



Building Modern Data Stacks

Project Brief

A d v e n t u r e W o r k s

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

Transformation > [dbt](#)

Reporting > [Tableau](#), Power BI, [Looker](#), Superset

N/B This is not an exhaustive list.

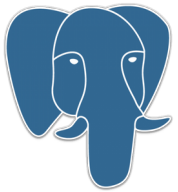
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Data Stack Architecture Design

Source

PostgreSQL



Ingestion

Airflow



+

Python



Storage
BigQuery



Amazon **Redshift**



Transformation
dbt



dbt

Raw



Model

Model

Model

Reporting

Looker





End Goal

Put data to use



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

~ Mark Twain

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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 – 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()
```

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 }}';
```

02

INGESTION

Setting up Apache Airflow

Load Task Group – Destination BigQuery

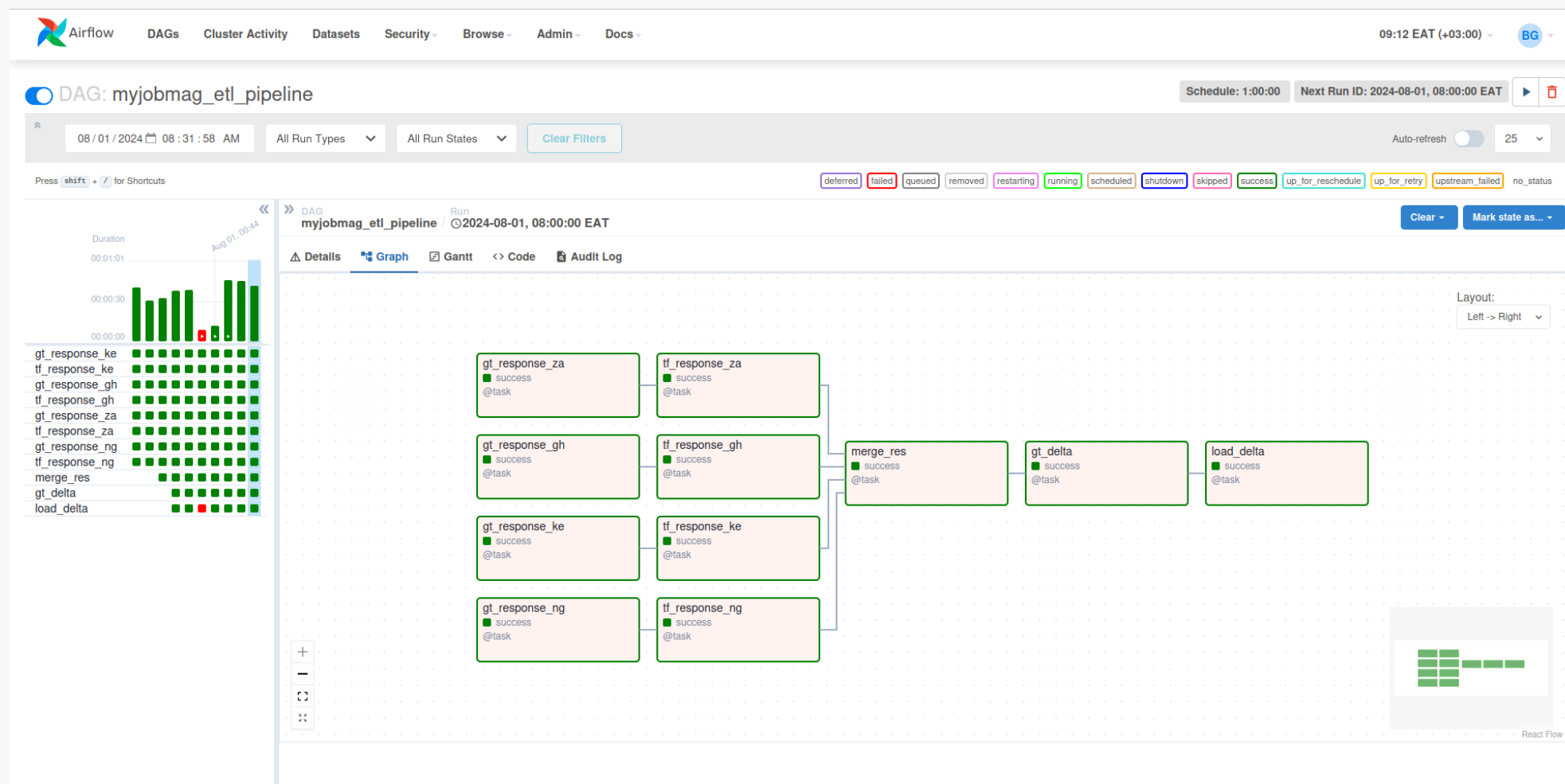
```
task()  
@def load(dict):  
    pandas_gbq.to_gbq(  
        df,  
  
        project_id=project_id,  
        if_exists=append,  
load(data)
```

Set dependencies

```
extract = extract()  
load = load(extract)
```

```
extract >> load
```

Orchestrating Data Pipeline - Airflow



Google BigQuery

Viewing resources.

[SHOW STARRED ONLY](#)

- ▼ adventureworks-431609
 - ▶ Queries
 - ▶ Notebooks
 - ▶ Data canvases
 - ▶ External connections
 - ▼ adw_dwh
 - customer
 - customers
 - employees
 - my_first_dbt_model
 - my_second_dbt_model
 - orders
 - product
 - productcategory
 - ▶ prod

SUMMARY

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			