HTW Winter Semester 2023/24 Cloud Computing Presentation

Developing ETL Pipelines Using API's

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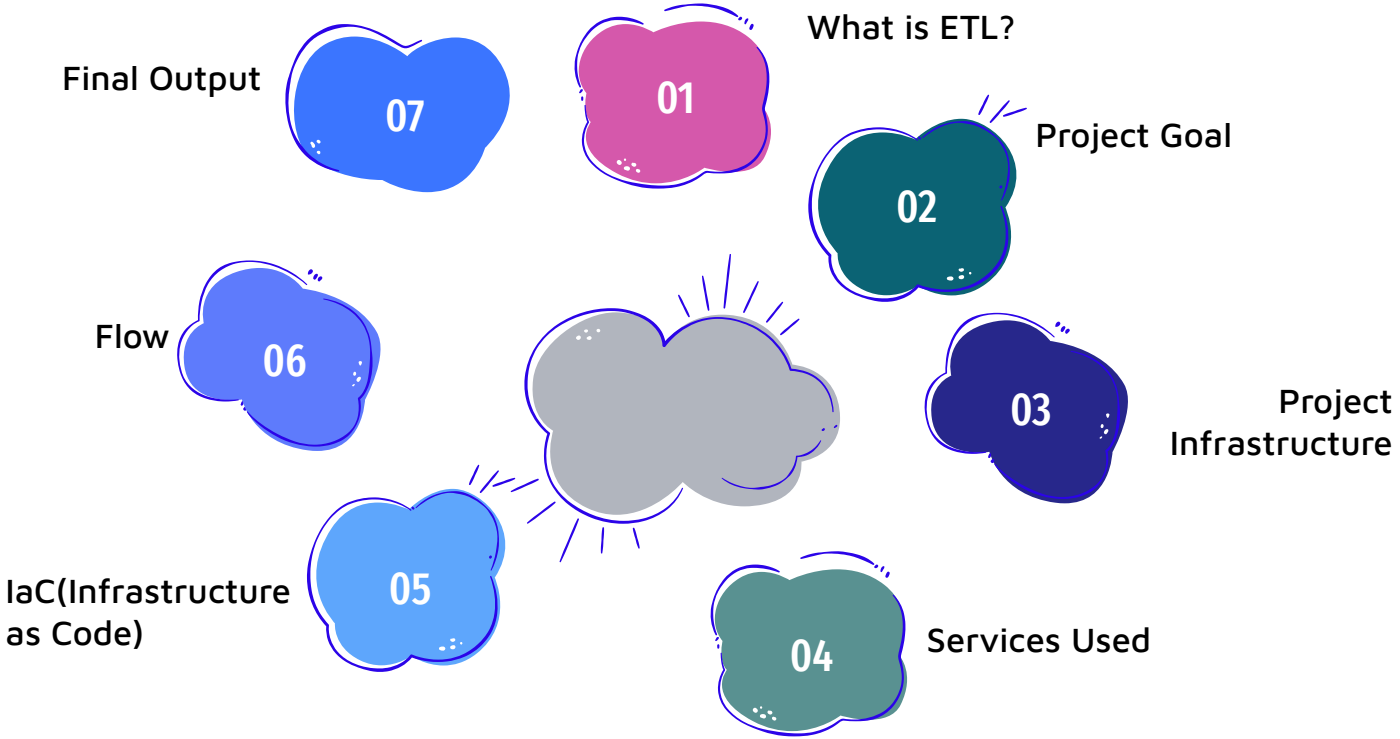
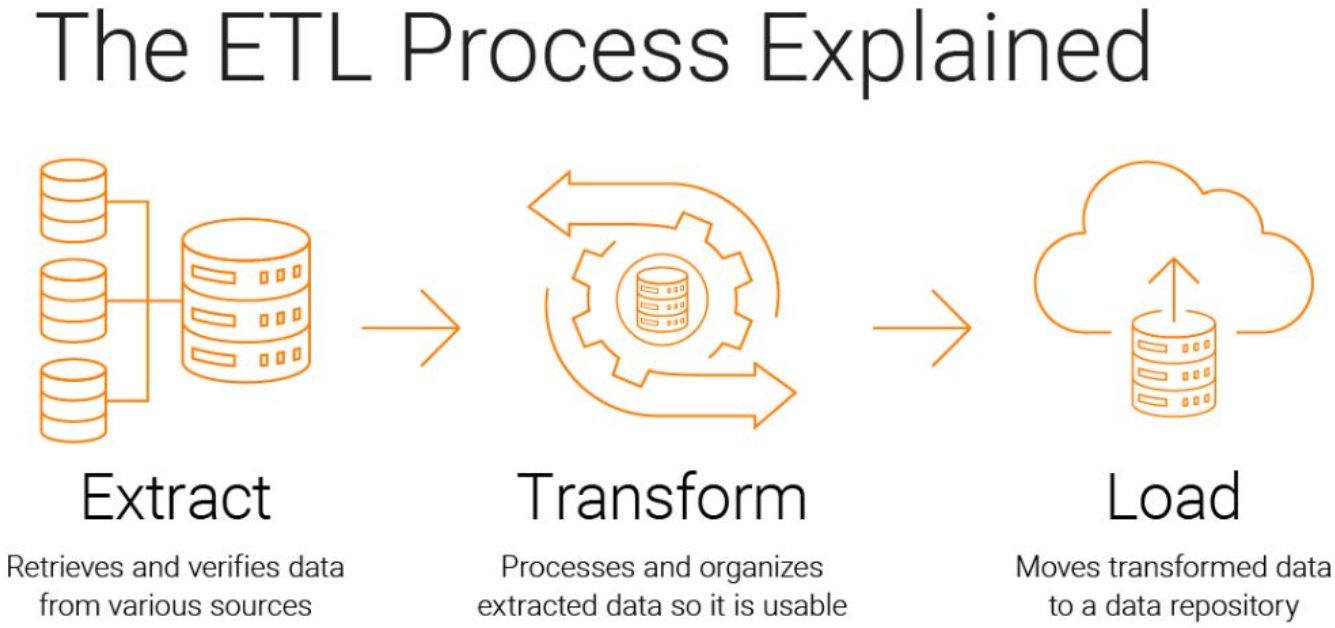


