Building A Simple Data Stack

Project Brief

This project demonstrate how to implement a modern data stack, build data pipelines, machine learning and reporting capabilities using a variety of solutions.

BRIAN GWAYI
Independent Data Lead & Engineer

First Things First !!!

Five Key Questions

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

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Data Stack Architecture Design

Where is our data?

PostgreSQL

MySQL

How will we get it there?

Airflow

+

Python

Where do we consolidate our data?

Amazon Redshift

Transformation

dbt

Raw

Model

Model

How do we analyze it?

tableau

looker

Power BI

Ultimate End Goal

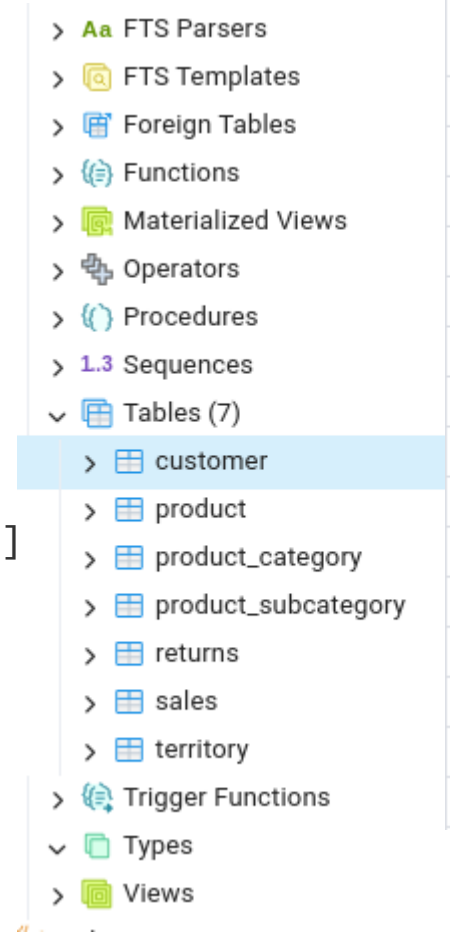
Insights + Action
= Actionable Insights

Observation	Insight	Action
What happened/ will happen?	**Why** did it happened/ will it happen?	**What** do we do?

Where

is Our Data?

```
Source : PostgresSQL
Schema : Public
Database Name: adw_db
Tables Count : 7
Tables : [customer,
          product,
          product_category,
          return,
          sales,
          territory,
          product_subcategory]
```



Data Output | Messages | Notifications

	orderdate date	stockdate date	ordernumber character varying (255)	productkey integer	customerkey integer
1	2022-01-01	2021-12-13	SO61285	529	23791
2	2022-01-01	2021-09-24	SO61285	214	23791
3	2022-01-01	2021-09-04	SO61285	540	23791
4	2022-01-01	2021-09-28	SO61301	529	16747
5	2022-01-01	2021-10-21	SO61301	377	16747
6	2022-01-01	2021-10-23	SO61301	540	16747
7	2022-01-01	2021-09-04	SO61269	215	11792
8	2022-01-01	2021-10-21	SO61269	229	11792
9	2022-01-01	2021-10-24	SO61286	528	11530
10	2022-01-01	2021-09-27	SO61286	536	11530
11	2022-01-01	2021-10-23	SO61298	530	18155
12	2022-01-01	2021-12-02	SO61298	214	18155
13	2022-01-01	2021-12-15	SO61298	223	18155
14	2022-01-01	2021-10-01	SO61310	538	13541
15	2022-01-01	2021-11-08	SO61310	584	13541

How do we ingest Our Data?

