Batcht# 1949 PT LeWagon Data Engineering , Aug 2025

Modern Banking DWH

Turning fragmented banking data into a reliable, analytics-ready warehouse

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Why this matters: Problems & Impact

Siloed, Slow, and Unmanaged Data

- Data scattered across systems makes analysis slow and unreliable
- Slow batch ingestion delays insights, weakens fraud detection, and limits timely market response

Higher Costs, Lower Trust

- Operational costs rise due to duplicate ETL pipelines and inefficient storage.
- Without centralized governance and lineage, confidence in analytics drops.

Fraud Loss Multiplied

- When banks absorb €4.12 for every €1 of fraud, customers feel it too — through higher fees, tighter controls, and lower trust
- In EMEA, 52% of fraud losses now occur via digital channels, surpassing physical fraud for first the time .

Our Solution

A Scalable, Modular Data Platform

01. Data Vault + 6NF Modeling

Replaces siloed, inconsistent data with a unified structure optimized for auditability, flexibility, and analytics.

02. Modular Cloud Architecture

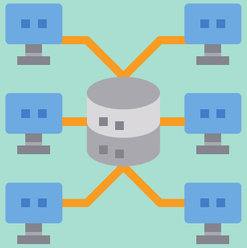
Separates ingestion, staging, modeling, and visualization — supports future scale and ML use.

03. CI/CD + Orchestration

Enables automated updates, reliable testing, and faster delivery through GitHub Actions + Airflow.

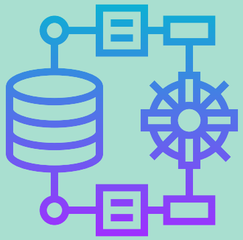
Data Vault + 6NF

A robust and flexible foundation for scalable analytics



Data Vault

- Separates raw data from business logic
- Flexible & scalable — schema changes don't break the model
- Built for auditability and long-term growth



6NF Modeling

- Clean separation of every changing attribute
- Enables versioned, historical analysis (e.g. setting/plan changes)

Impact on Analytics

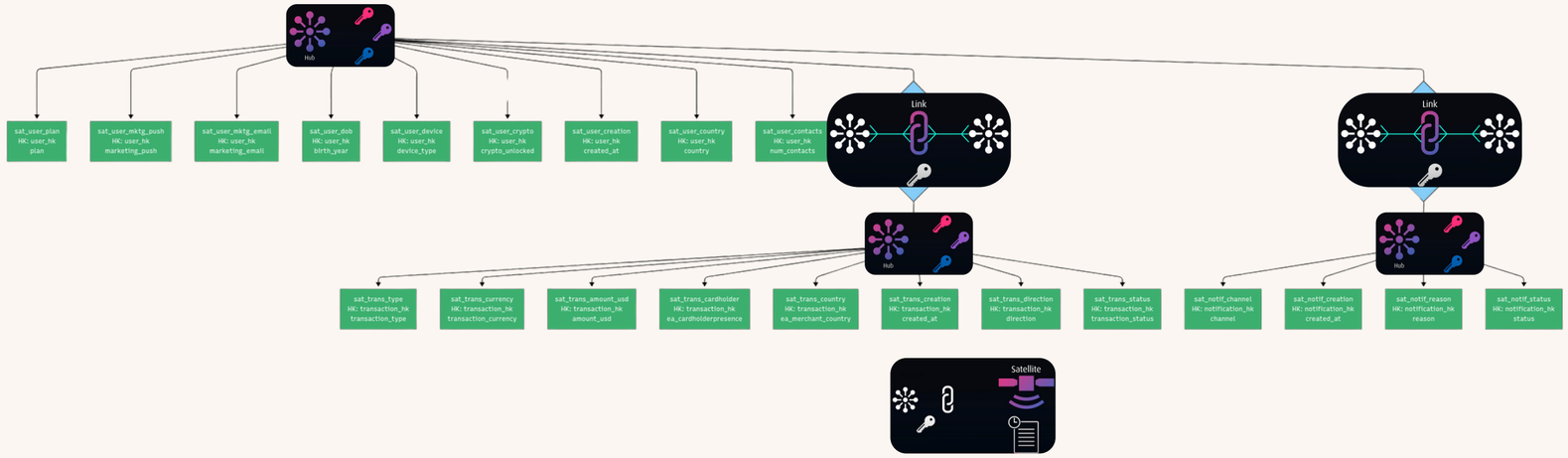
- Time-based insights — enables history-aware analytics
- Full lineage — every metric can be traced back to source & timestamp

