Building
Modern Data Stacks

Project Brief

Adventure Works

Adventure works is a bicycle manufacturing company. This project demonstrated how to build data pipelines for an e-commerce, implement machine learning models, and develop business intelligence reporting solutions.

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Building
Modern Data Stacks

First Things First !!!

Four Key Questions

I. Where do we consolidate our data ? > Storage
II. How will we get it there ? > Ingestion
III. How will we clean it up? > Transformation
IV. How will we analyze it? > Reporting

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The
Big Choice

Data Stack

Popular Options

Storage > Snowflake, BigQuery, s3, Redshift
Ingestion > Airbyte, Airflow, Fivetran, dagster
Transformation > dbt
Reporting > Tableau, Power BI, Looker, Superset

N/B This is not an exhaustive list.

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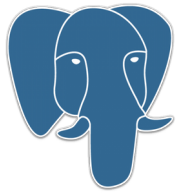
Data Stack Architecture Design

Source

PostgreSQL



Ingestion

Airflow

+

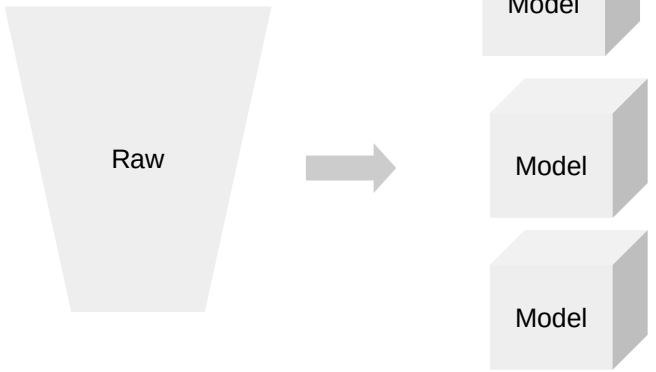
Python

Storage
BigQuery

Amazon **Redshift**

Transformation
dbt

dbt



Reporting

Looker

looker

End Goal

Put data to use - make decisions

“Data is like garbage. You’d better know what you are going to do with it before you collect it.”

~ Mark Twain

PROJECTS

01

Storage/Database/Data Warehouse
Google BigQuery
Snowflake
AWS Redshift

02

Ingestion
Apache Airflow
Airbyte
Dagster

03

Transformation
Setting up dbt
Building Models

04

Reporting
Looker
Tableau
Power BI

02

INGESTION
BUILDING ELT DATA PIPELINE
– Apache Airflow

Setting up Apache Airflow - Documentation

Python ELT (Extract Load Transform) script

```
# importing libraries

from airflow.decorators import dag, task
from datetime import datetime, timedelta
import requests
from google.cloud import bigquery
import pandas as pd
import psycopg2
from io import StringIO
```

02

INGESTION

Setting up Apache Airflow

Defining a DAG - Directed Acyclic Graph

```
args{
    ”owner”:”gwayi”,
    "retries": 1,
    "retry_delay":timedelta(minutes=5)
    }


@dag(
    default_arguments = args
    schedule=timedelta(minutes=30),
    start_date=datetime(2024, 7, 29),
    catchup=False,
    tags=['Team B']
    )
```

02

INGESTION

Setting up Apache Airflow

Extract Task Group – Source PostgreSQL Database

```
@task()
def extract():
  try:
     src_cursor.execute(sql)
     tables = cursor.fetchall()

     output = {}

     for table in tables:
       cursor.execute(f"SELECT *
              FROM {table[0]}")
rows = cursor.fetchall()

output.update({table[0]: rows})
       return output

    except Exception as e:
        print("extract error:" +
str(e))

    finally:
        connection.close()
output = extract()
```

Load
Strategy

Incremental Load

Data Change Capture

Timestamp Approach – extracts all rows modified Since the last execution date {{ds}}.

```
SELECT *
FROM {table[0]}
WHERE last_updated >= '{{ ds }}';
```

