

# Modern Data Architecture



Speaker

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sunday

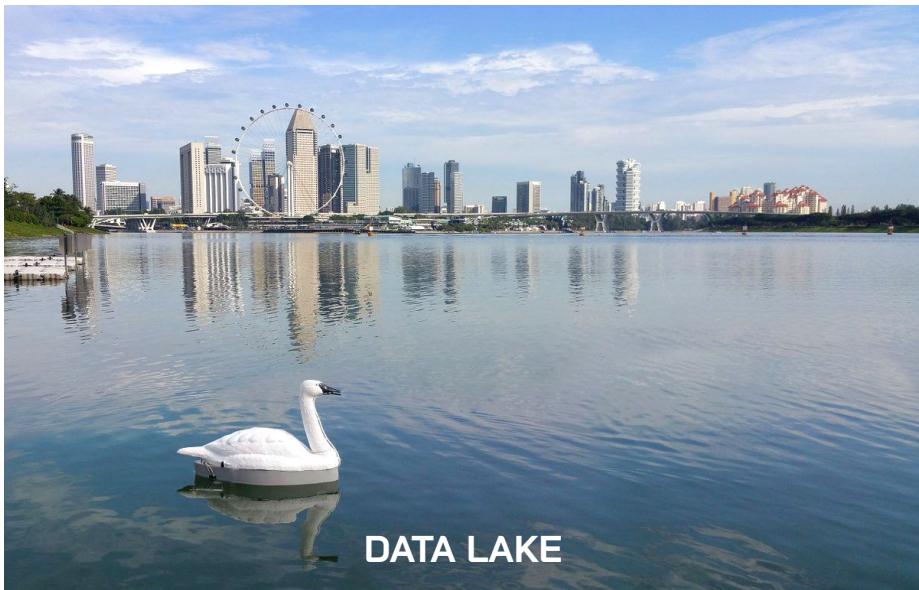
# Agenda

- Introduction to modern data architecture
- ML and AI data architecture
- Fundamentals of data architecting
- Example of modern data stack

# Introduction to modern data architecture

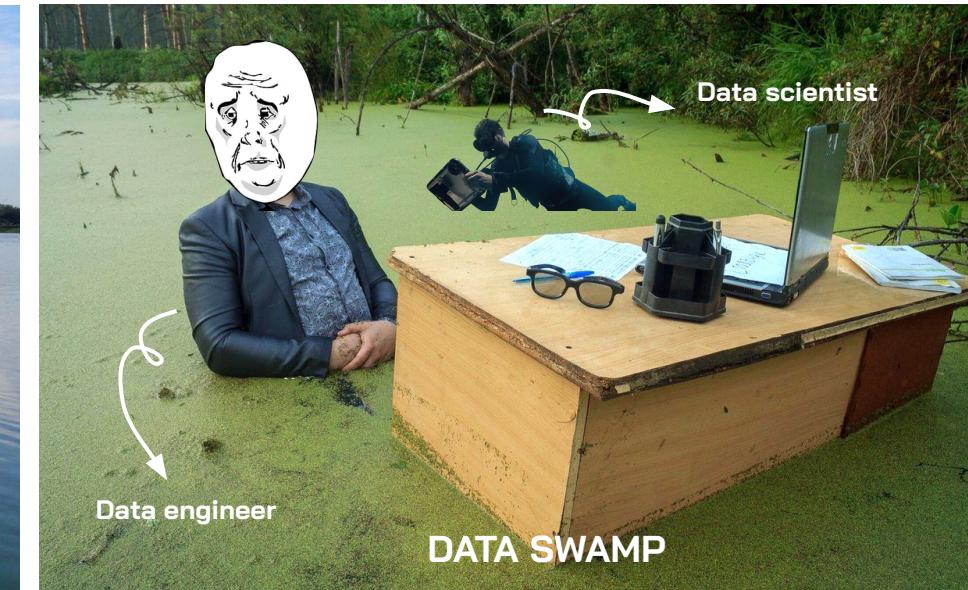


Without a proper data architecture



DATA LAKE

What we expected



Data engineer

Data scientist

DATA SWAMP

VS.

Reality

# Introduction to modern data architecture

Without a proper data architecture

Data engineer  
trying to gather  
data



Data scientist  
trying to figure  
out about where  
to start

Business person  
waiting for a  
simple report



# Introduction to modern data architecture



## With a proper data architecture

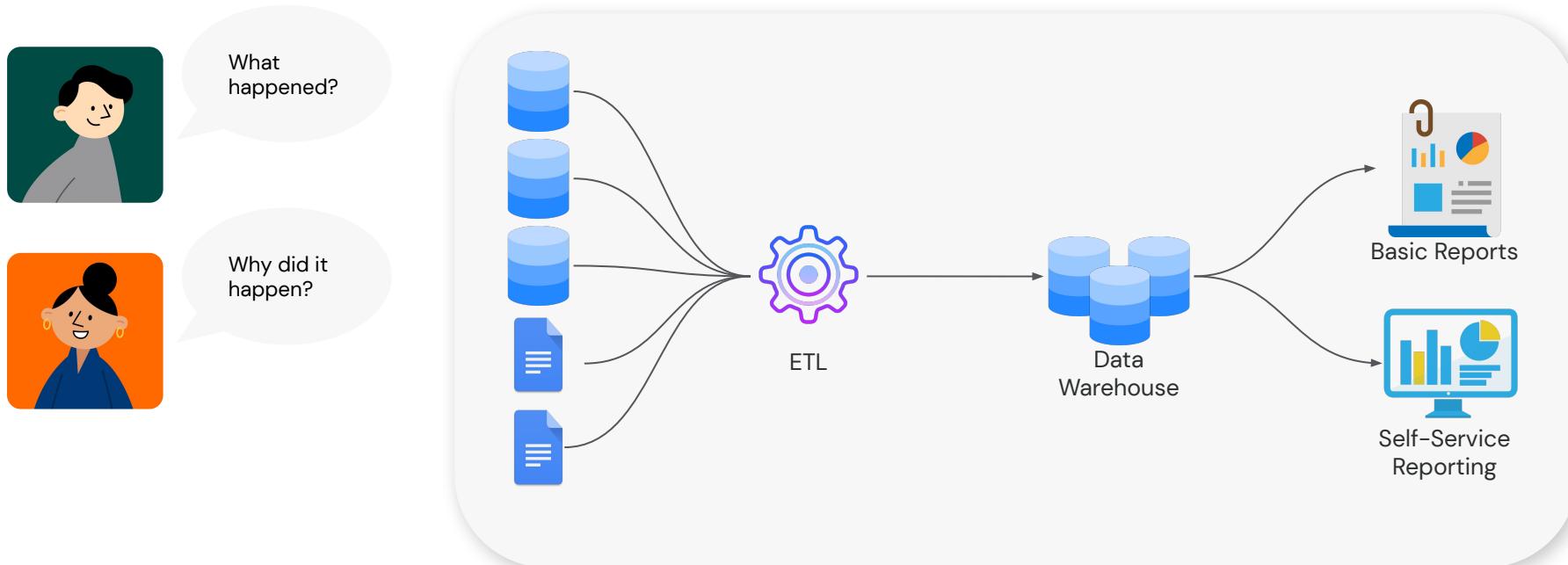
A well-designed data architecture allows integrating data from disparate source and enables teams to discover and deliver useful insights and make data-driven decisions. Without common standards for data integration and data management, organizations will struggle to derive meaningful results from the data.



