# Building
# Modern Data Stacks

## Project Brief

**Adventure Works**

This project demonstrate how to build data a modern data stack 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

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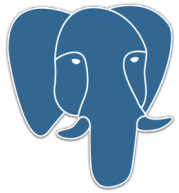
# Data Stack Architecture Design

Source

PostgreSQL



Ingestion

Airflow

+

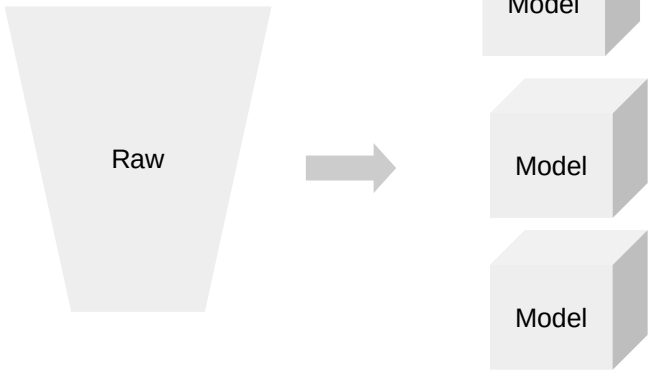
Python

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

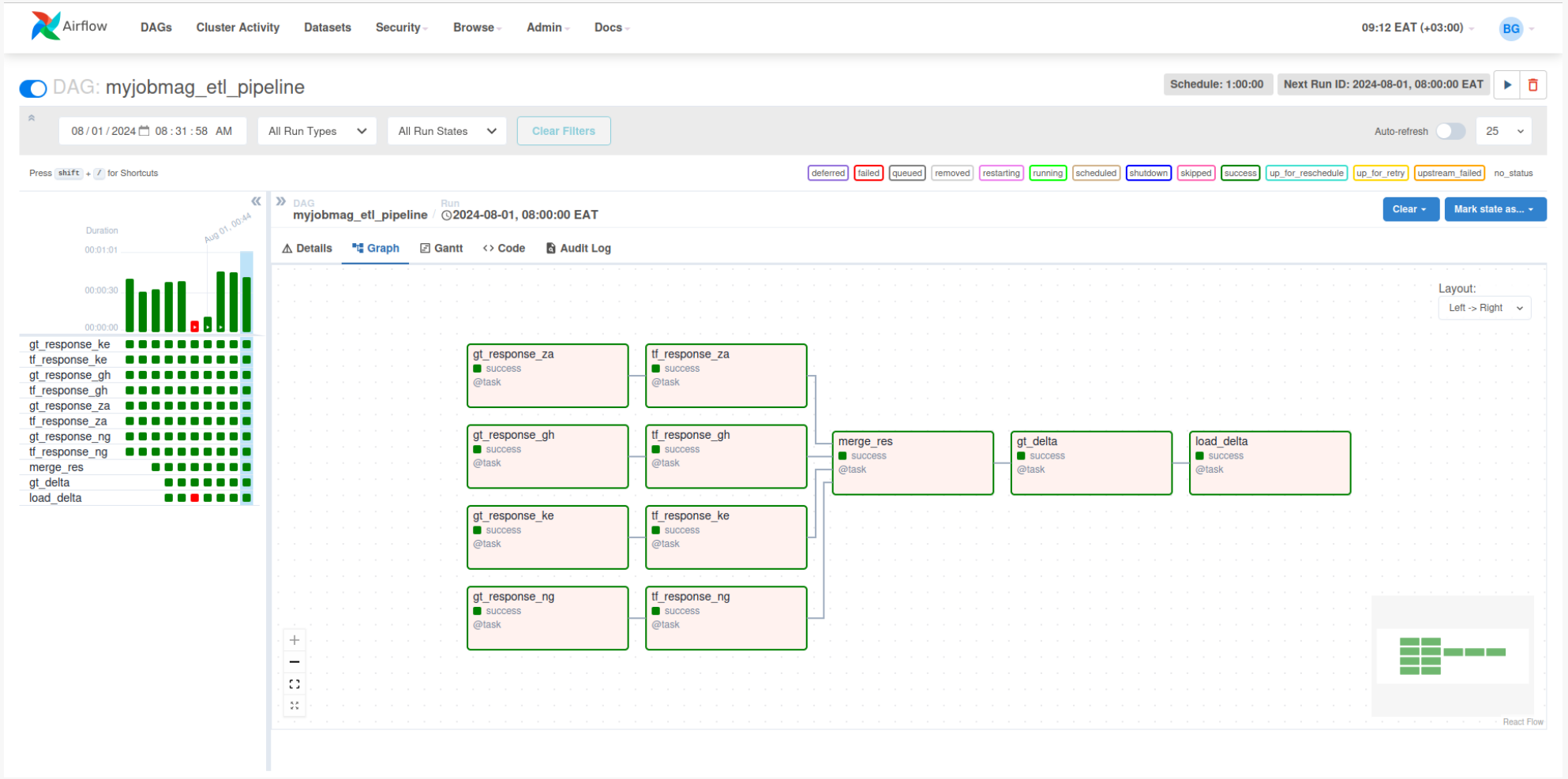
```
task()
@def load(dict):
    pandas_gbq.to_gbq(
        df[{table}],
        project_id=project_id,
        if_exists=append,
load(data)
```