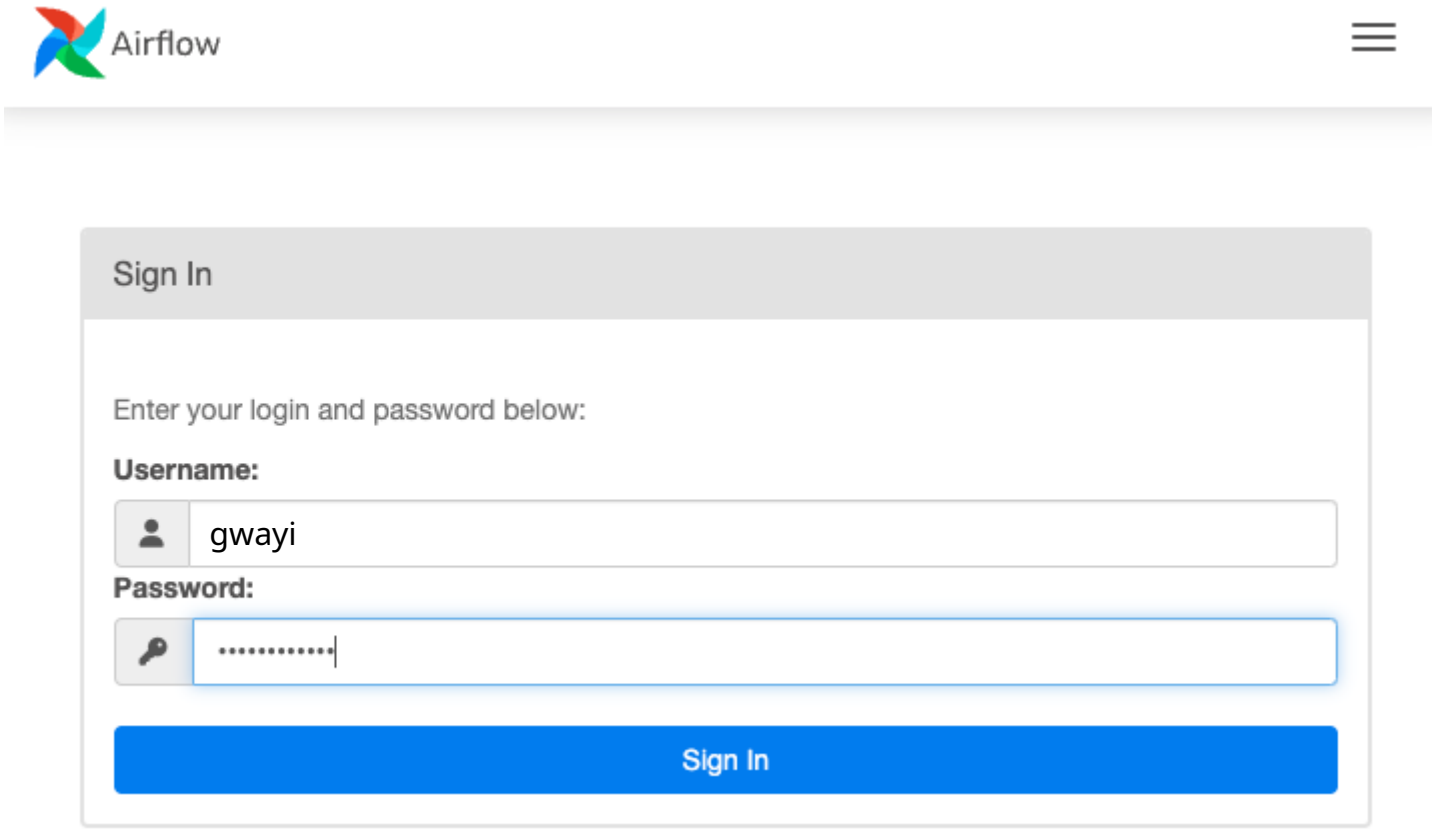
```
Ingestion : python script
Orchestration : Apache Airflow
```

Apache Airflow Setup

```
Terminal

$ python3 -m venv airflow-env
$ source airflow-env/bin/activate
$ export AIRFLOW_HOME=~/airflow
$ pip install apache-airflow
$ airflow db init
$ airflow webserver -p 8080
$ airflow sheduler
```

Apache Airflow Webserver UI



How do we

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```

ELT Python script

```
pip install google-cloud-bigquery

# importing libraries

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

Insatiate a DAG

```
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']
    )
```

How do we

ingest Our Data?

```
Ingestion : python script
Orchestration : Apache Airflow
```

ELT Python script

```
@task()
def get_tables():
"""extract list of tables in public schema"""

  try:
    cursor.execute(
         f"""SELECT table_name
         FROM information_schema.tables
         WHERE table_schema = 'public'"""
         )