# The “Evolution” of Cloud data platform

# Introduction to modern data architecture

## The evolution of cloud data platform – 1st generation : Data Warehouse

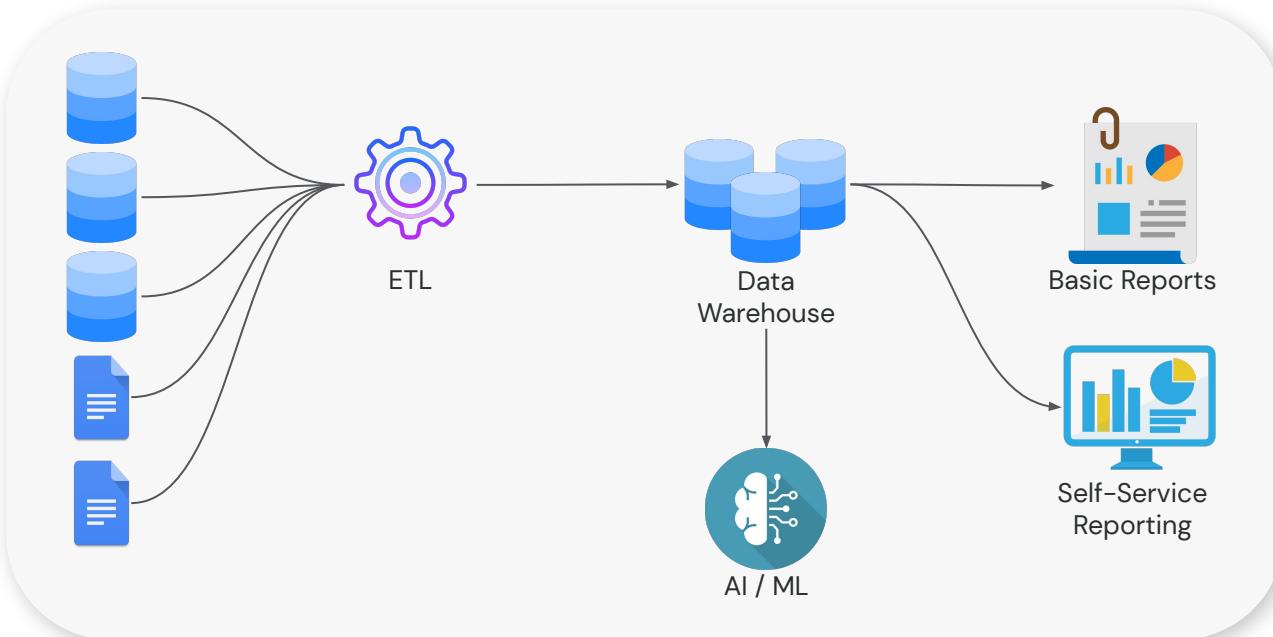


# Introduction to modern data architecture

## The evolution of cloud data platform – 1st generation : Data Warehouse

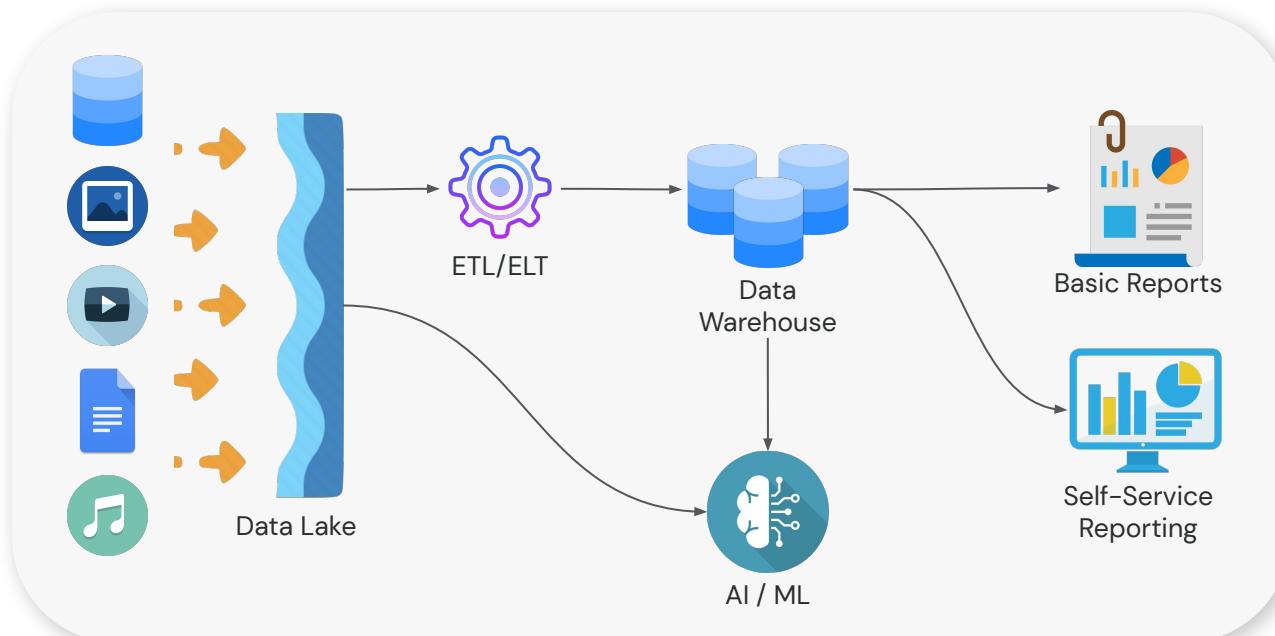


What may happen?



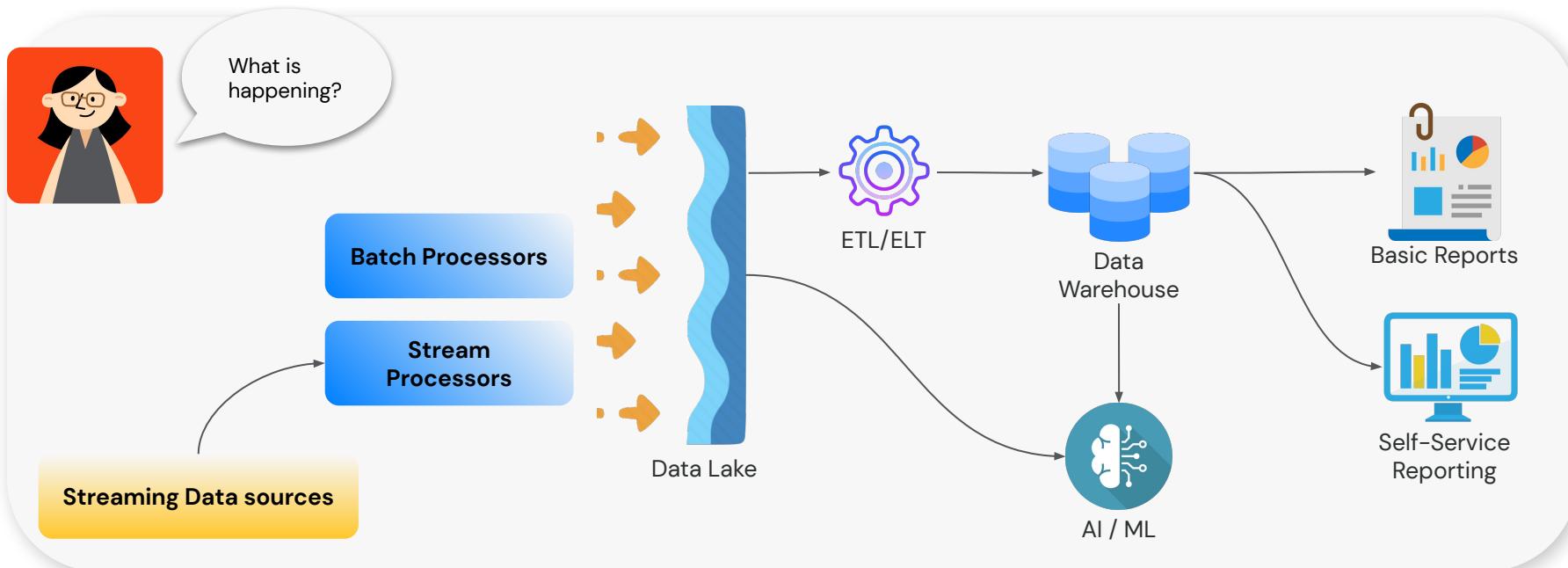
# Introduction to modern data architecture