What is ETL ?

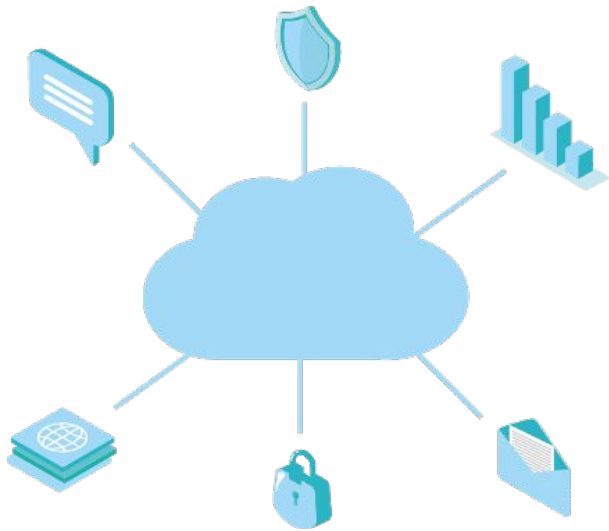

The ETL Process Explained
Extract
Retrieves and verifies data from various sources
Transform
Processes and organizes extracted data so it is usable
Load
Moves transformed data to a data repository

Project Goal

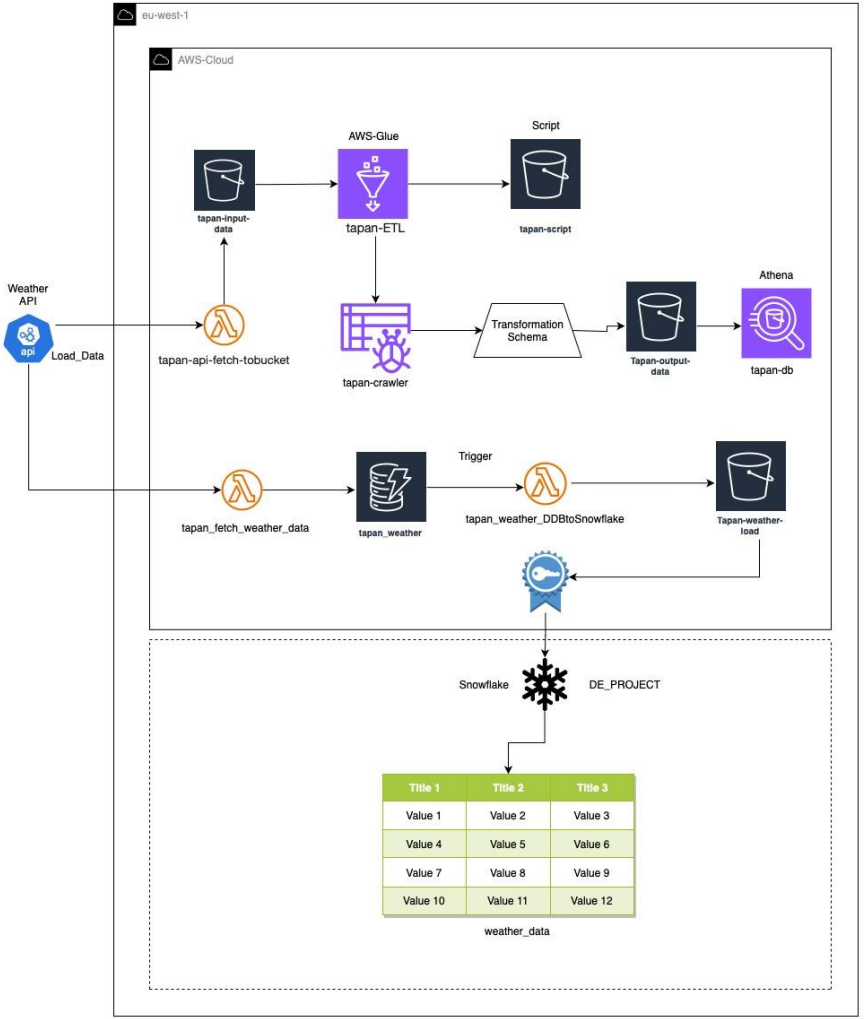
The overall goal of an ETL project using AWS is to efficiently and reliably integrate, transform, and load data into a target system for analysis and decision-making

This can lead to various benefits, such as:

- Improved business insights: Gain deeper understanding of customers, operations, and trends.
- Enhanced decision-making: Make data-driven decisions based on accurate and timely information.
- Increased efficiency: Automate data pipelines and reduce manual effort.
- Reduced costs: Optimize data storage and processing for cost-effectiveness.



Project Infrastructure



Services Used :

