Data lineage and observability with OpenLineage

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Julien Le Dem, CTO and Co-Founder Datakin | Mai 2021

AGENDA

- The need for metadata
- **OpenLineage** - the open standard for lineage collection - and **Marquez**, its reference implementation
- Spark observability with OpenLineage

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The need for Metadata

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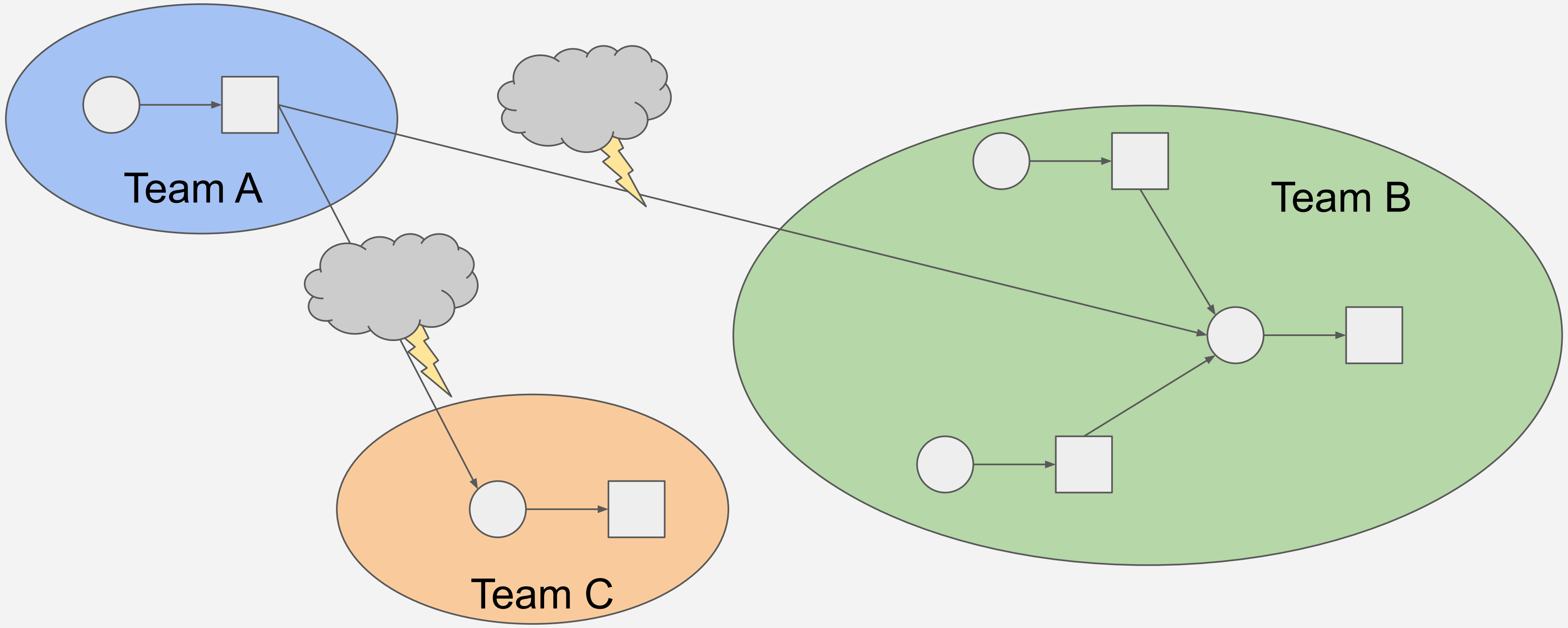
Building a healthy data ecosystem