Our vault architechture

Modelling data using Hub, Links and Satellites: Present all the data, all the time

Why vault?

- **Incremental:** add sources & changes with minimal rework
- **Raw first:** store unchanged history, apply rules later
- **Traceable:** full lineage & auditability built in
- **Automatable:** insert-only, parallel loads



Our vault architechture

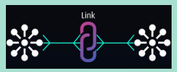
Incremental, insert-only, parallel; BI on marts

How it works?

Philosophy: Raw first, rules later; keep all data + lineage

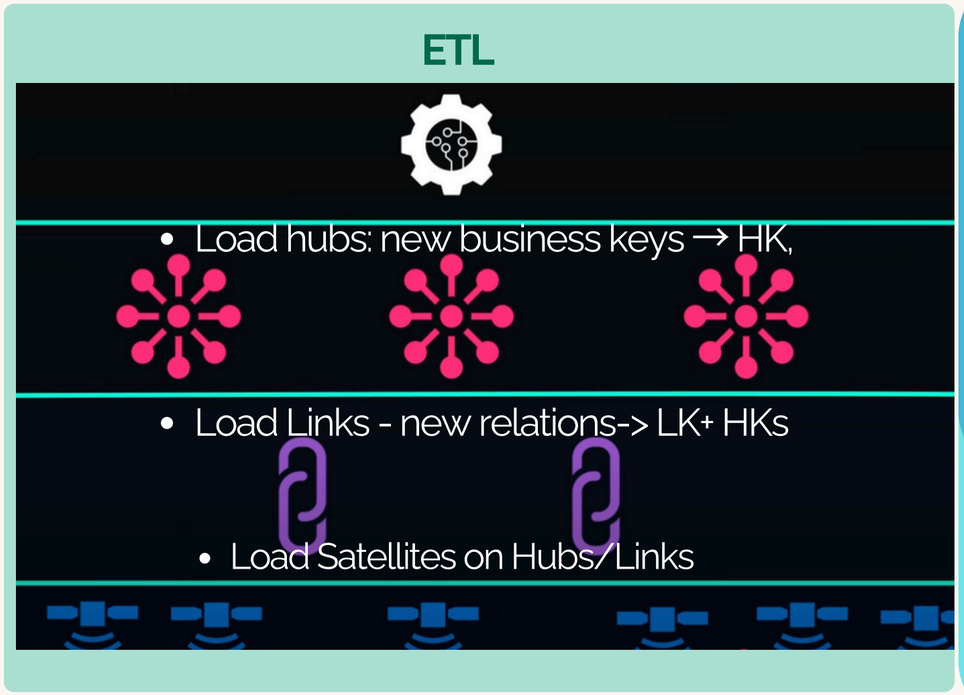
Layers: Staging → Raw Vault →
(Business Vault) → Marts

Hub = business key



Link = relationship

Satellite = descriptive history



Incemental, insert-only, pallelizable

Continous Integration & Development (CICD)