    tbls = [x[0] for x in cursor.fetchall()]
```

Insatiate a DAG

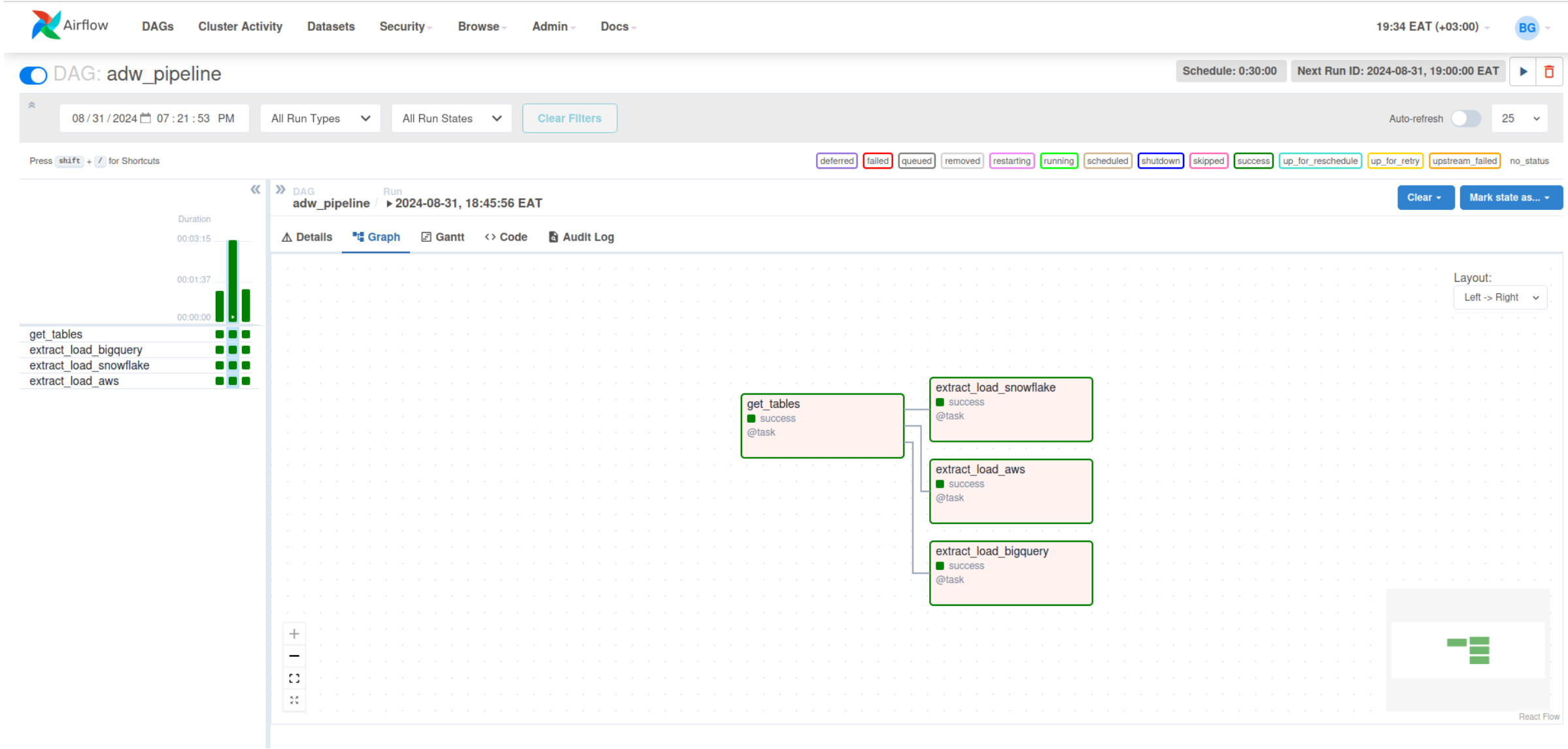
```
@task()
def extract|load_bigquery(tbls, conn):
"""loop through tbls then extract & load"""