The evolution of cloud data platform – 2nd generation : Data Lake



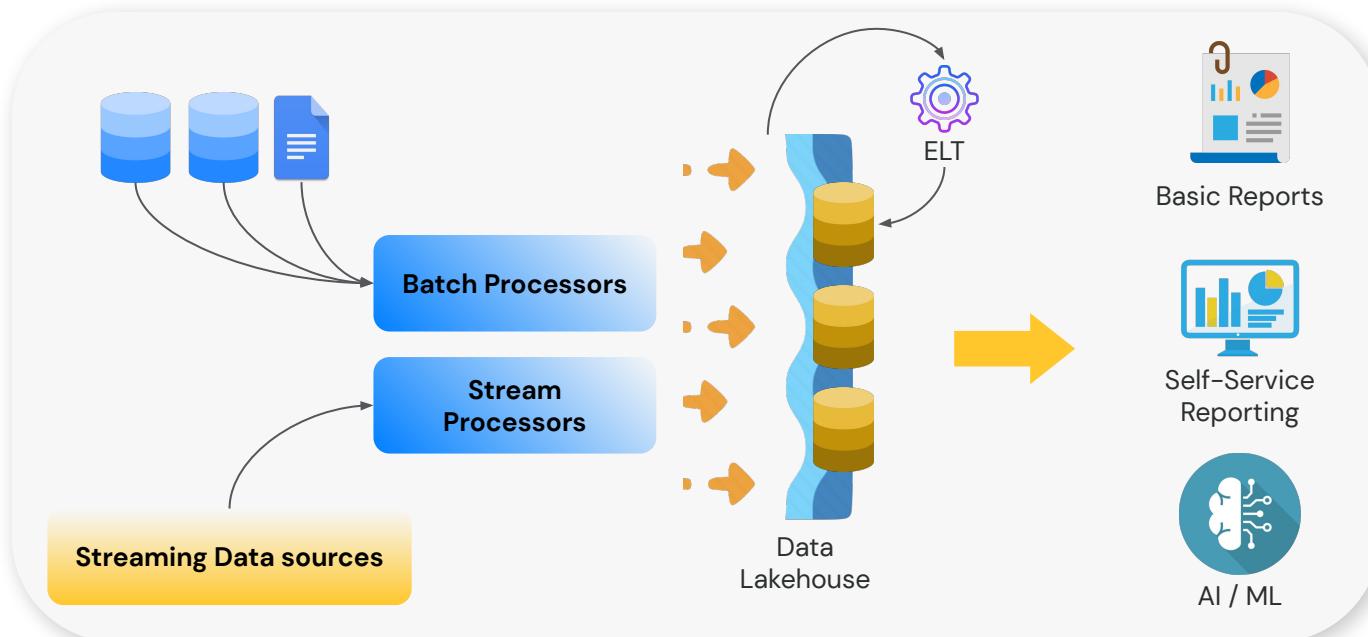
# Introduction to modern data architecture

## The evolution of cloud data platform – 2nd generation : Data Lake



# Introduction to modern data architecture

The evolution of cloud data platform – 3rd generation : Data Lakehouse



# “Data Mesh”

The future is now ...

	Data Warehouse	Data Lake	Data Lakehouse
Storage Data Type	Works well with structured data	Works well with semi-structured and unstructured data	Can handle structured, semi-structured, and unstructured data
Purpose	Optimal for data analytics and business intelligence (BI) use-cases	Suitable for machine learning (ML) and artificial intelligence (AI) workloads	Suitable for both data analytics and machine learning workloads
Cost	Storage is costly and time-consuming	Storage is cost-effective, fast, and flexible	Storage is cost-effective, fast, and flexible
ACID Compliance	Records data in an ACID-compliant manner to ensure the highest levels of integrity	Non-ACID compliance: updates and deletes are complex operations	ACID-compliant to ensure consistency as multiple parties concurrently read or write data

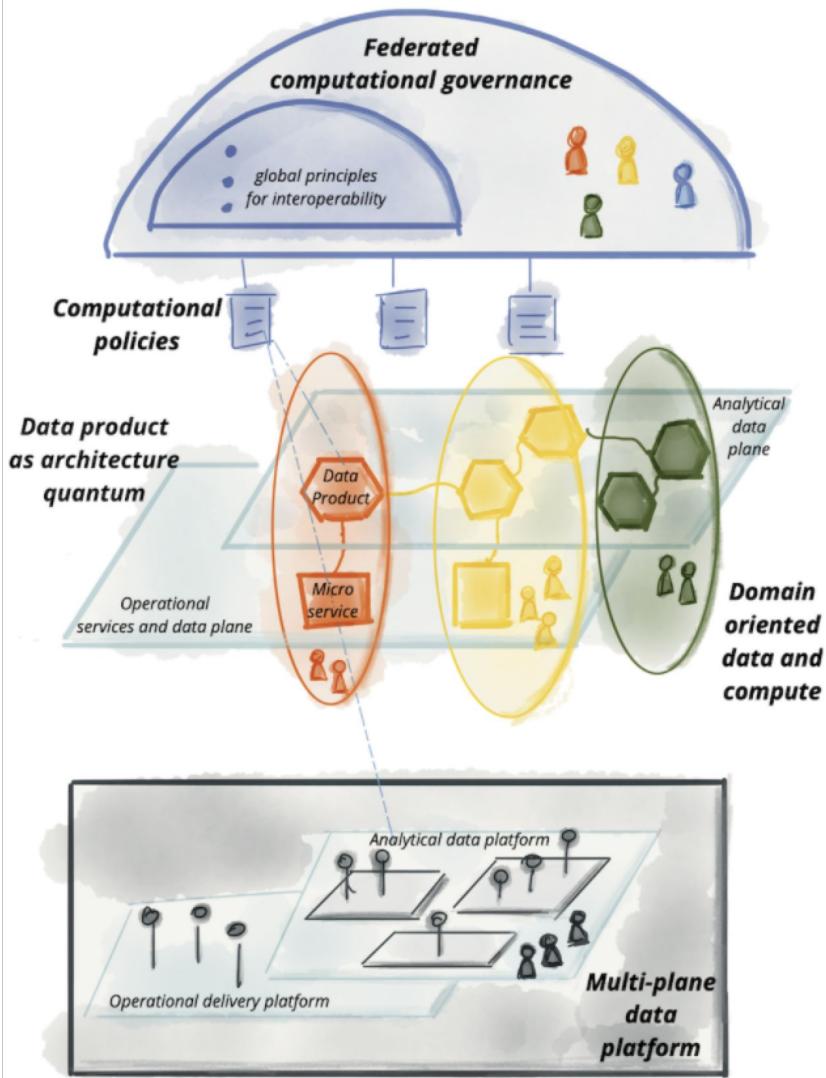
# Introduction to modern data architecture