Safe & Automated Development

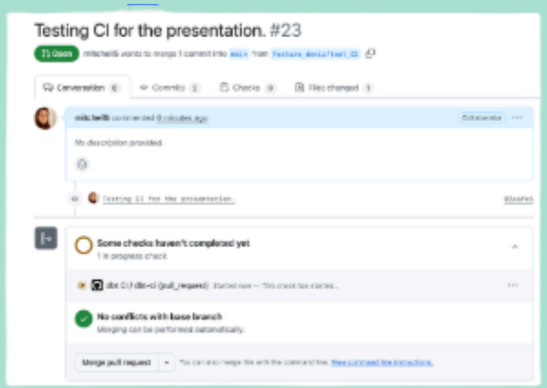
GitHub Actions

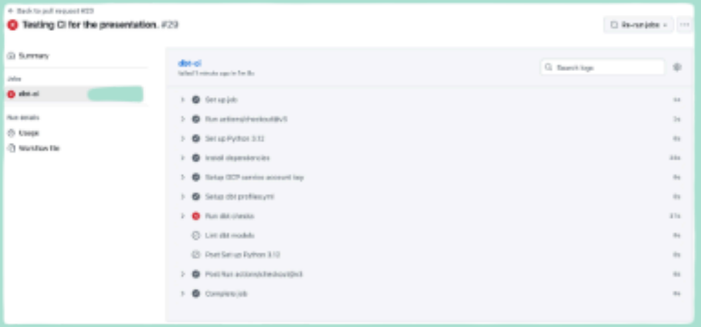
Continous Integration

- CI runs on pull requests to dbt models only
- Builds on ubuntu-latest
- Uses Poetry to install dependencies
- Injects GCP credentials securely
- Automatically rewrites profiles.yml for dataset selection
- Runs dbt deps, dbt build, and SQLFluff for linting
- Fails the build and blocks merge if anything breaks

