://databricks.com/resources/type/customer-stories

Projects and Papers

https://cs.stanford.edu/~matei/

https://amplab.cs.berkeley.edu/tag/spark/

https://spark.apache.org/research.html

https://databricks.com/resources/type/research-papers

Training and Certification

https://databricks.com/training
https://docs.databricks.com/
https://legacy.gitbook.com/@jaceklaskowski
https://www.edureka.co/blog/spark-tutorial/
https://github.com/midomsft/DatabricksHOL
http://spark.apache.org/docs/latest/building-spark.html
https://www.coursera.org/specializations/big-data
https://www.coursera.org/specializations/scala
https://databricks.com/training/certified-spark-developer

Other projects

https://www.microsoft.com/en-us/research/project/urban-computing/

https://www.microsoft.com/en-us/research/project/dryadlinq/

https://github.com/Microsoft/SmartHotel360-Backend

https://eng.uber.com/uber-big-data-platform/

https://github.com/Microsoft/Mobius

Dayton Gray Sort Record - 2014

https://databricks.com/blog/2014/11/05/spark-officially-sets-a-new-record-in-large-scale-sorting.html

https://spark.apache.org/news/spark-wins-daytona-gray-sort-100tb-benchmark.html

http://sortbenchmark.org/

http://sortbenchmark.org/ApacheSpark2014.pdf

References and posts - 1

https://docs.microsoft.com/en-us/azure/architecture/reference-architectures/data/stream-processing-databricks

https://databricks.com/glossary/what-are-continuous-applications

https://docs.microsoft.com/en-us/azure/stream-analytics/stream-analytics-window-functions

https://docs.databricks.com/spark/latest/structured-streaming/index.html

https://databricks.com/blog/2016/07/28/continuous-applications-evolving-streaming-in-apache-spark-2-0.html

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https://databricks.com/blog/2018/05/03/benchmarking-apache-spark-on-a-single-node-machine.html

http://datastrophic.io/core-concepts-architecture-and-internals-of-apache-spark/

https://lenadroid.github.io/posts/connecting-spark-and-eventhubs.html

https://docs.microsoft.com/en-us/azure/machine-learning/team-data-science-process/spark-data-exploration-modeling

References and posts - 3

https://docs.microsoft.com/en-us/azure/machine-learning/team-data-science-process/spark-overview

https://github.com/mspnp/reference-architectures/tree/master/data/streaming_azuredatabricks

https://azure.microsoft.com/en-us/blog/azure-databricks-industry-leading-analytics-platform-powered-by-apache-spark/

https://papers.nips.cc/paper/5656-hidden-technical-debt-in-machine-learning-systems.pdf

https://towardsdatascience.com/sql-at-scale-with-apache-spark-sql-and-dataframes-concepts-architecture-and-examples-c567853a702f

References and posts - 4

https://docs.microsoft.com/en-us/sql/big-data-cluster/big-data-cluster-overview?view=sqlallproducts-allversions

https://github.com/giulianorapoz/DatabricksStreamingPowerBI

https://databricks.com/blog/2017/01/19/real-time-streaming-etl-structured-streaming-apache-spark-2-1.html

https://databricks.com/blog/2016/05/23/apache-spark-as-a-compiler-joining-a-billion-rows-per-second-on-a-laptop.html

Databricks Delta - 5

https://databricks.com/product/databricks-delta

https://docs.databricks.com/delta/index.html

https://databricks.com/session/ali-ghodsi-michael-armbrust-delta-lake

https://databricks.com/session/building-robust-production-data-pipelines-with-databricks-delta-2