## The future is now : Data Mesh

Data Mesh is an analytical data architecture and operating model where data is treated as a product and owned by teams that most intimately know and consume the data. - Thoughtworks

### 4 Principles of data mesh

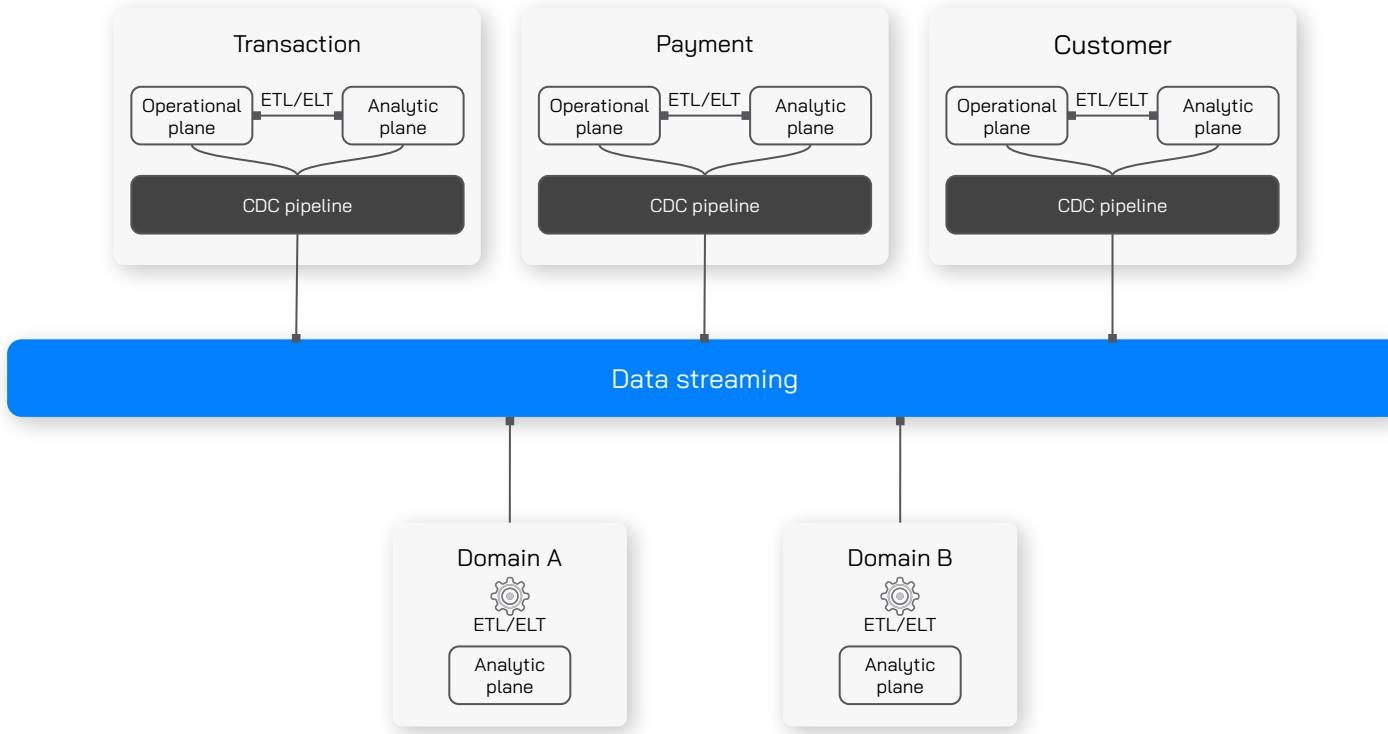
1. Domain-oriented decentralized data ownership and architecture
2. Data as a product
3. Self-serve data infrastructure as a platform
4. Federated computational governance