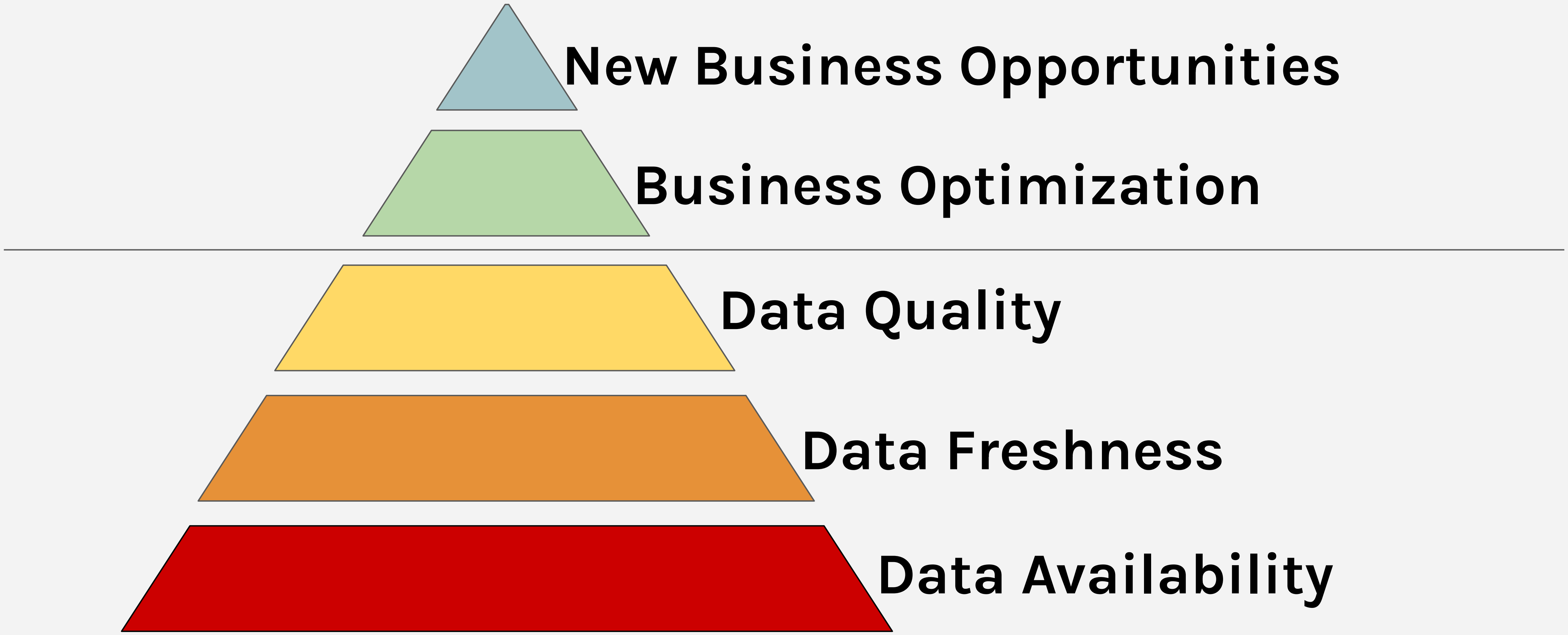


Today: Limited context

DATA

- What is the data source?
- What is the schema?
- Who is the owner?
- How often is it updated?
- Where is it coming from?
- Who is using the data?
- What has changed?

~~Maslow's~~ Data hierarchy of needs



OpenLineage

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OpenLineage contributors

Creators and contributors from major open source projects involved

pandas

MARQUEZ

Data Hub

APACHE Spark

dbt

Amundsen

Parquet

Apache Airflow

ODPi EGERIA

ICEBERG

PREFECT

great_expectations

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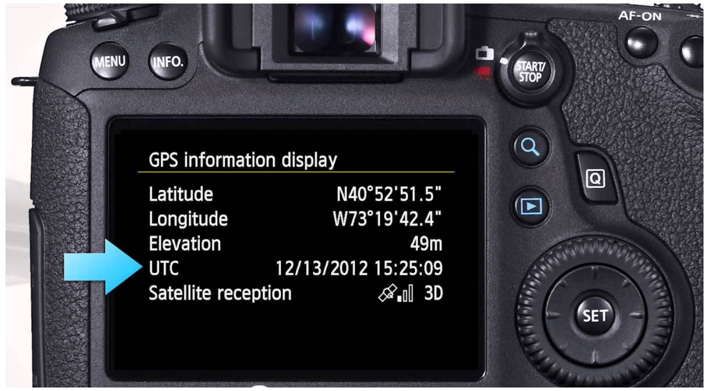
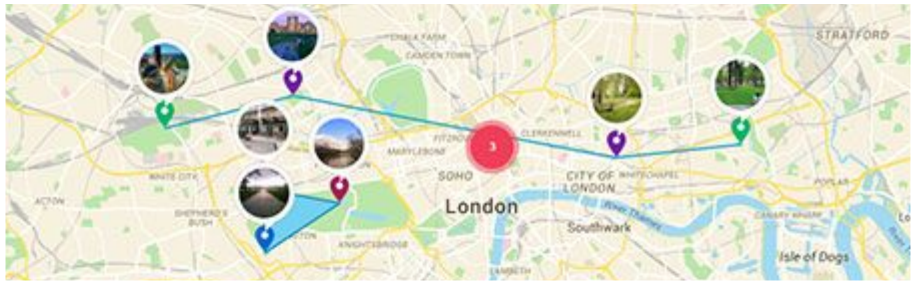
Purpose:

Define an Open standard for metadata and lineage collection by instrumenting data pipelines as they are running.

Purpose:
EXIF for data pipelines

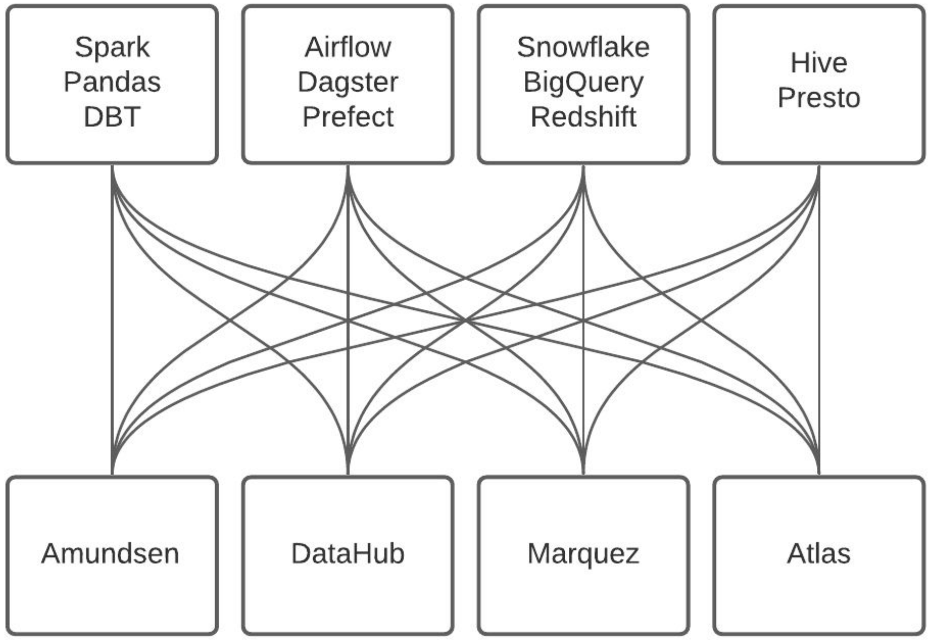

GPS information display

Latitude	N40°52'51.5"
Longitude	W73°19'42.4"
Elevation	49m
UTC	12/13/2012 15:25:09
Satellite reception	3D