Continous Development

- Streamlit cloud provides CD

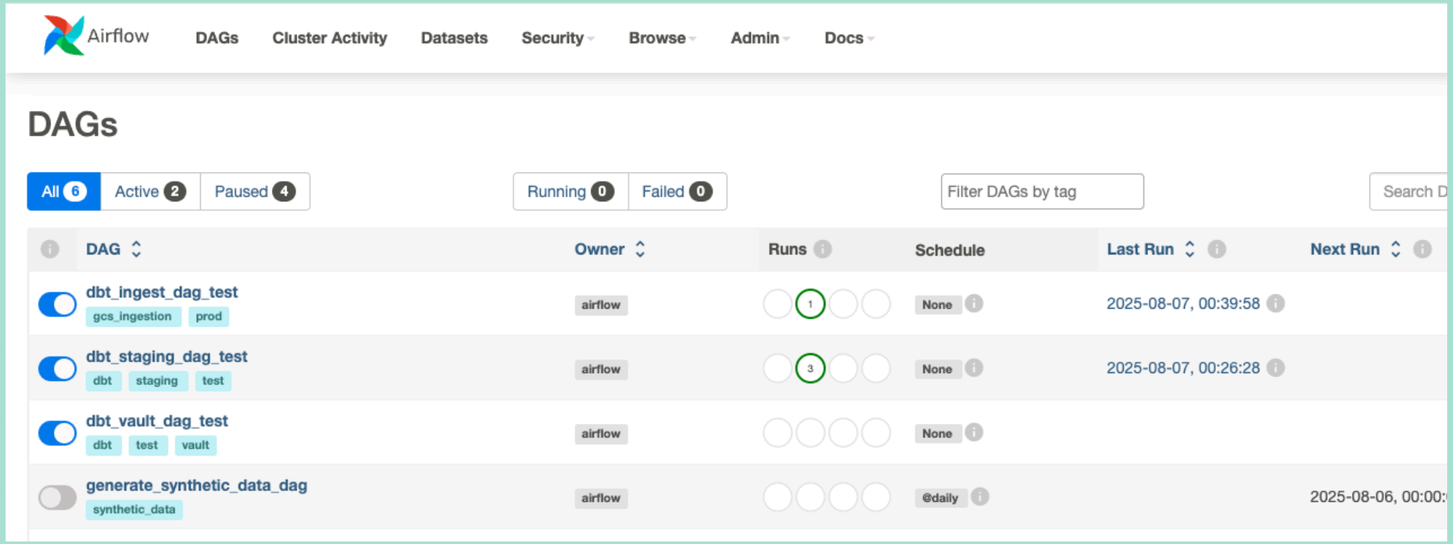




Orchestration

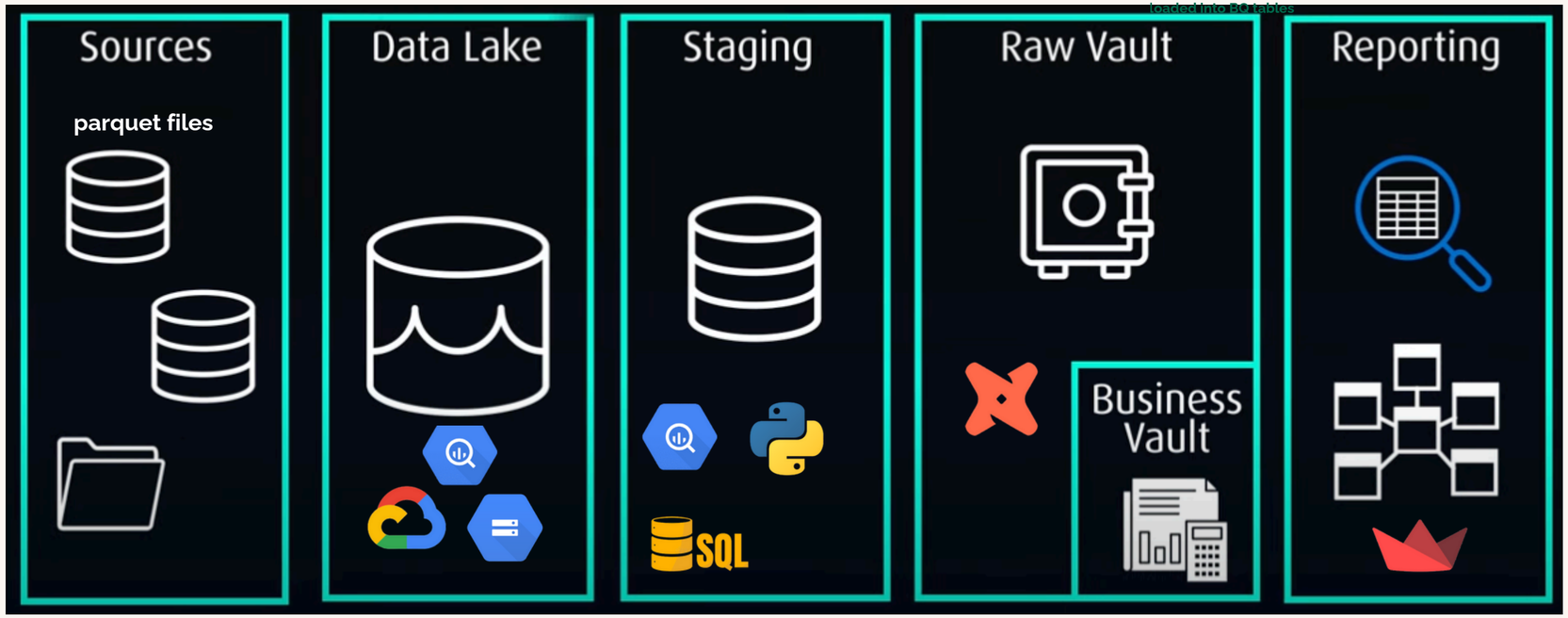
Triggering ingestion, transformation, and model runs on schedule

- DAGs split by stage: ingest, staging, and vault
- Each DAG handles a distinct layer of the pipeline
- Can be triggered manually or scheduled
- Airflow ensures dependency order and scalability



