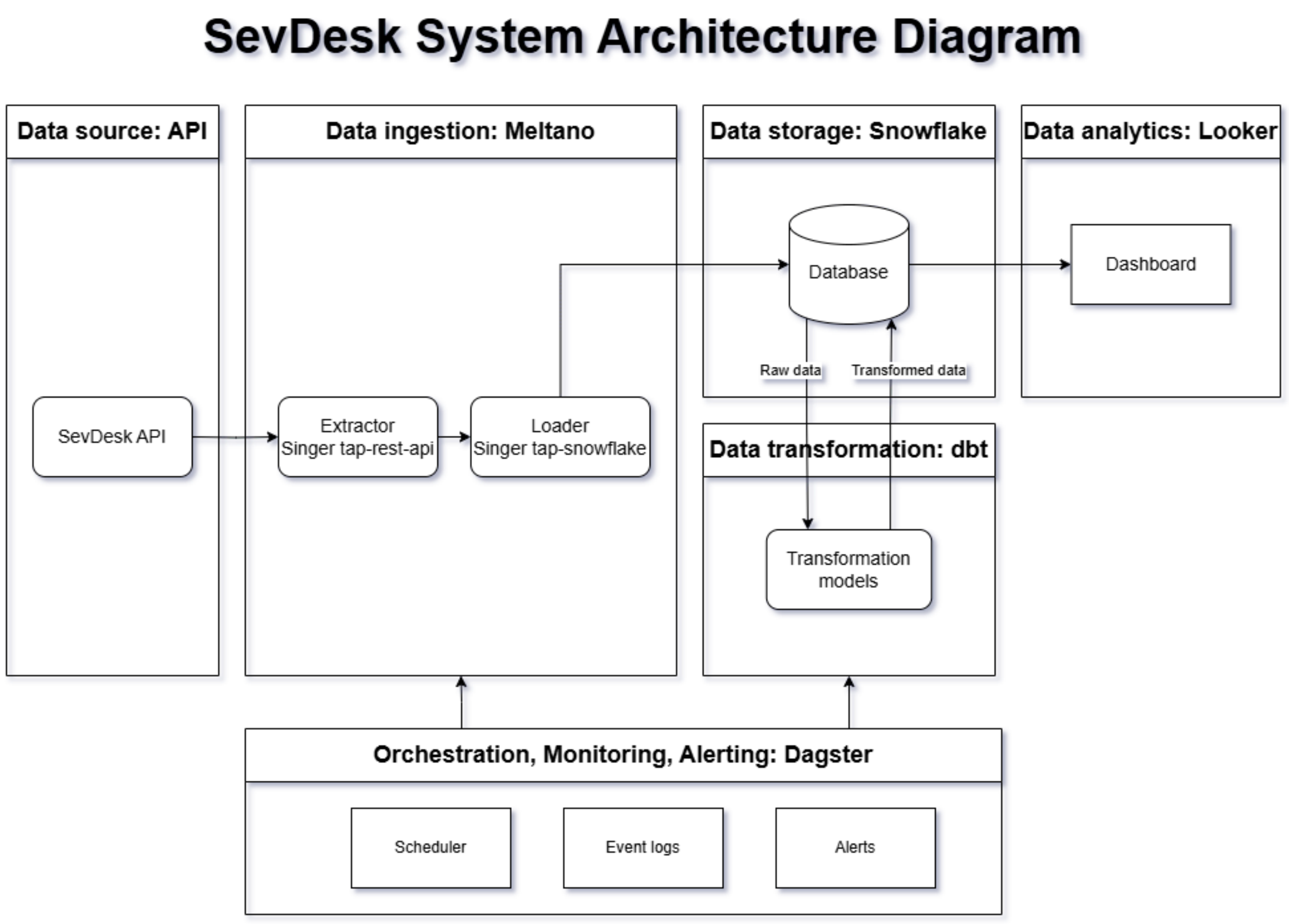
Exercise: Build a Data Platform Design

System Architecture Diagram



Tech Stack

Component	Tool	Purpose	Why?
Orchestration	Dagster	Schedule, execute, and monitor pipelines (Meltano + dbt workflows)	Modern orchestrator with lineage, status, retriy policies
Ingestion	Meltano SDK	Uses Singer taps (APIextractor + Snowflake loader)	Plugin-based extract/load, flexible to create custom plugins
Data Warehouse	Snowflake	Central storage of raw + transformed data	Cloud-native DWH with scalability, security, and dbt compatibility
Transformation	dbt	SQL-based modeling and transformations	Integrates with Snowflake, git-friendly, future-ready for Looker
Analytics	Looker	BI dashboard and exploration layer	Connects directly to Snowflake, supports dbt layer

Component	Tool	Purpose	Why?
Monitoring & Alerting	Dagster	Observability and alerting	UI for visual monitoring of logs, built-in alerting system (Slack/Email)