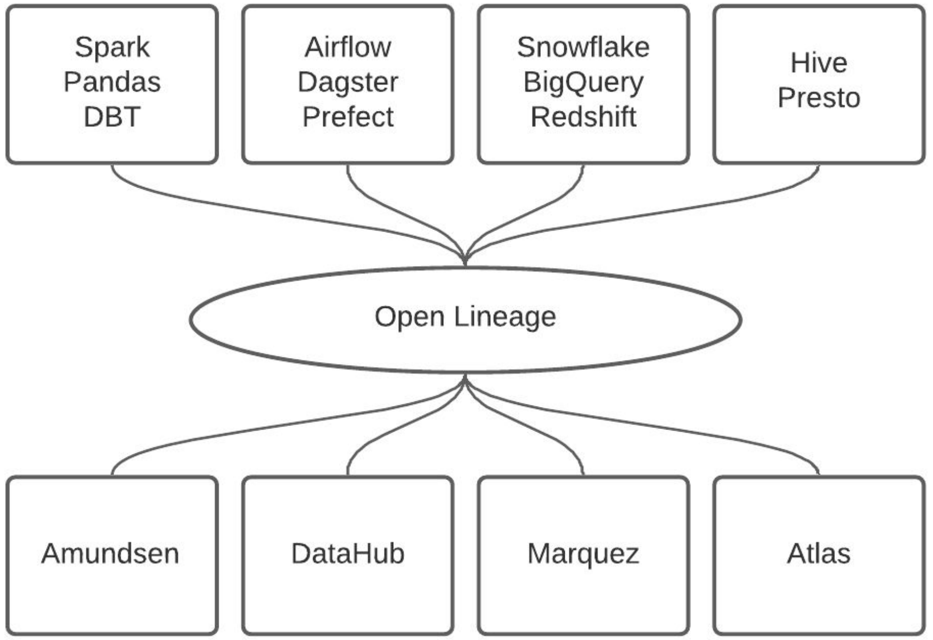


Problem

Before:



With Open Lineage



- Duplication of effort: Each project has to instrument all jobs
- Integrations are external and can break with new versions

- Effort of integration is shared
- Integration can be pushed in each project: no need to play catch up