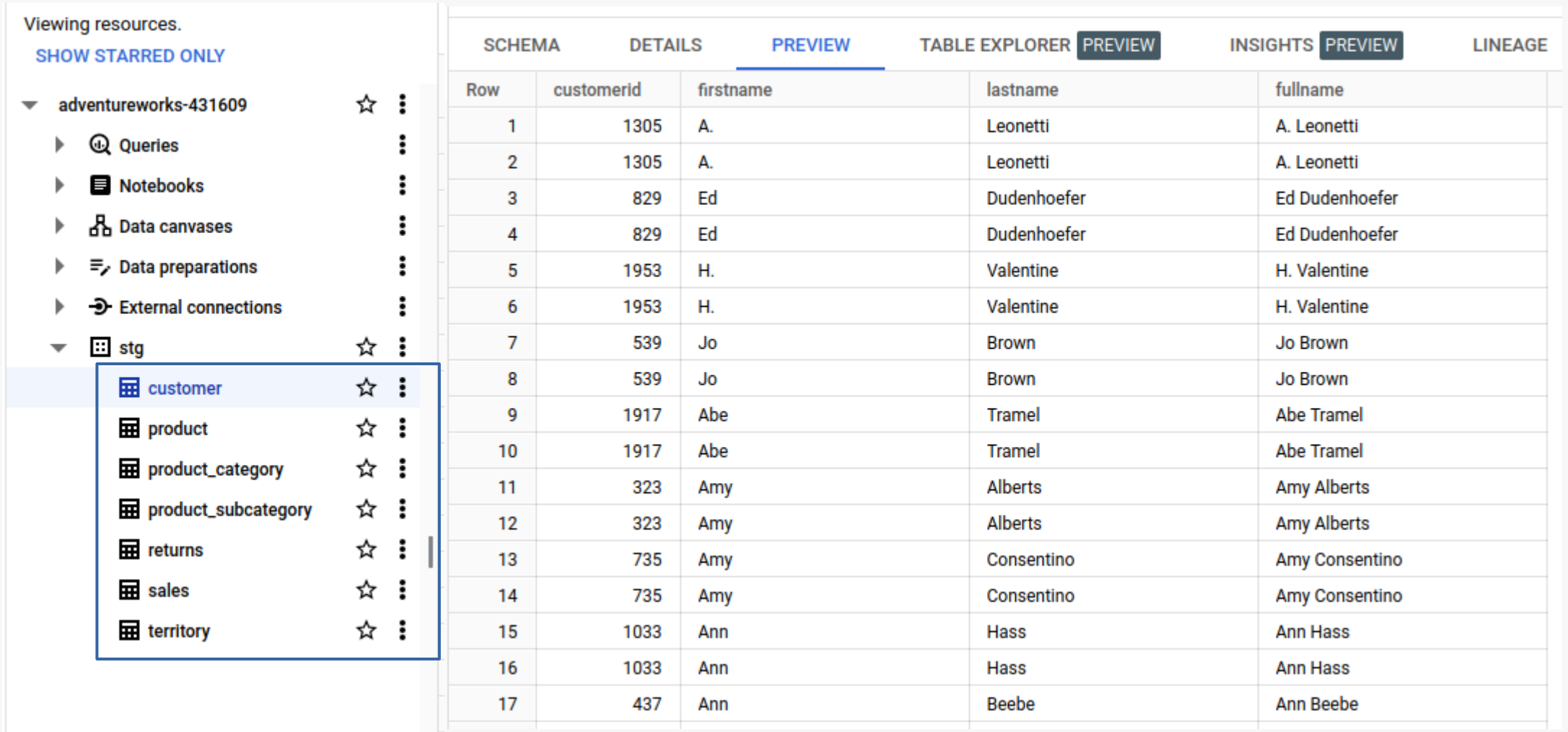
     client = bigquery.Client()
     job_config = bigquery.LoadJobConfig(
     write_disposition="WRITE_TRUNCATE")