Our Pipeline in Action

How we ingest, transform, model & visualize the data



Visualization

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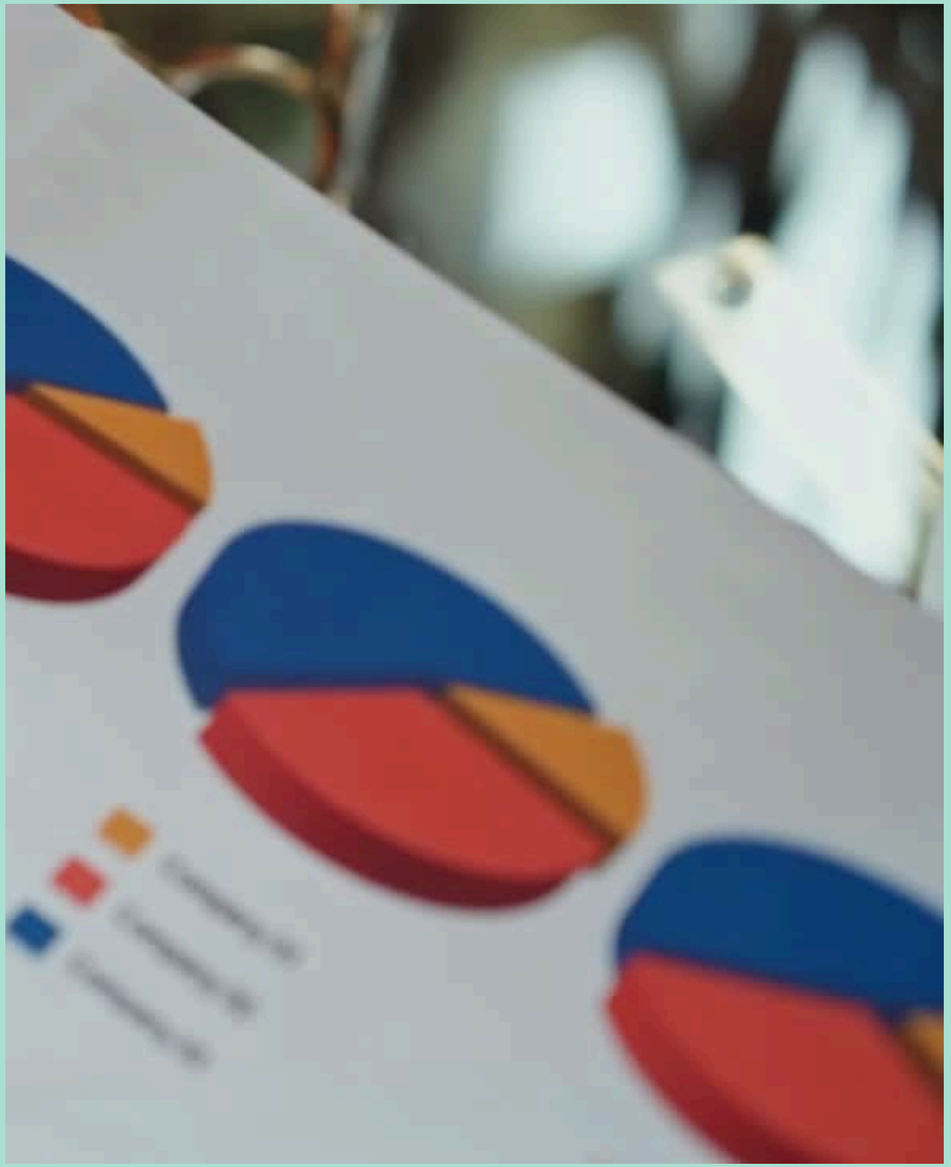

Sucess Metrics

Turning complete data ingestion into actionable insights — with automation built in.

- 100% ingested data sources
- Tested all models
- Created visualizations per each mart
- Provided MVP + CICD integration
- Fully orchestrated by airflow!