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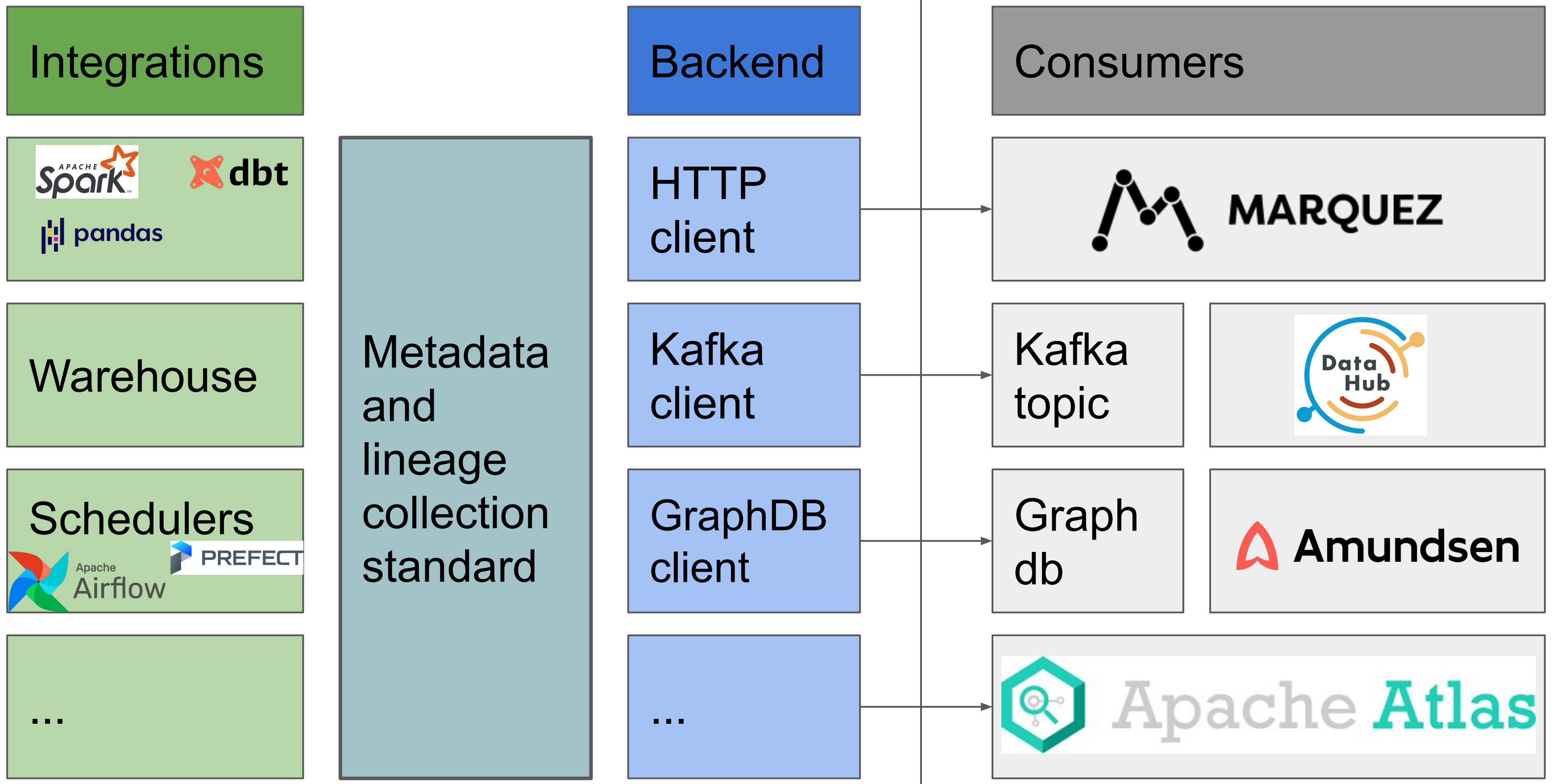
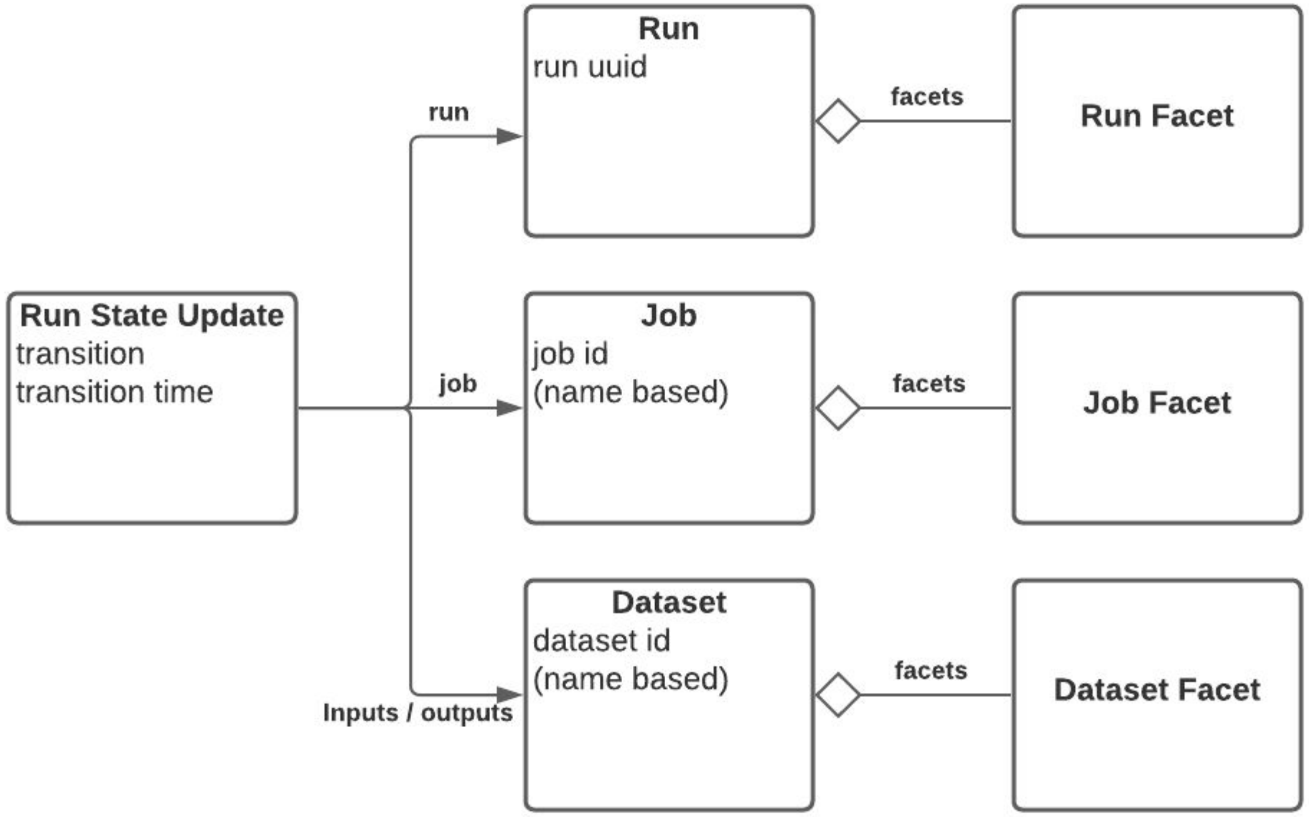
Open Lineage scope

Not in scope



Core Model:

- JSONSchema spec
- Consistent naming:
  Jobs:
    scheduler.job.task
  Datasets:
    instance.schema.table



Protocol:

- Asynchronous events:

  Unique run id for identifying a run and correlate events

- Configurable backend:
  - Kafka
  - Http

Examples:

- Run Start event
  - source code version
  - run parameters

- Run Complete event
  - input dataset
  - output dataset version and schema

Facets

- **Extensible:**

  Facets are atomic pieces of metadata identified by a unique name that can be attached to the core entities.