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02

INGESTION

Setting up Apache Airflow

Load Task Group – Destination BigQuery

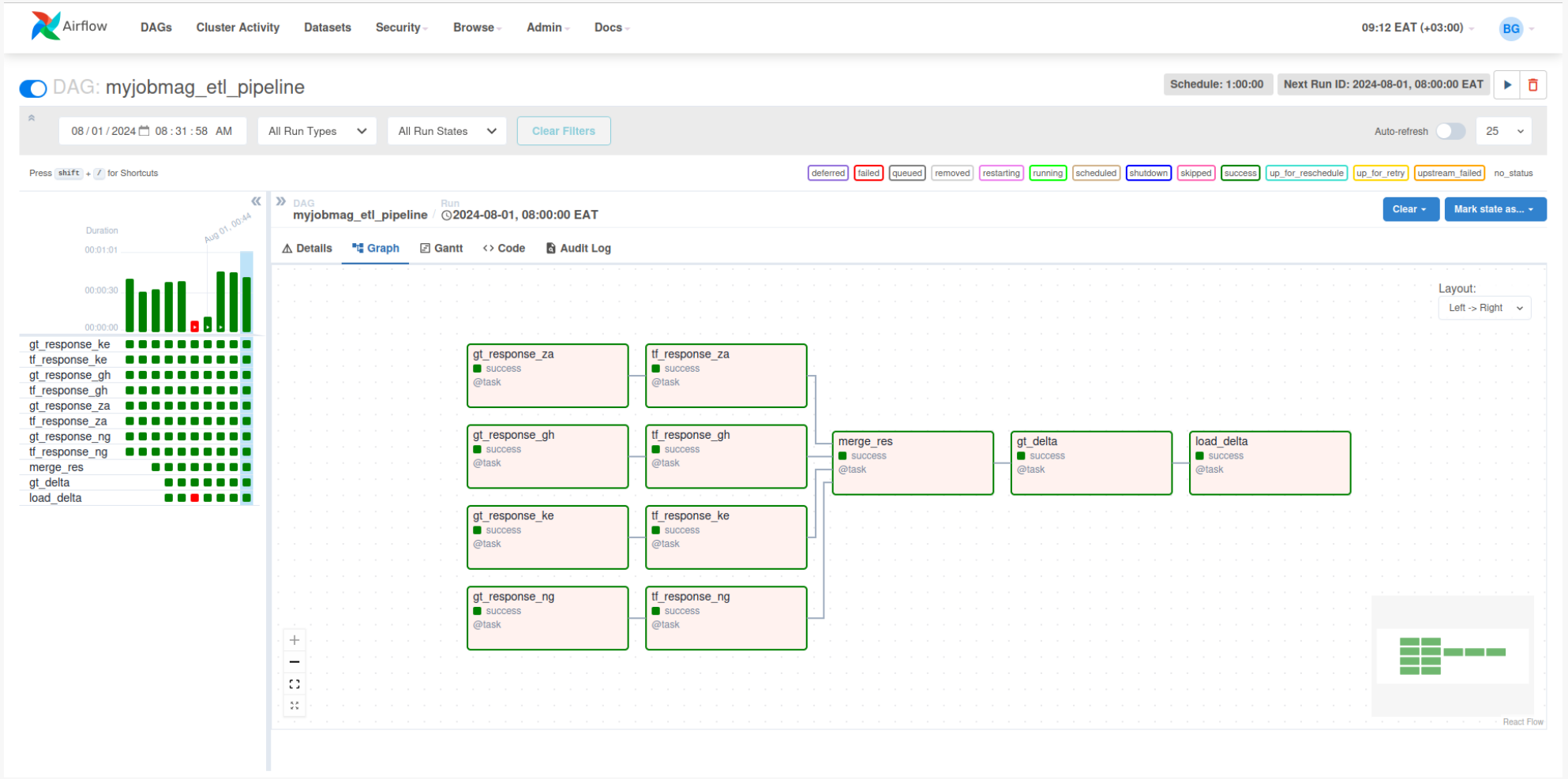
```
task()
@def load(dict):
    pandas_gbq.to_gbq(
        df[{table}],
        project_id=project_id,
        if_exists=append,
load(data)
```