# Introduction to modern data architecture

The future is now : Data Mesh

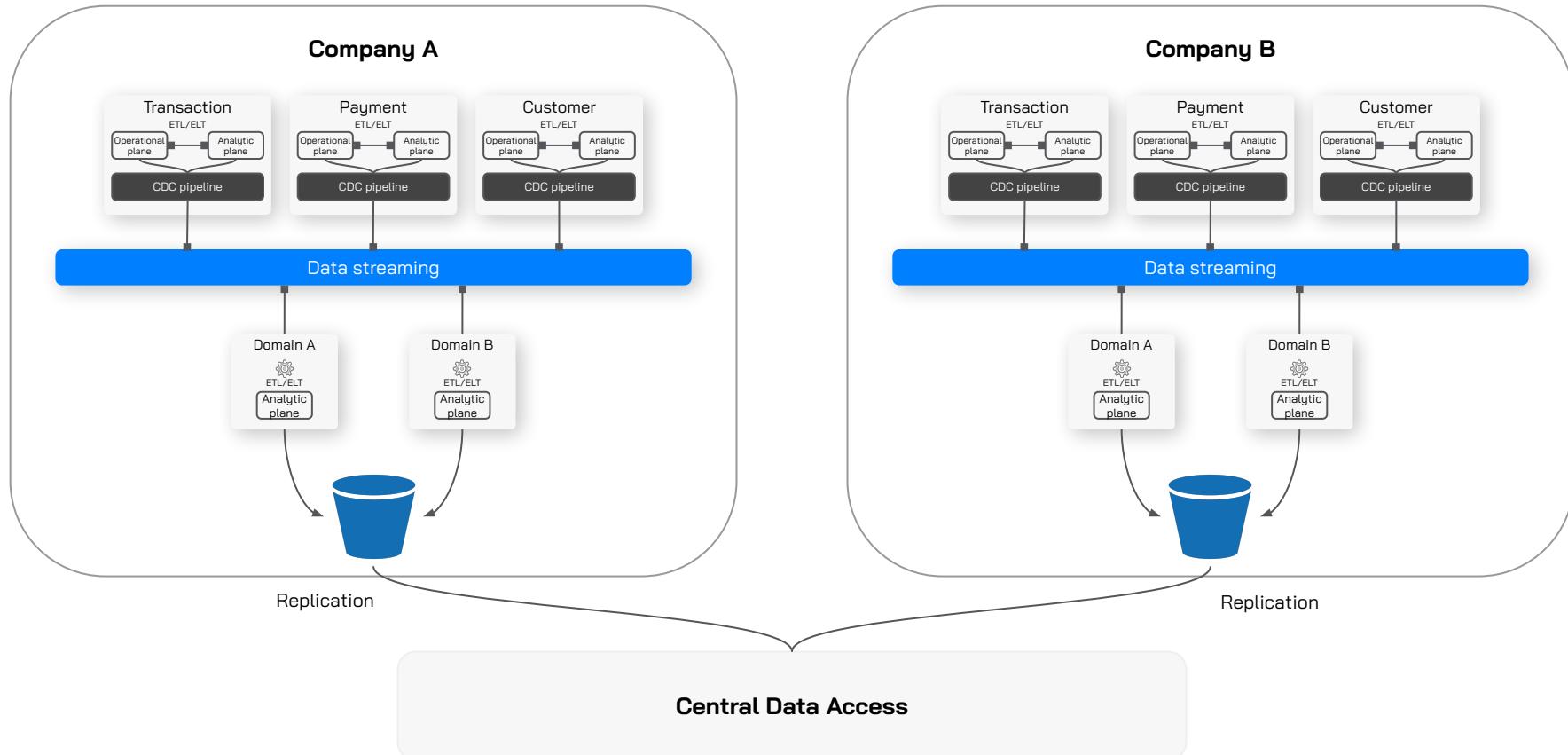
Source domain

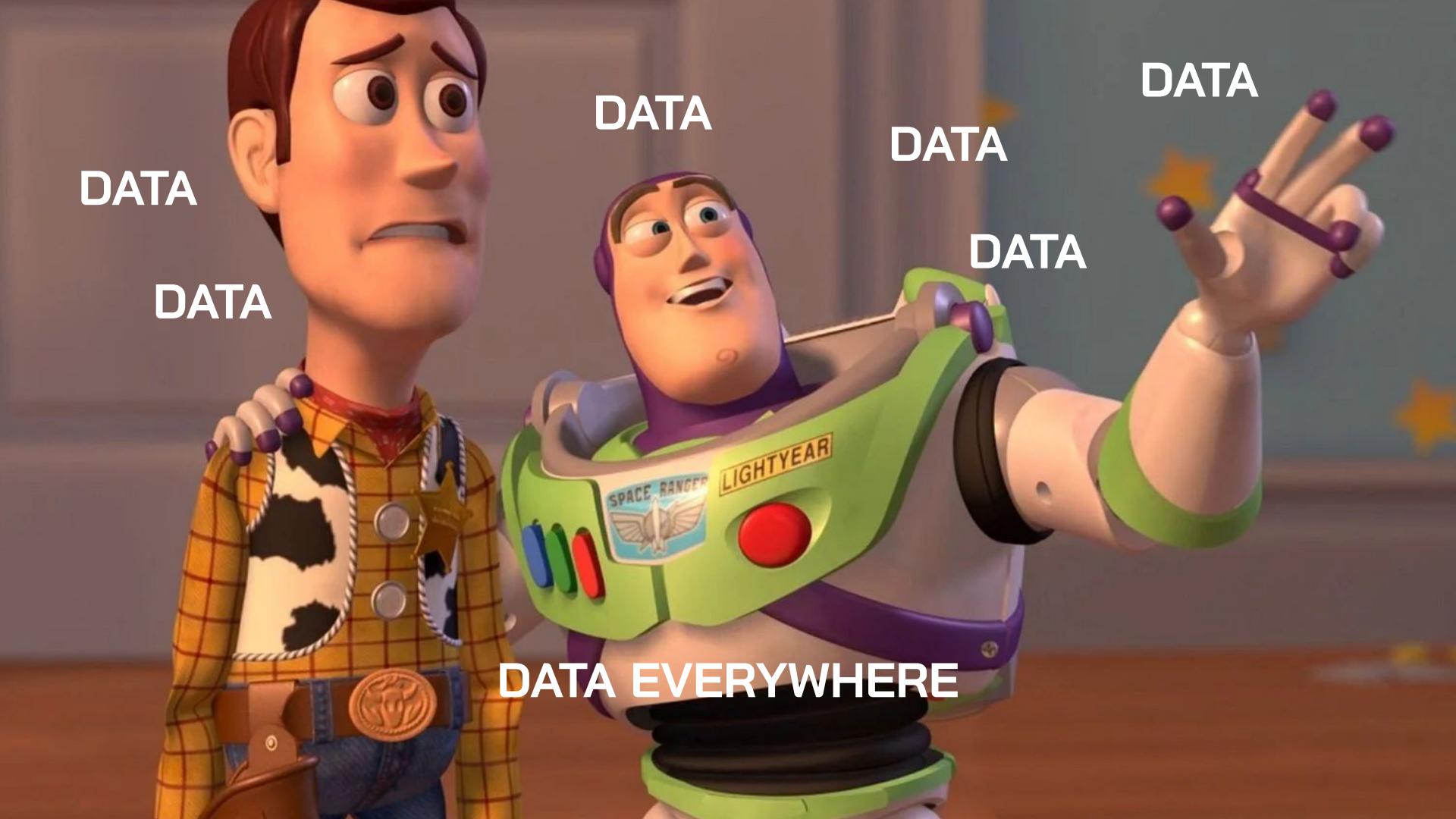


Consumer domain

# Introduction to modern data architecture

The future is now : Data Mesh



A scene from Toy Story featuring Woody and Buzz Lightyear. Woody, on the left, has three 'DATA' labels floating around his head and shoulders. Buzz, on the right, has four 'DATA' labels floating around his head and torso. A large, bold 'DATA' label is positioned at the bottom center, below the characters.

DATA

DATA

DATA

DATA

DATA

DATA

DATA EVERYWHERE



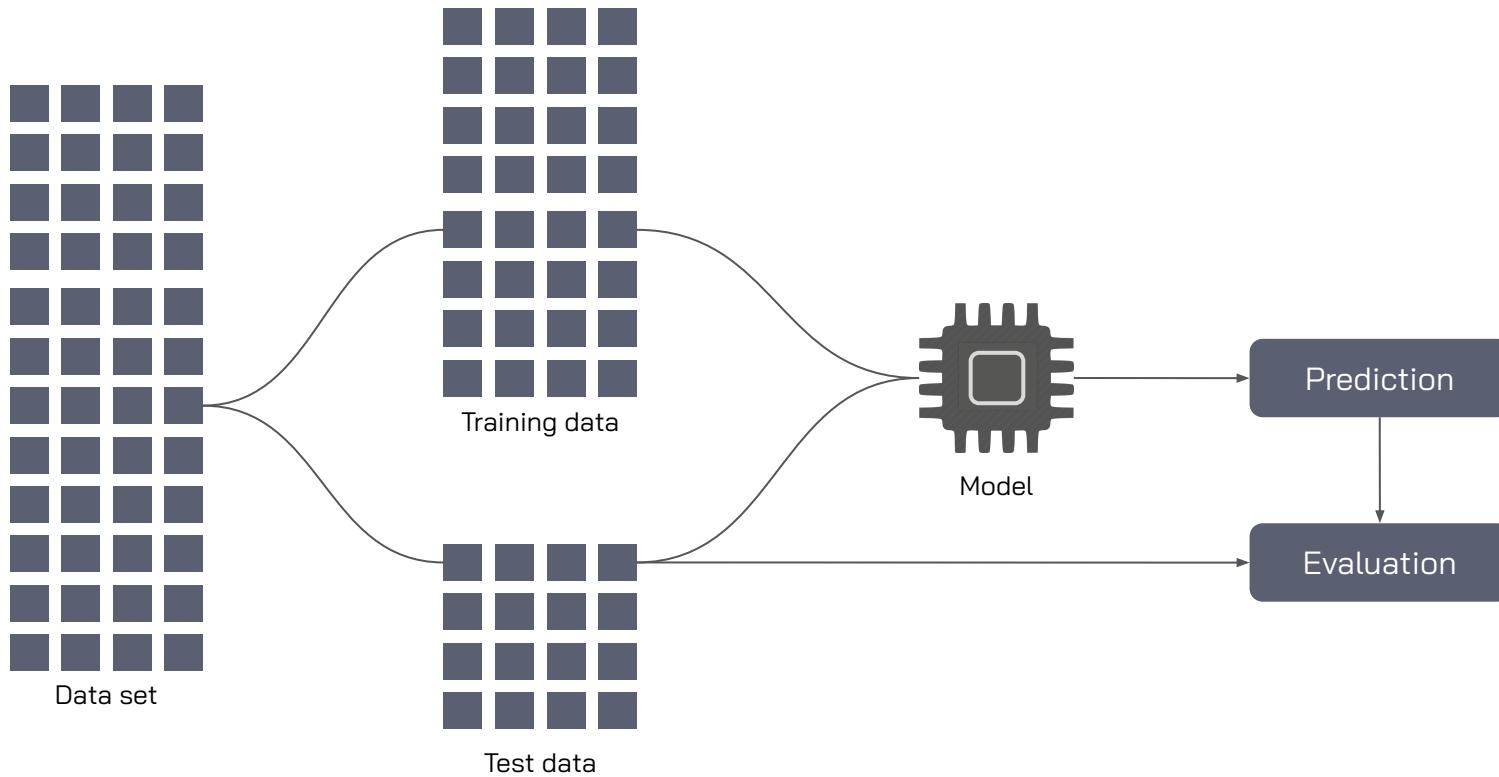
# Data Architecture Application In Real world use cases