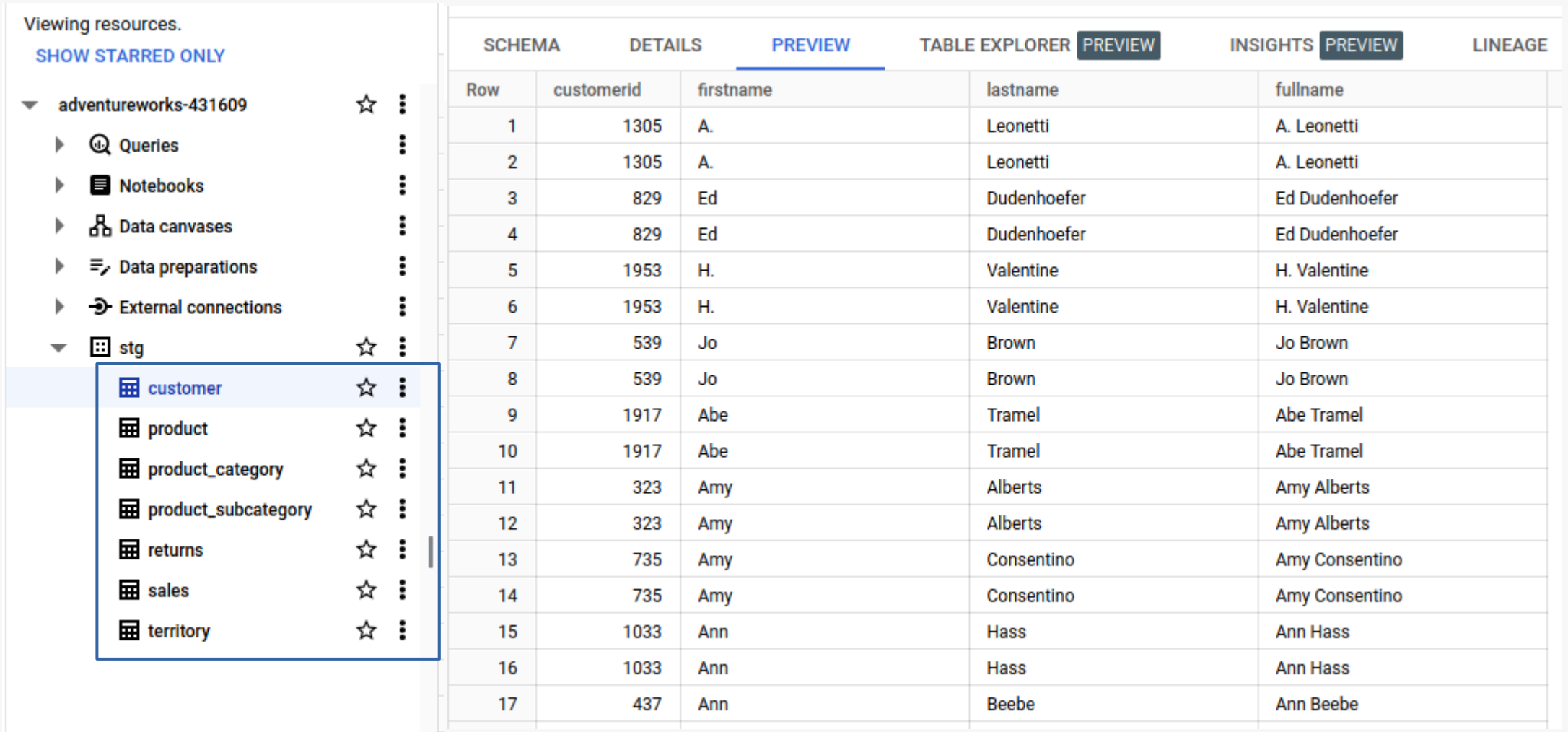
```
Set dependencies

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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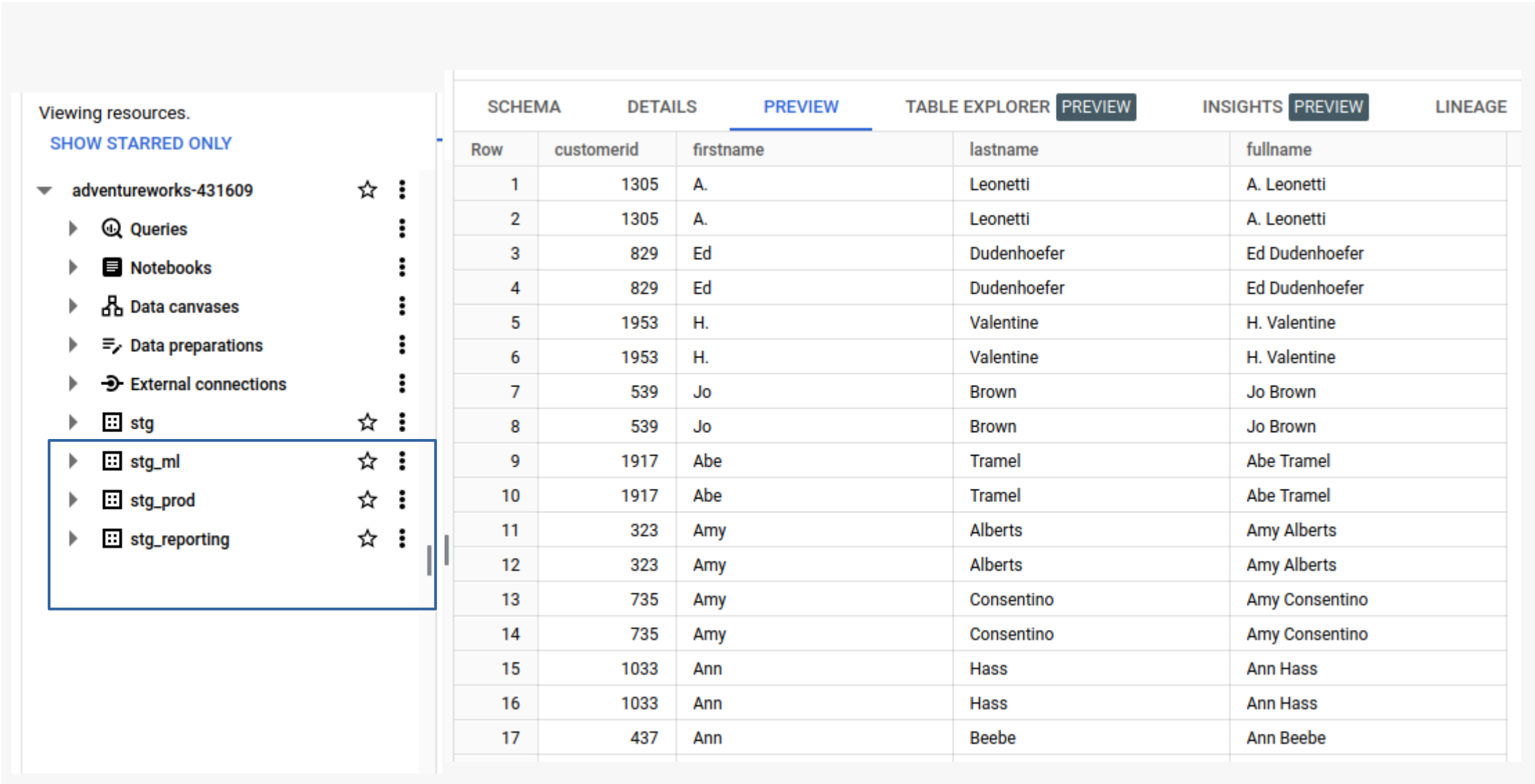


| Row | customerid | firstname | lastname | fullname |
|---|---|---|---|---|
| 1 | 1305 | A. | Leonetti | A. Leonetti |
| 2 | 1305 | A. | Leonetti | A. Leonetti |
| 3 | 829 | Ed | Dudenhoefer | Ed Dudenhoefer |
| 4 | 829 | Ed | Dudenhoefer | Ed Dudenhoefer |
| 5 | 1953 | H. | Valentine | H. Valentine |
| 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 |