Data Piepline Steps for SevDesk invoices

1. Data extraction

- Job: set and scheduled on Dagster
- Frequency: the meltano pipeline is run on a fixed schedule (e.g., every hour)
- Extractor: `tap-rest-api-msdk` in Meltano.
- Configuration:
    - API URL: https://my.sevdesk.de/api/v1/
    - Headers: `Authorization header ({{ env('SEVDESK_API_KEY') }})`, dynamically set from environment variables stored in `.env`
    - Streams: The pipeline is designed to extract objects from `/Invoice` endpoint

```
meltano.yml
...
  extractors:
  - name: tap-rest-api-msdk
    variant: widen
    pip_url: tap-rest-api-msdk
    config:
      api_url: "https://my.sevdesk.de/api/v1"
      headers:
        Authorization: "{{ env('SEVDESK_API_KEY') }}"

      streams:
      - name: "invoice"
        path: "/Invoice"
        method: "GET"
        records_path: "objects"
...
```

2. Data loading

- Loader: `tap-snowflake` in Meltano
- Configuration:

```
meltano.yml
...
  loaders:
  - name: target-snowflake
    variant: meltanolabs
    pip_url: meltanolabs-target-snowflake
```

```
      config:
        user: "{{ env_var('SNOWFLAKE_USER') }}"
        password: "{{ env_var('SNOWFLAKE_PASSWORD') }}"
        account: "{{ env_var('SNOWFLAKE_ACCOUNT') }}"
        warehouse: "{{ env_var('SNOWFLAKE_WAREHOUSE') }}"
        database: "{{ env_var('SNOWFLAKE_DATABASE') }}"
        schema: "{{ env_var('SNOWFLAKE_SCHEMA') }}"
        role: "{{ env_var('SNOWFLAKE_ROLE') }}"
...
```

- Output: load data into `SEVDESK.raw.invoices` table in Snowflake

3. Data Transformation

- Trigger: Dagster triggers the dbt transformation jobs to run directly on Snowflake
- Transformation: dbt models will clean and reshape this raw data to meet business requirements. The transformations can include aggregations, filtering, or creating new dimensions
- Output: cleaned data into `SEVDESK.staging.invoices_stg`, curated data into `analytics.invoices_summary` for e.g (business-ready models)

4. Data amalytics

- Looker Integration: Looker can directly query `analytics.invoices_summary` in Snowflake for business intelligence and analytics reporting
- Ouput: insight extraction from the data into dashboard

5. Monitoring and alerting

- Visualization: job executions can be accessed real time on Dagster UI
- Configuration: send Slack/email notification to stakeholders whenever a pipeline fails, or retries are needed

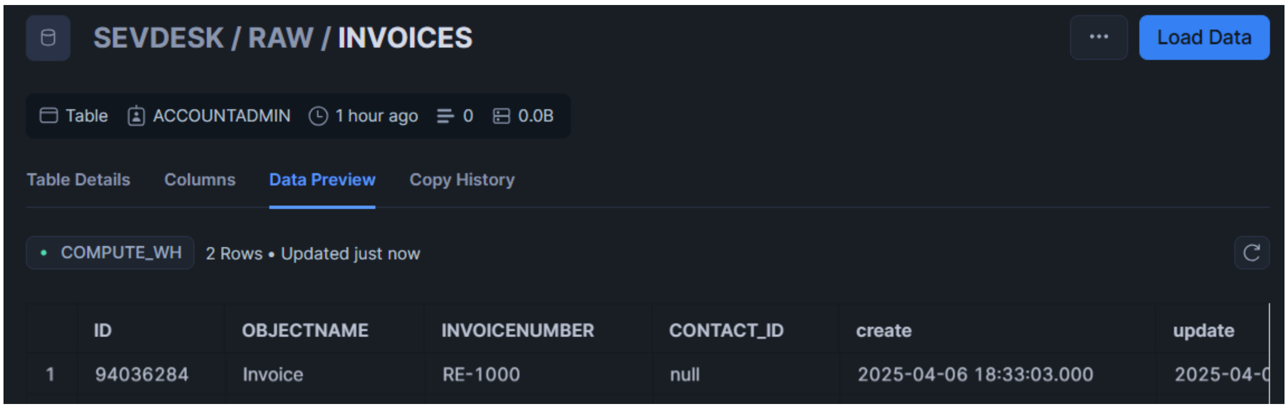
Use Case: Invoice Revenue Ranking by Country

The Finance or Sales team wants a dashboard that shows:

- The total invoice amount per city in €
- Updated every hour

1. Invoice data is ingested using maltano extractor triggered every hour by dagster

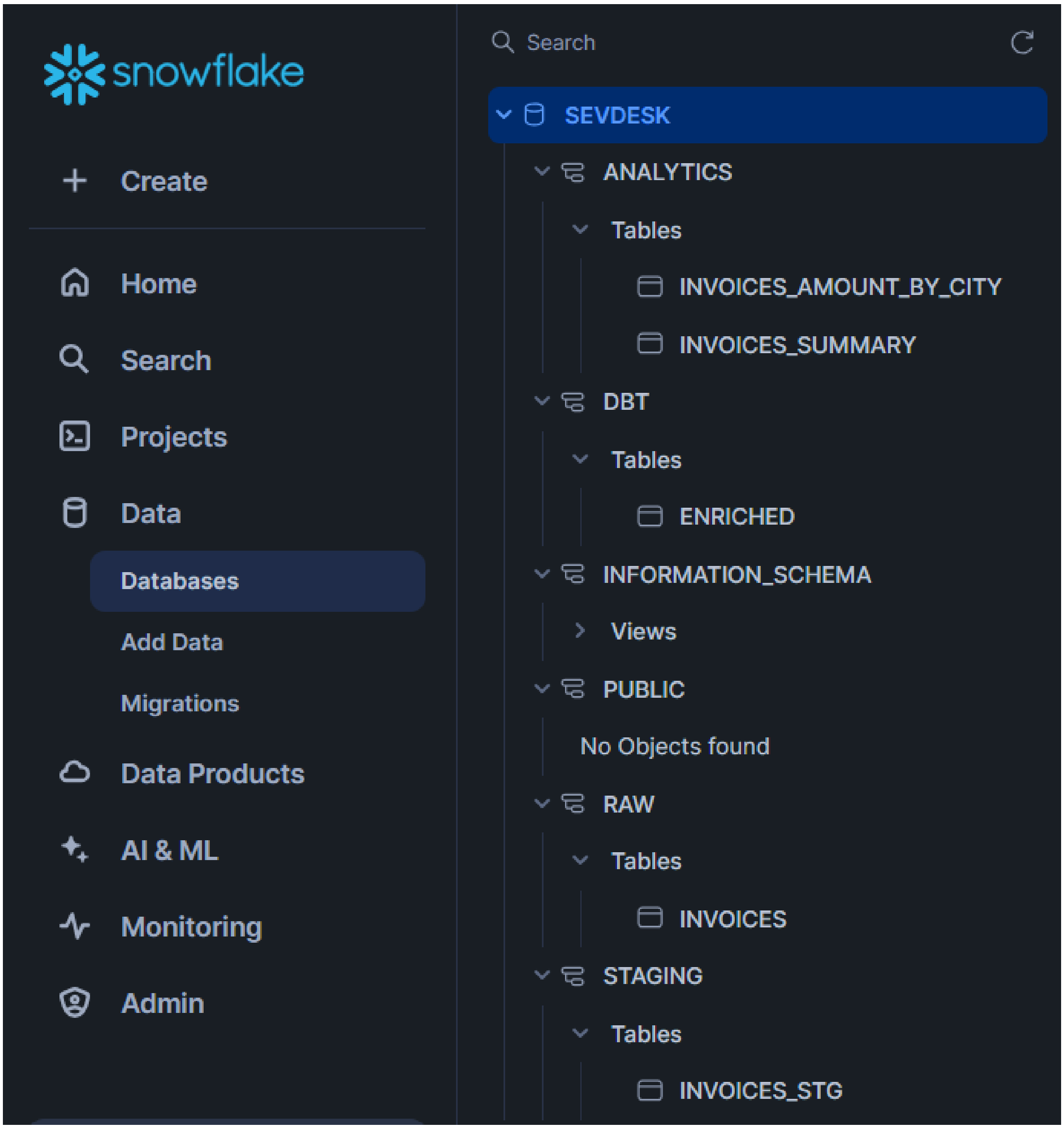
2. Data is loaded into snowflage raw schema


SEVDESK / RAW / **INVOICES**

2 Rows • Updated just now

	ID	OBJECTNAME	INVOICENUMBER	CONTACT_ID	create	update
1	94036284	Invoice	RE-1000	null	2025-04-06 18:33:03.000	2025-04-0

3. dbt staging models clean fields, cast types, convert ammount to the same currency, create a new table `analytics.invoices_amount_by_city`



4. Looker query the table in snowflake to generate a dashboard

5. Dagter sends a notification in case one of the pipeline failed so that the finance team knows the dashboard is outdated

Possible Enhancements

Incremental Loading

- Problem:
  Loading all data every time from the SevDesk API can be inefficient, especially as the data grows over time
- Solution:
  Implement incremental loading using `update` timestamps in the SevDesk API. Only new or updated records are loaded, reducing the amount of data transferred and stored.
- Implementation:
  Modify the extractor (tap-rest-api-msdk) to fetch data based on `update` fields

Event-Driven Ingestion via Webhooks

- Problem:
  Relying on a fixed schedule for data extraction can result in delays
- Solution: Integrate webhooks to trigger data extraction whenever there is new data in SevDesk (e.g., a new invoice or payment)
- Implementation: Implement a webhook listener to trigger the Meltano extraction pipeline upon receipt of an event from SevDesk. This can be done by using an HTTP API in Dagster

CI/CD for Pipeline + dbt Deployment

- Problem:
  Maintaining pipeline and transformation code manually can be error-prone
- Solution:
  Use a CI/CD pipeline to automatically deploy and test changes to both the Meltano pipeline and dbt transformations
- Implementation:
  Set up a CI/CD pipeline with GitHub Actions to run tests and deploy updates automatically when code is pushed to the repository