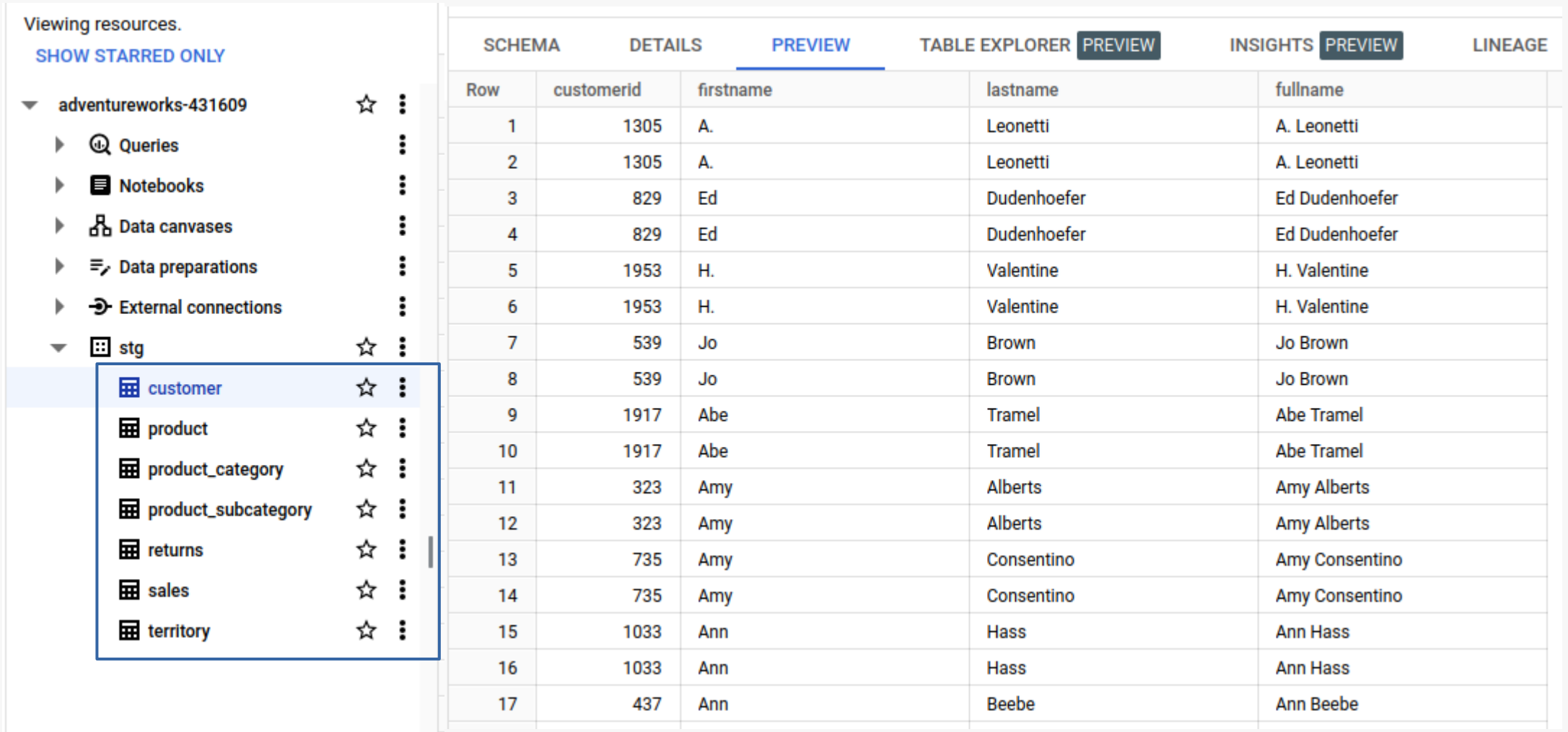
```
Set dependencies

extract = extract()
load = load(extract)

extract >> load
```

Orchestrating Data Pipeline - Airflow




Viewing resources.
SHOW STARRED ONLY
adventureworks-431609
Queries
Notebooks
Data canvases
Data preparations
External connections
stg
customer
product
product_category
product_subcategory
returns
sales
territory
SCHEMA
DETAILS
PREVIEW
TABLE EXPLORER PREVIEW
INSIGHTS PREVIEW
LINEAGE
Row customerid firstname lastname fullname
1 1305 A. Leonetti A. Leonetti
2 1305 A. Leonetti A. Leonetti
3 829 Ed Dudenhoefer Ed Dudenhoefer
4 829 Ed Dudenhoefer Ed Dudenhoefer
5 1953 H. Valentine H. Valentine
6 1953 H. Valentine H. Valentine
7 539 Jo Brown Jo Brown
8 539 Jo Brown Jo Brown
9 1917 Abe Tramel Abe Tramel
10 1917 Abe Tramel Abe Tramel
11 323 Amy Alberts Amy Alberts
12 323 Amy Alberts Amy Alberts
13 735 Amy Consentino Amy Consentino
14 735 Amy Consentino Amy Consentino
15 1033 Ann Hass Ann Hass
16 1033 Ann Hass Ann Hass
17 437 Ann Beebe Ann Beebe

Transformation

Business Modeling

Using dbt build three models ;

ML Model – for Machine Learning Model
Production – for production
Reporting – for reporting