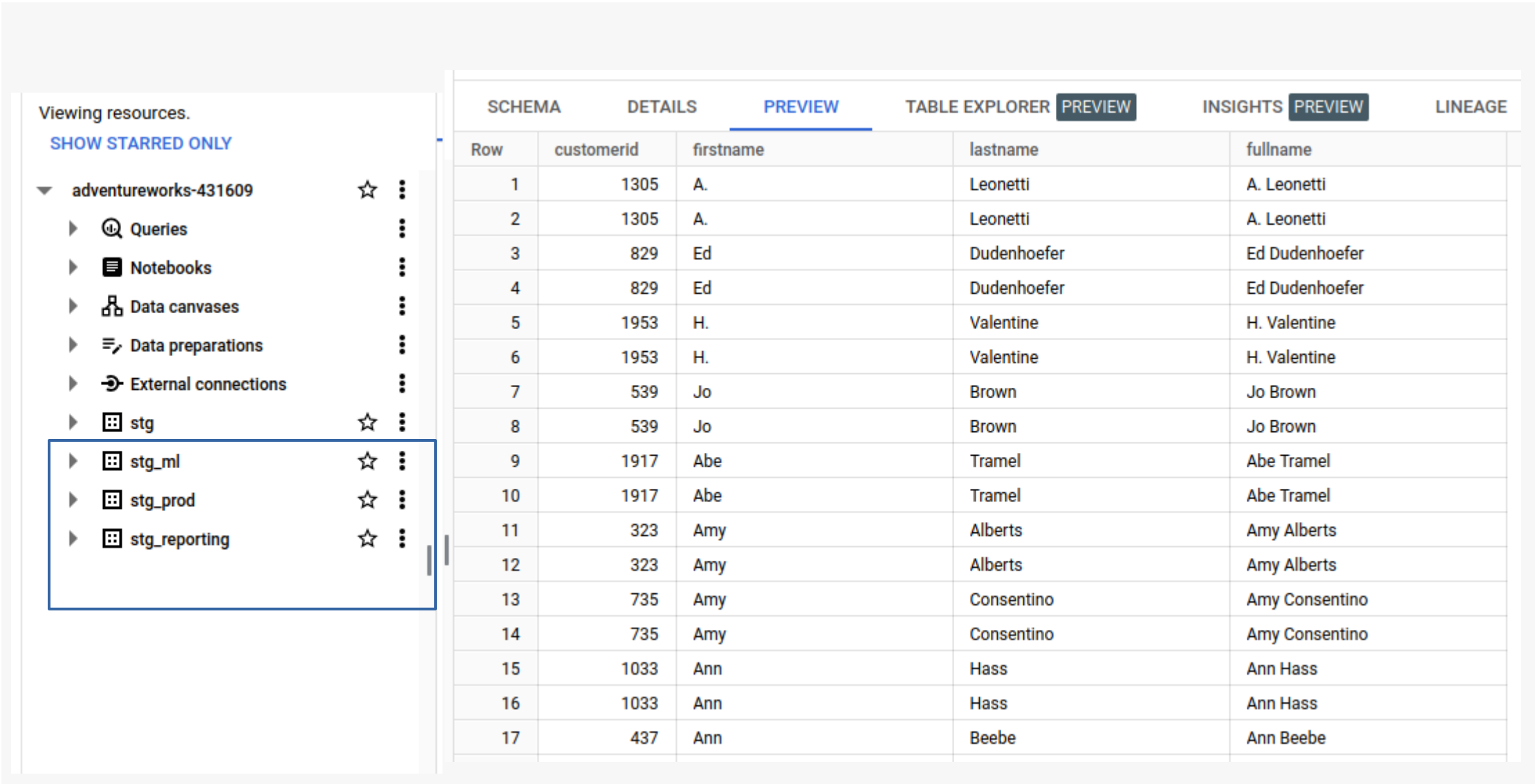

    for tbl in tbls:
      table_id = f"adventureworks-431609.stg.{tbl}"
       sql = f"SELECT * FROM {tbl} WHERE
       updated_at >= '2024-08-12'"
       df = pd.read_sql(sql, conn)


        job = client.load_table_from_dataframe(
        df, table_id, job_config=job_config)
        job.result()

    get_tables = get_tables()
    extract_load = extract_load(get_tables)
```


Airflow
DAGs
Cluster Activity
Datasets
Security
Browse
Admin
Docs
19:34 EAT (+03:00)
BG
DAG: adw_pipeline
Schedule: 0:30:00
Next Run ID: 2024-08-31, 19:00:00 EAT
08 / 31 / 2024 07 : 21 : 53 PM
All Run Types
All Run States
Clear Filters
Auto-refresh
25
Press shift + / for Shortcuts
deferred
failed
queued
removed
restarting
running
scheduled
shutdown
skipped
success
up_for_reschedule
up_for_retry
upstream_failed
no_status
Duration
00:03:15
00:01:37
00:00:00
get_tables
extract_load_bigquery
extract_load_snowflake
extract_load_aws
DAG
adw_pipeline
Run
2024-08-31, 18:45:56 EAT
Clear
Mark state as...
Details
Graph
Gantt
Code
Audit Log
Layout:
Left -> Right
get_tables
success
@task
extract_load_snowflake
success
@task
extract_load_aws
success
@task
extract_load_bigquery
success
@task
React Flow


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



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

PROJECTS

01

Storage/Data Warehouse
Implementing Data Warehouse Solutions
Google BigQuery | Snowflake | AWS Redshift | Oracle ADW

02

Ingestion
Developing Data Pipelines
Python | Airflow | Airbyte | dagster | Prefect

03

Transformation
Setting up dbt
Building Models

04

Reporting
Looker | Tableau | Power BI

05

Machine Learning
Building ML Models