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Dev Team

Deniz

SOFTWARE ENG

Emma

DATA ANALYST

Lina

MATHEMATICIAN

Architechture as a Team

External and Internal Challenges

- ☁️ 3 developer VMs on GCP for local experimentation
- 📦 Central GitHub repository for collaboration & version control
- 🚀 1 production VM for deployment & dashboard hosting

🔁 **Workflow:**

- Developers work in branches
- •Submit Pull Requests to dev
- After validation, merge to main

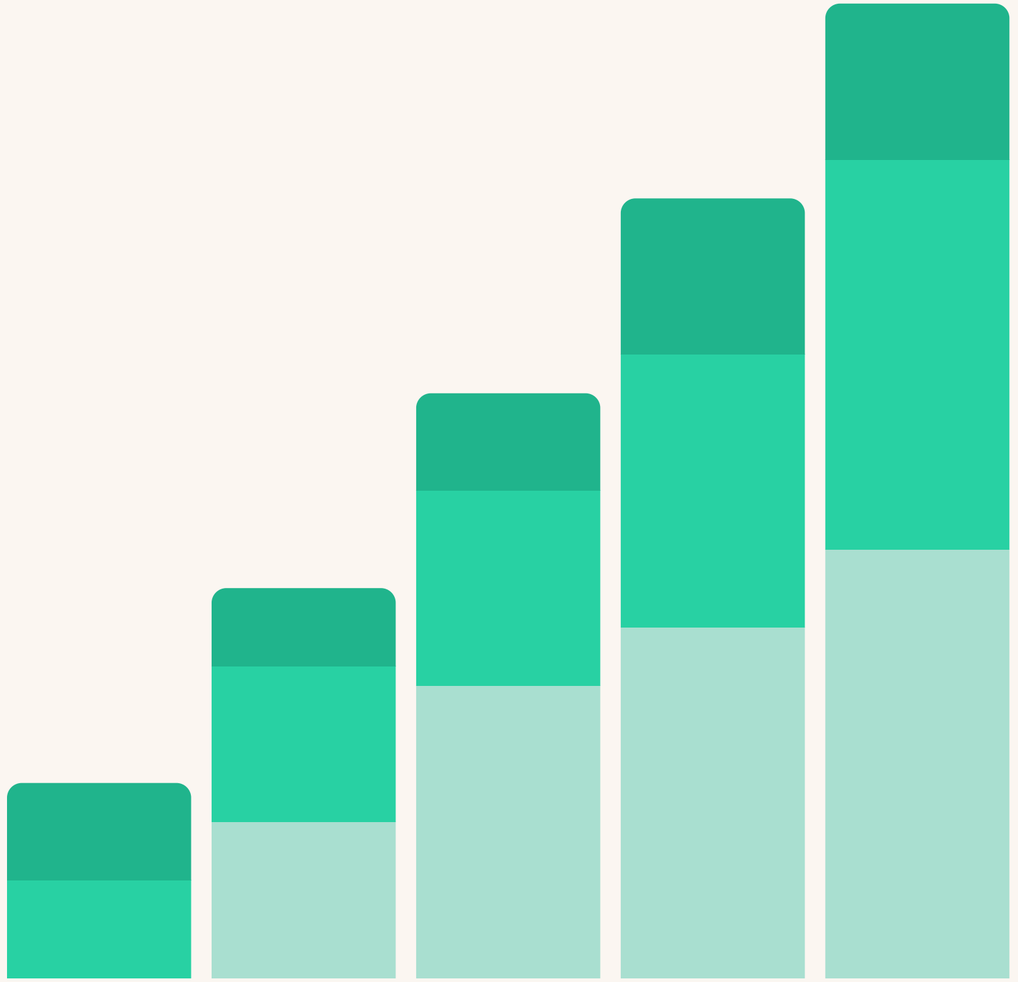
Keep up

How we plan to scale and improve our data platform in the short term:

- 🤖 Enable API access to our dashboard
- → Use LLMs to assist with natural language queries (e.g., “Show churn by plan last month”)

- 🧠 Introduce ML models
- → Predict fraud patterns and analyze churn risk

- 🔄 Add Airbyte for real-time ingestion
- → Automate ingestion from multiple sources to reduce latency and manual work



Thank you!