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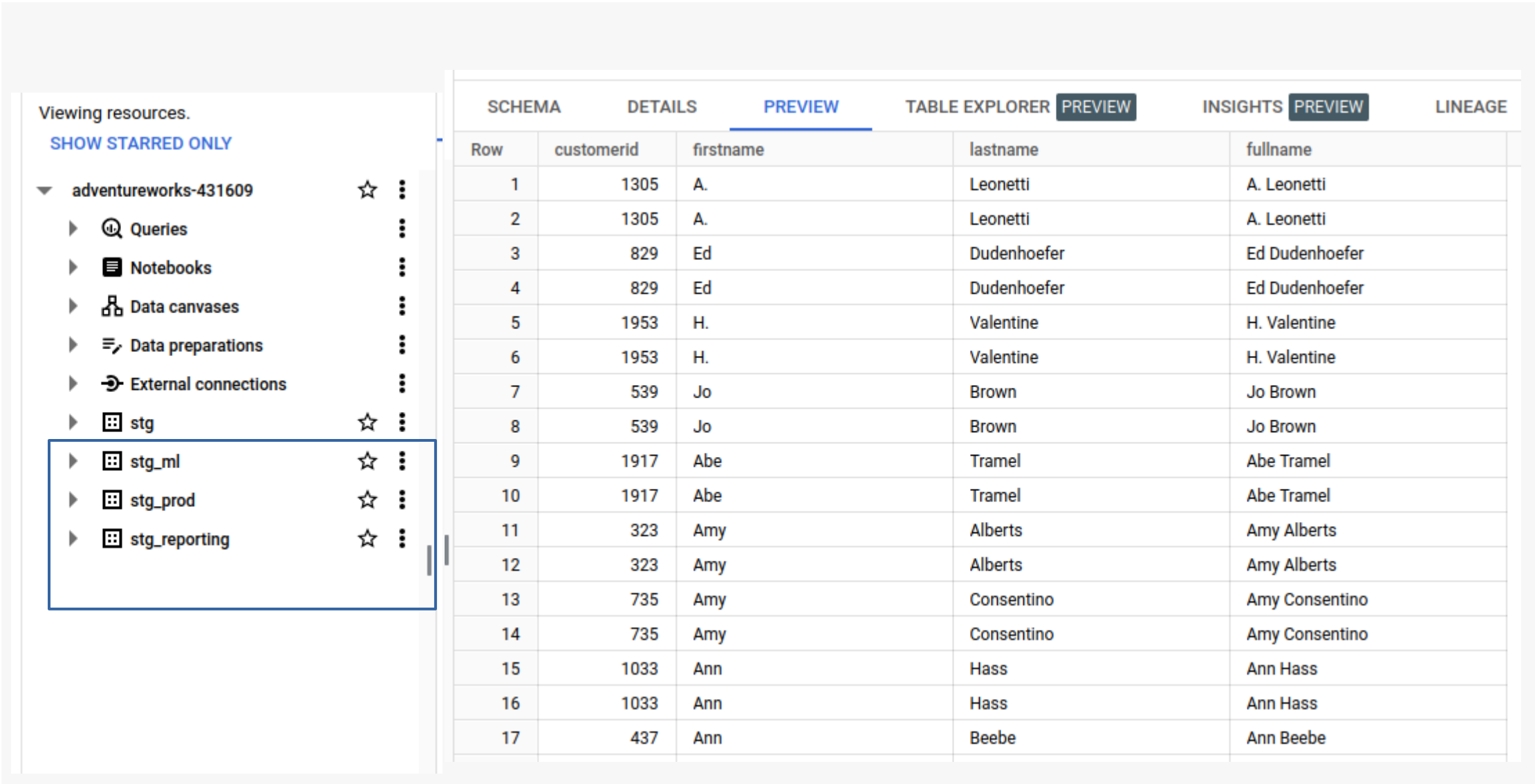

Row	customerid	firstname	lastname	fullname
1	1305	A.	Leonetti	A. Leonetti
2	1305	A.	Leonetti	A. Leonetti
3	829	Ed	Dudenhoefer	Ed Dudenhoefer
4	829	Ed	Dudenhoefer	Ed Dudenhoefer
5	1953	H.	Valentine	H. Valentine
6	1953	H.	Valentine	H. Valentine
7	539	Jo	Brown	Jo Brown
8	539	Jo	Brown	Jo Brown
9	1917	Abe	Tramel	Abe Tramel
10	1917	Abe	Tramel	Abe Tramel
11	323	Amy	Alberts	Amy Alberts
12	323	Amy	Alberts	Amy Alberts
13	735	Amy	Consentino	Amy Consentino
14	735	Amy	Consentino	Amy Consentino
15	1033	Ann	Hass	Ann Hass
16	1033	Ann	Hass	Ann Hass
17	437	Ann	Beebe	Ann Beebe