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# ML & AI data architecture



## ML basics



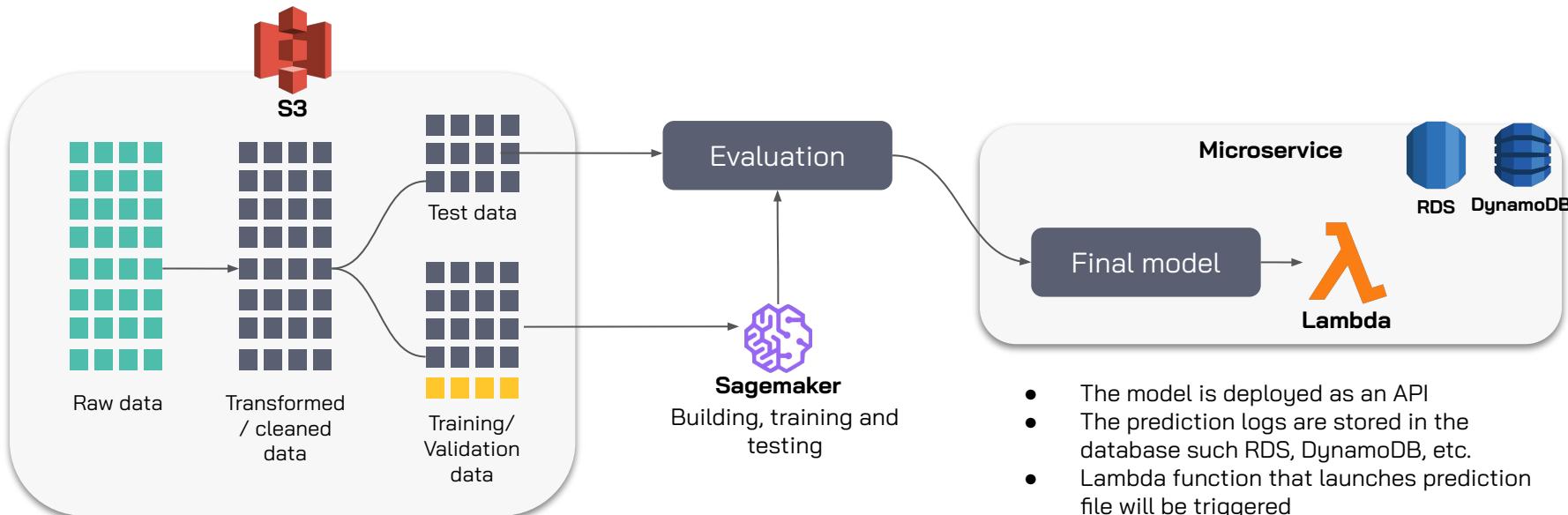
# ML & AI data architecture



# ML & AI data architecture

## Scenario 1 : Image processing

**Use case :** Building a car damage assessment ML model using car images.



- The model is deployed as an API
- The prediction logs are stored in the database such RDS, DynamoDB, etc.
- Lambda function that launches prediction file will be triggered

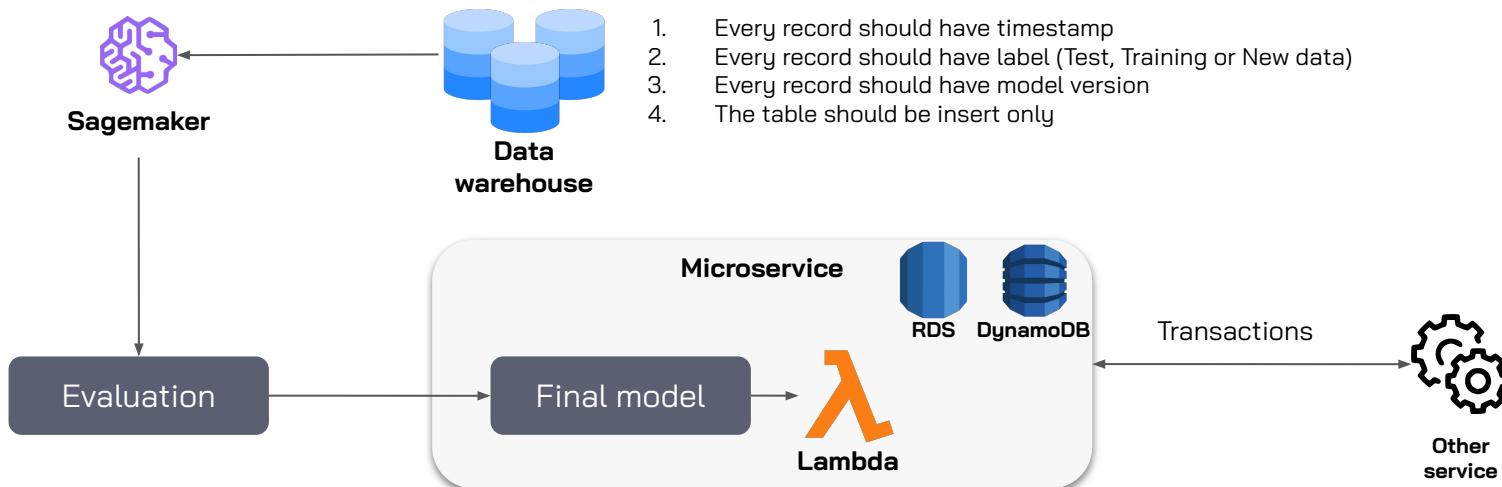
Training and test data are stored in data lake

# ML & AI data architecture



## Scenario 2 : Real-time predictive model

**Use case :** Building the pricing engine model using historical claim data and customers' demographic. Then consume real-time data for prediction.