- **Decentralized:**

  Prefixes in facet names allow the definition of Custom facets that can be promoted to the spec at a later point.

Facet examples

Dataset:
- Stats
- Schema
- Version
- Column level lineage

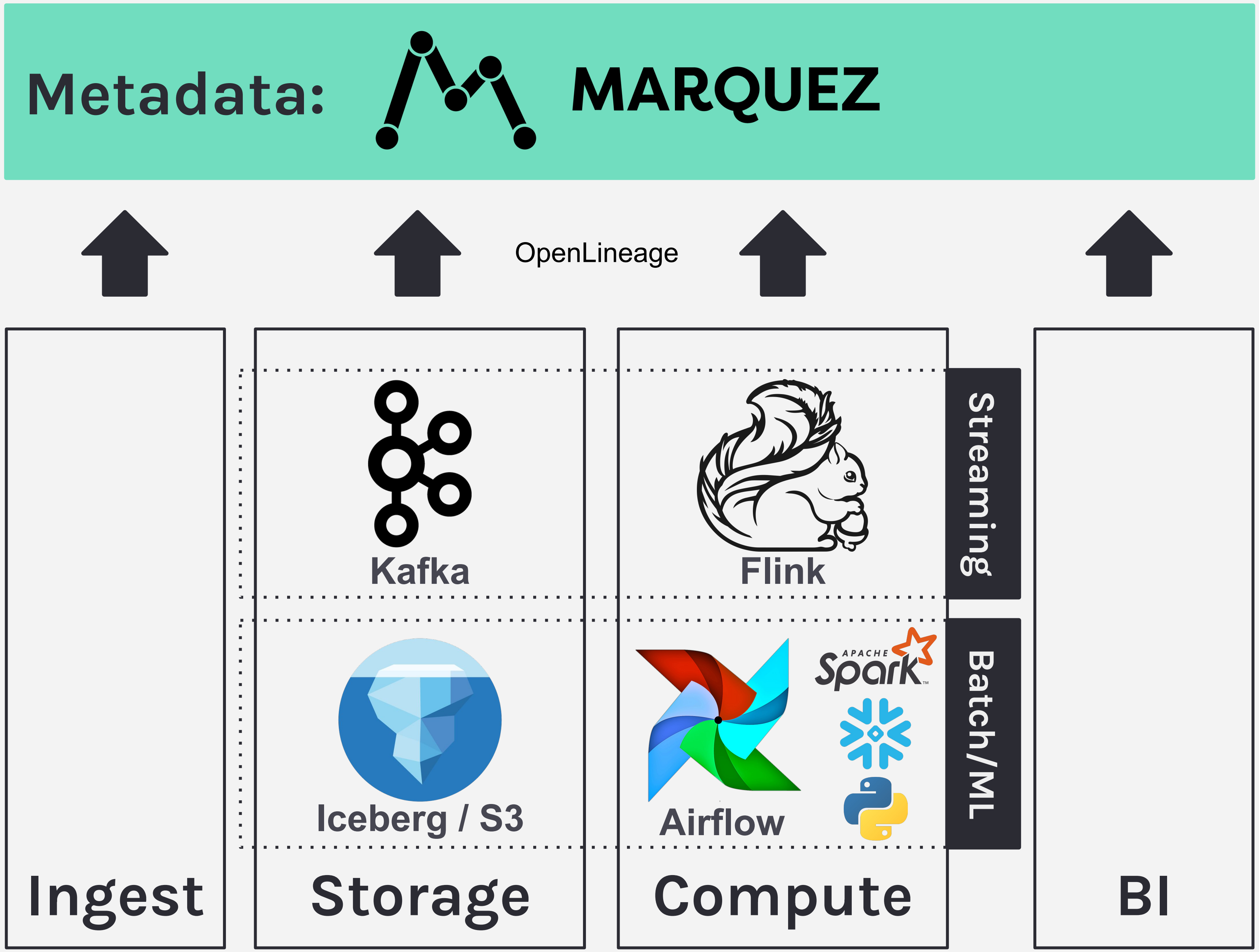
Job:
- Source code
- Dependencies
- params
- Source control
- Query plan
- Query profile