# Fundamentals of data architecting

The main components of a modern data architecture are data ingestion, data storage, transformation and BI tools

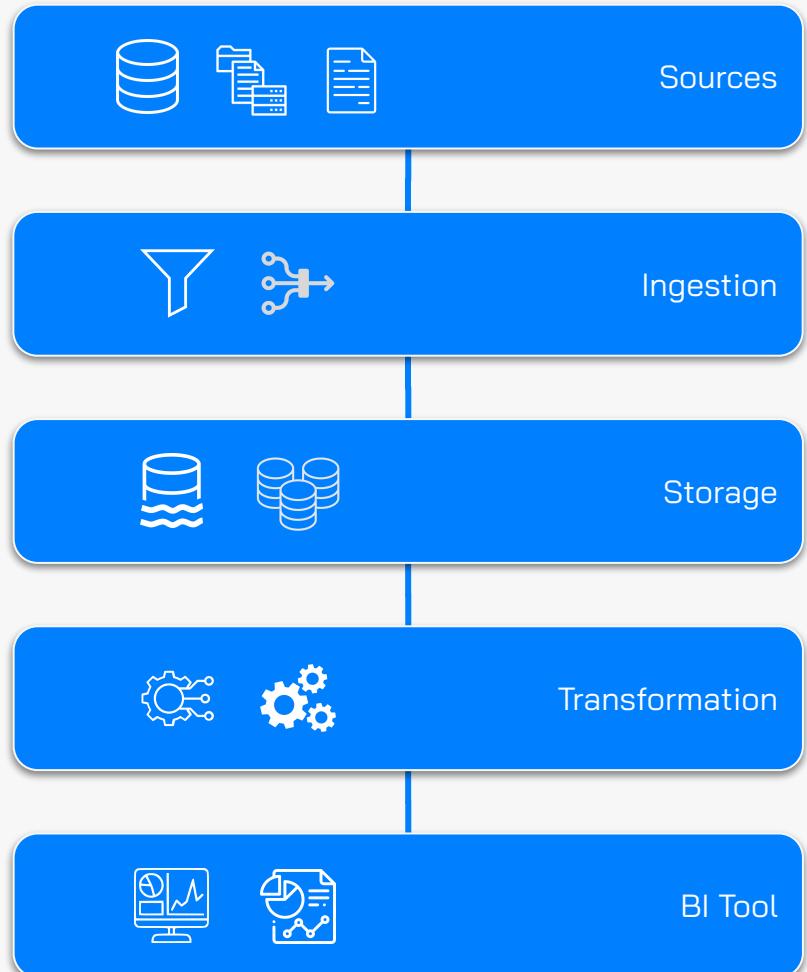
**Step 1** : Identify data sources

**Step 2** : Choose the most suitable data ingestion tool

**Step 3** : Plan for the data pipeline and define process of data transformation or modeling

**Step 4** : Pick the most appropriate data warehouse or data lake solution

**Step 5** : Pick a BI tool



# Fundamentals of data architecting



## Data management system



### Data Catalog

The data catalog should contain all data asset definitions, data owners and, the source of the data.



### Metadata

Capturing metadata across the ecosystem describing when, how, and where to load data.



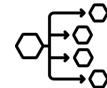
### Monitoring & Alert

Detecting the anomalies before the consumers do.



### Flexibility

Anticipate changes, if a source column is added, it will automatically be ingested.



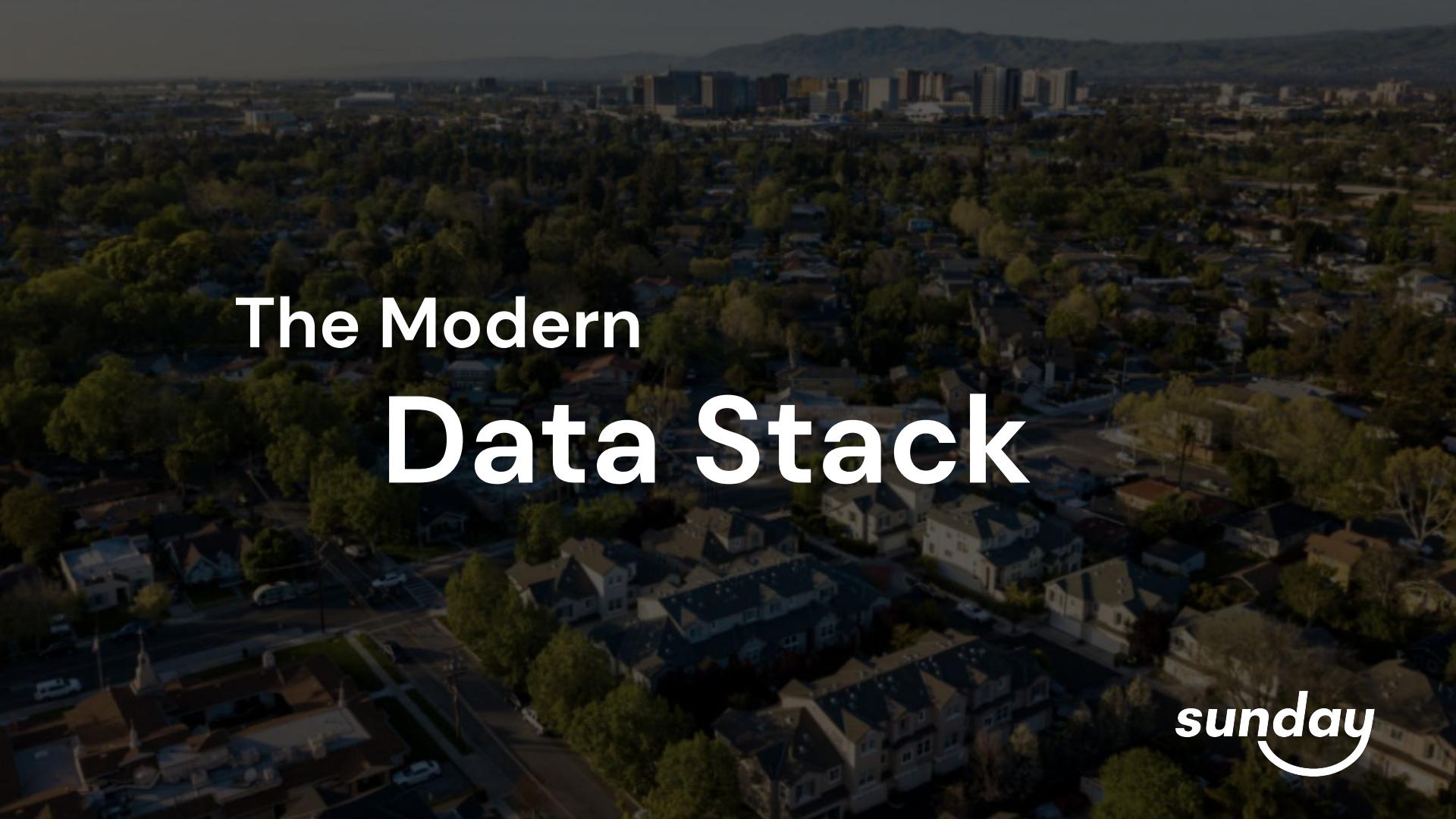
### Security

Defining data security control that allow each data item to be classified according to how sensitive it is and protected behind multiple security layers



### Reverse ETL

Identifying how to deliver the data back to consumers through other data platform