Run:
- Schedule time
- Batch id

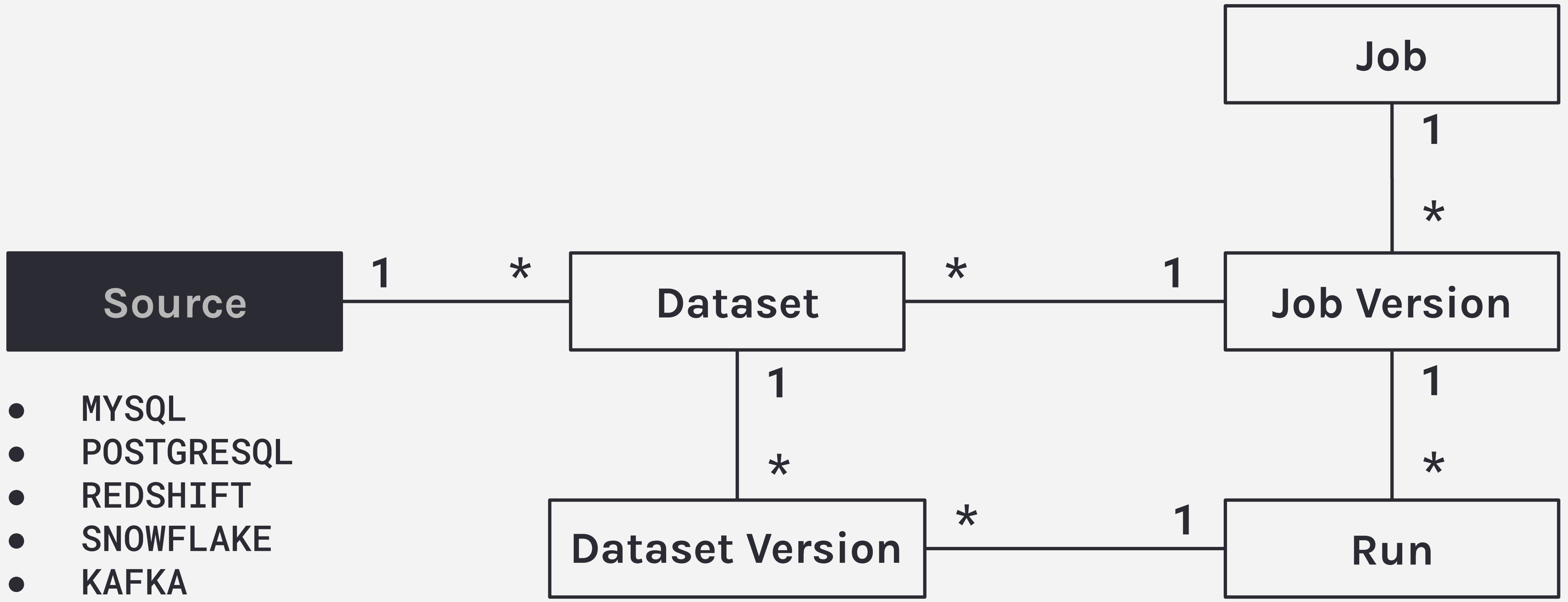
MARQUEZ

- **Data Platform** built around **Marquez**

- **Integrations**
  - Ingest
  - Storage
  - Compute



Marquez: Data model

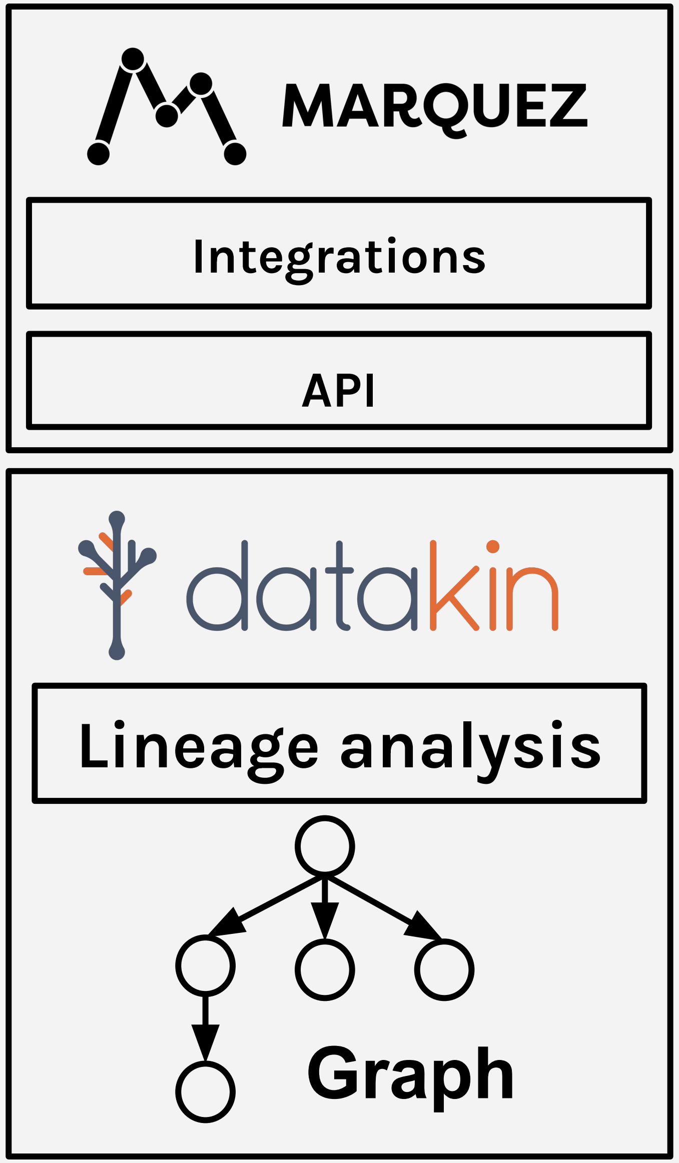


- BATCH
- STREAM
- SERVICE

- MYSQL
- POSTGRESQL
- REDSHIFT
- SNOWFLAKE
- KAFKA
- S3
- ICEBERG
- DELTALAKE

MARQUEZ

Datakin leverages Marquez metadata



- **Open Lineage and Marquez standardize metadata collection**
  - Job runs
  - Parameters
  - Version
  - Inputs / outputs
- **Datakin enables**
  - Understanding operational dependencies
  - Impact analysis
  - Troubleshooting: What has changed since the last time it worked?

Spark observability with OpenLineage

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Spark java agent

spark.driver.extraJavaOptions:

```
-javaagent:marquez-spark-0.13.1.jar={argument}
```

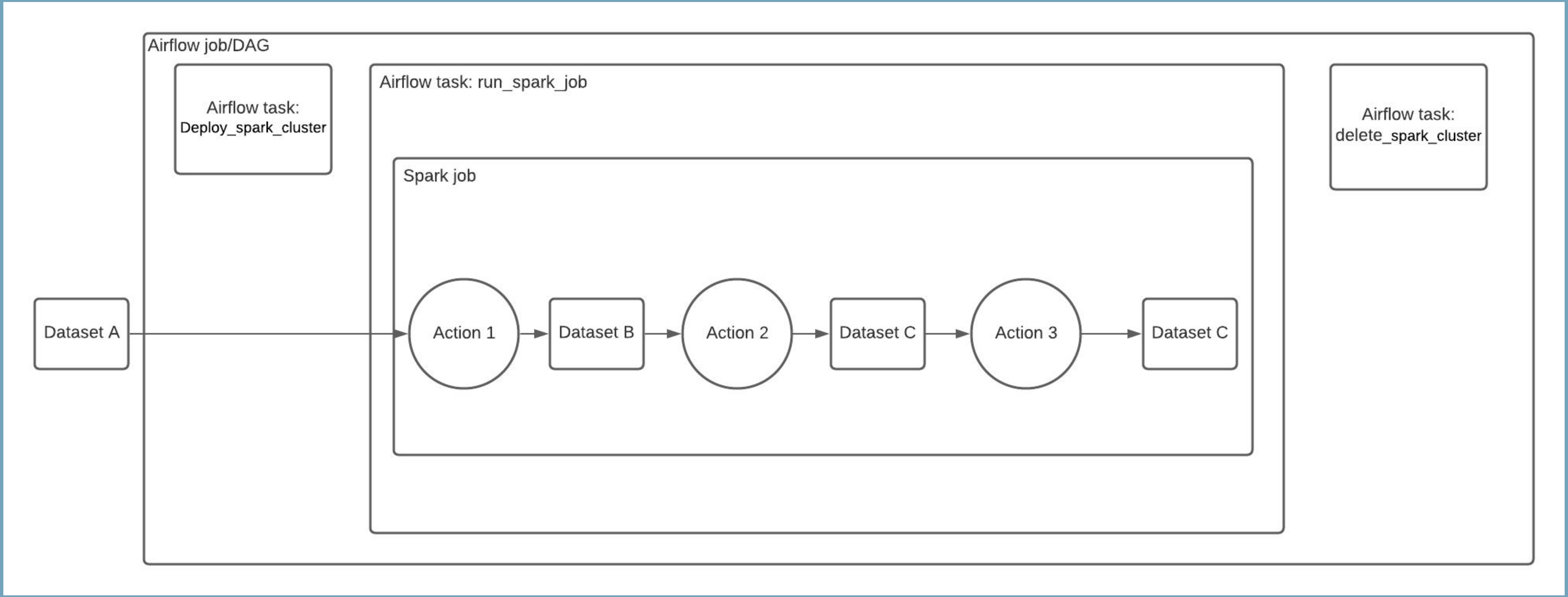
Metadata collected

Lineage: inputs/outputs

Data volume: row count/byte size

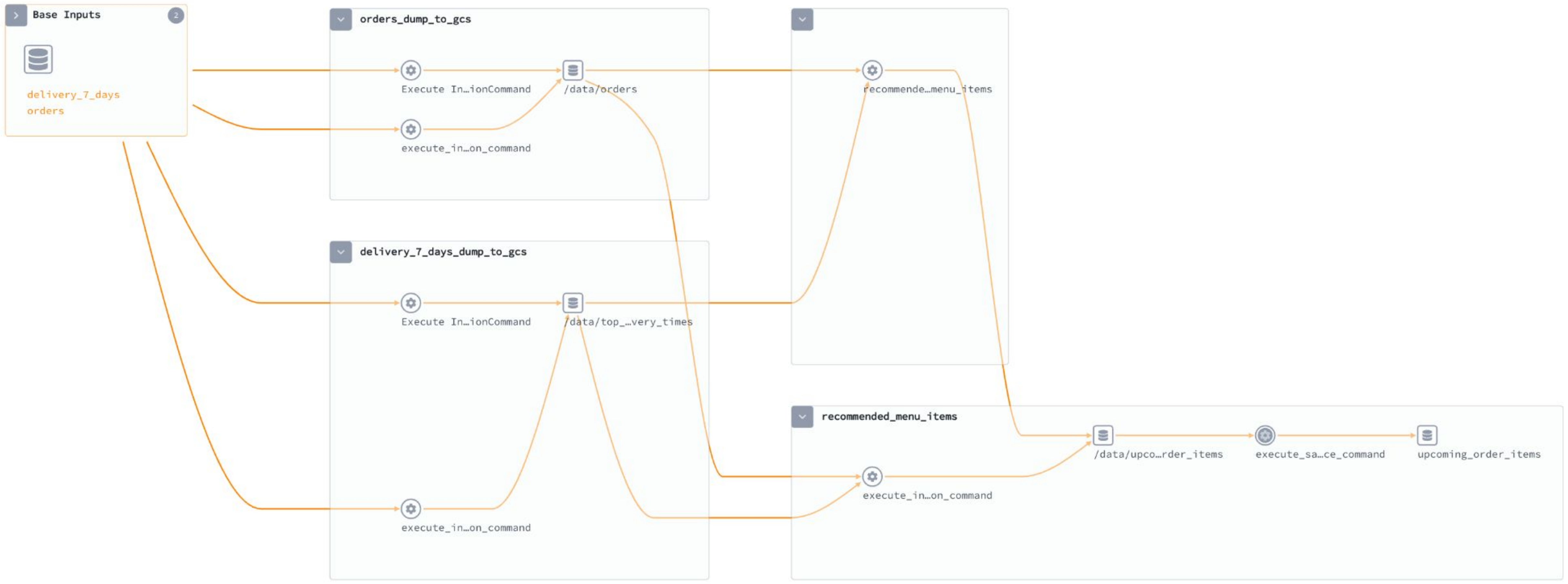
Logical plan

Lineage model



Airflow job/DAG
Airflow task: Deploy_spark_cluster
Airflow task: run_spark_job
Spark job
Dataset A
Action 1
Dataset B
Action 2
Dataset C
Action 3
Dataset C