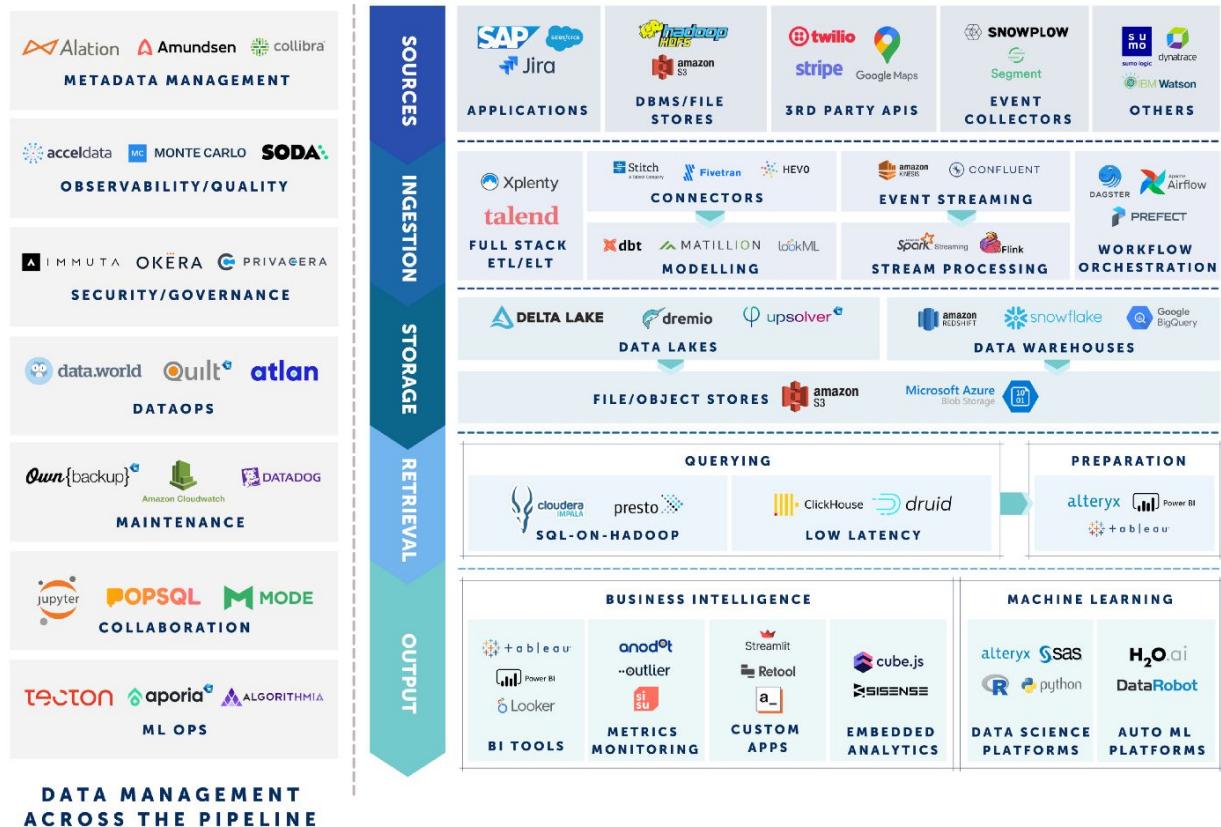
# The Modern Data Stack

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# Modern data stack



The modern data stack is a set of technologies and services that engineers combine to build the data architecture.



# Modern data stack

Netflix

Big data



Apache  
Iceberg

Data Streaming



Kafka

Operational DB



DynamoDB

Transformation



Flink

# Modern data stack

Spotify

Data Lakes



AWS S3

Data Warehouse



HDFS

Data Streaming



Apache Storm



Kafka

# Modern data stack

Sunday

Data Lakes



AWS S3

Workflow Orchestration



Airflow

Data Streaming



Kafka

Data Warehouse



Redshift

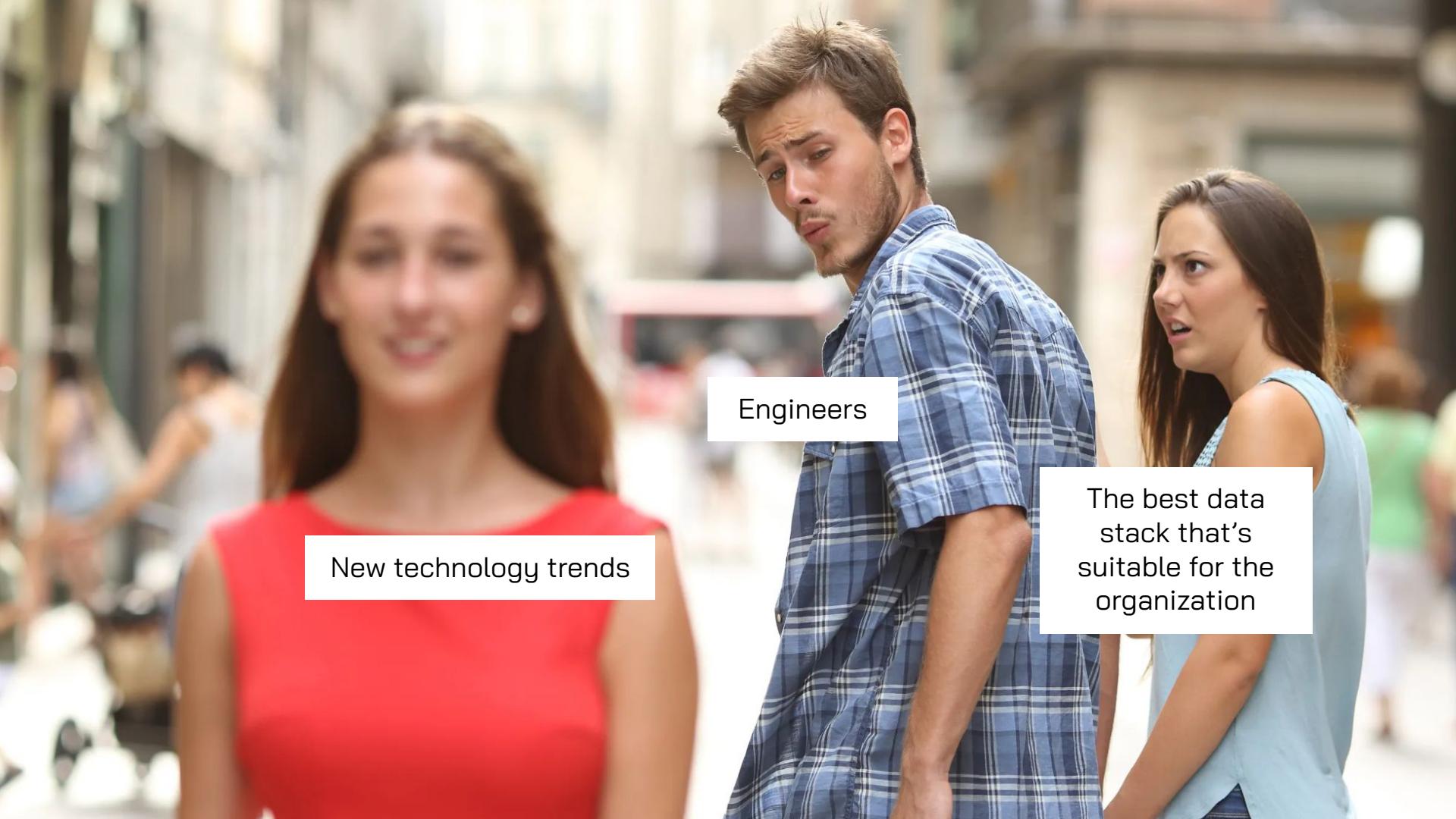
Business Intelligence



Tableau



Data Studio



New technology trends

Engineers

The best data  
stack that's  
suitable for the  
organization



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