Airflow task: delete_spark_cluster

Lineage Example across jobs



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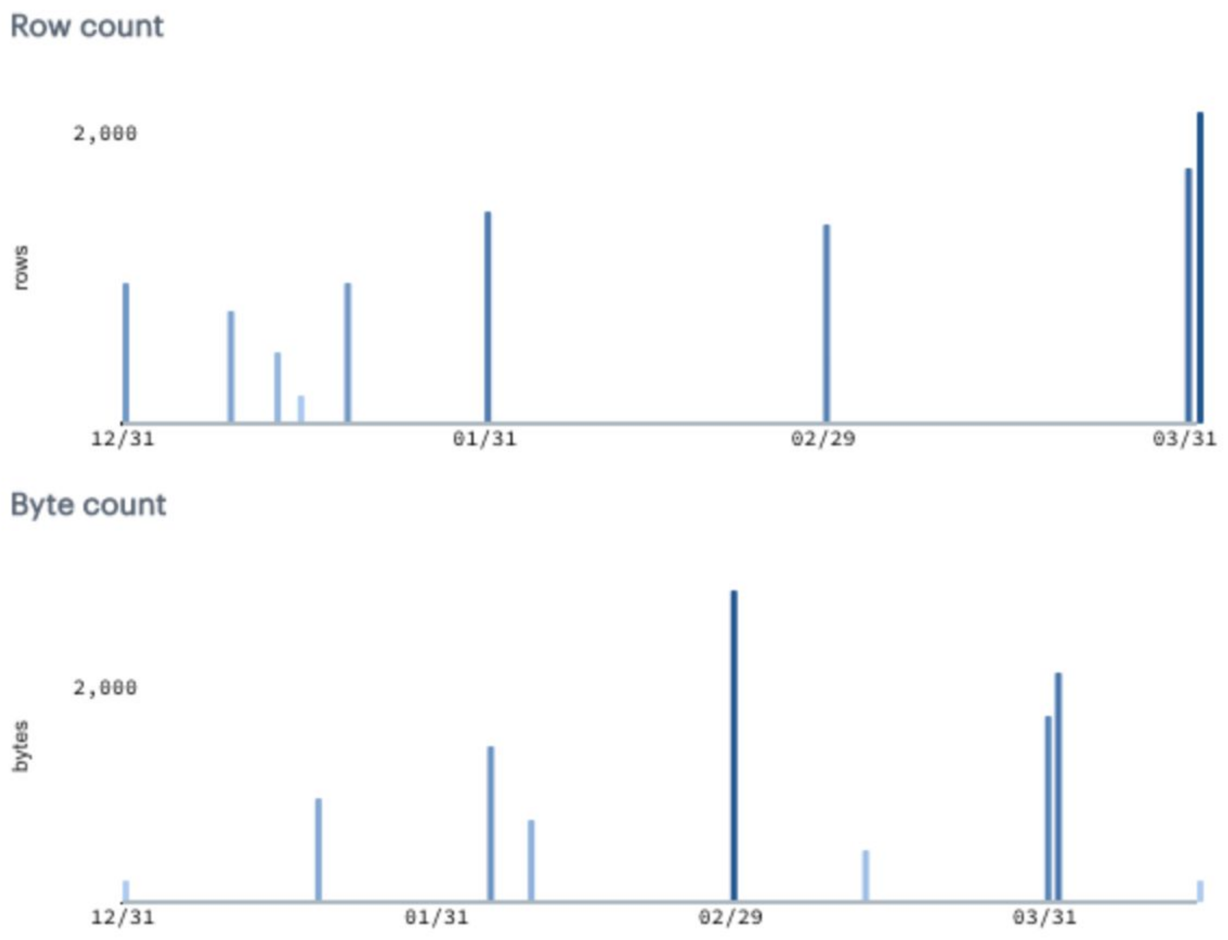
Example of OpenLineage metadata usage:

Data volume evolution



Join the conversation

OpenLineage:

- **Github:** github.com/OpenLineage ★
- **Slack:** OpenLineage.slack.com
- **Twitter:** @OpenLineage
- **Email:** groups.google.com/g/openlineage

Marquez:

- **Github:** github.com/MarquezProject/marquez ★
- **Slack:** MarquezProject.slack.com
- **Twitter:** @MarquezProject