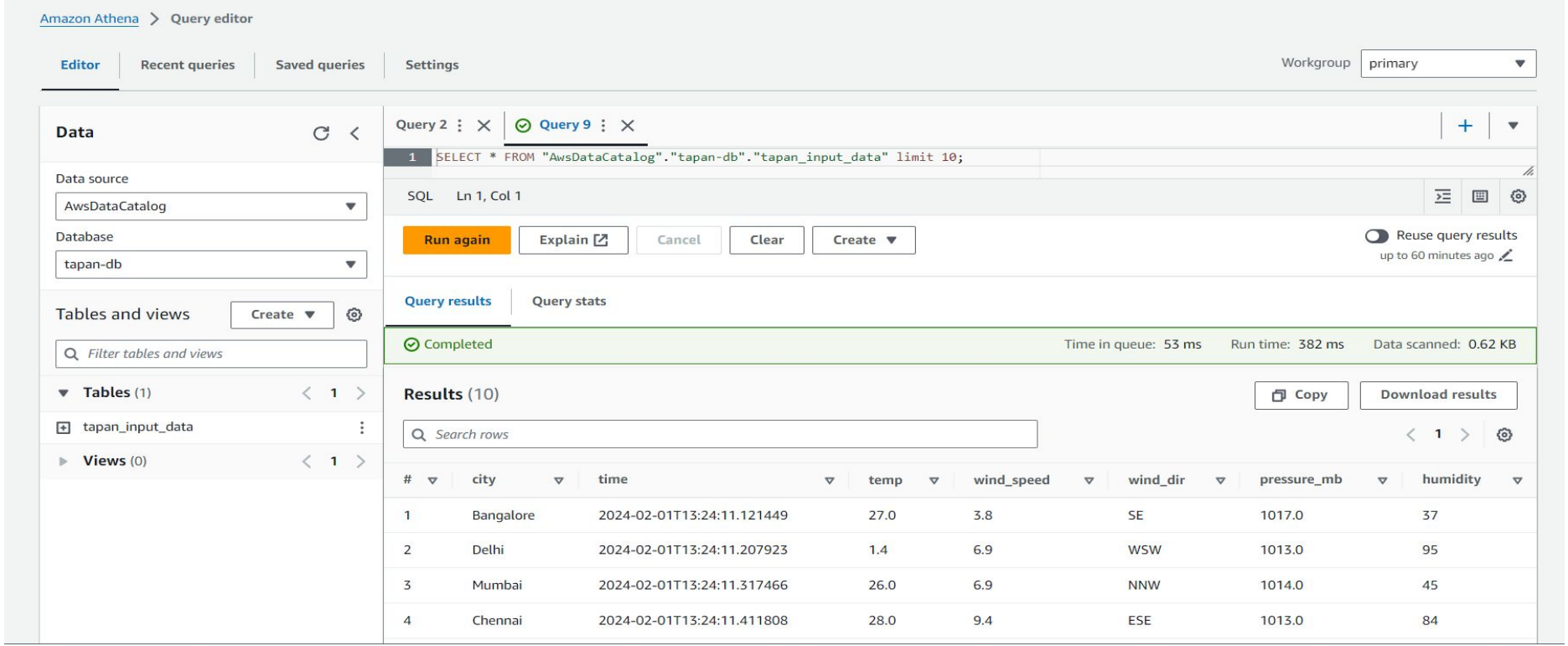
1. Weather API
2. S3 Bucket
3. Lambda Functions
4. AWS Glue
5. Amazon Athena
6. Amazon Crawler
7. Dynamodb
8. Snowflake
9. Cloud Formation for IAC

Amazon Services Overview:

1. **Weather API**: Get real time weather and geo data in .json format.
2. **Lambda Function 1**(*tapan_fetch_weather_data*): Get data from the API (**Extract**)and insert it into DynamoDB
3. **Amazon DynamoDB(tapan_weather)**: To store the data we get from API. Good for handling large amount of data
4. **Lambda Function 2***(tapan_weather_DDBtoSnowflake*): **Transform** the data stored in DynamoDB in .csv format and put it in a S3 Bucket.
5. **Amazon S3 Bucket**(*tapan-weather-load*): Store the transformed data and pass it on to Snowflake DB
6. **Snowflake**: A DB service which helps us store, retrieve and view our data. Useful for Data Analysis. Here we **Load** our data
7. **AWS Glue:**(*tapan-ETL*) A fully managed extract, transform, and load (ETL) service that makes it easy for users to prepare and load their data for analysis.
8. **AWS Crawler:**(*tapan-crawler*) An AWS Glue component that automatically discovers, classifies, and extracts metadata from various data sources, facilitating efficient data cataloging and ETL processes.
9. **AWS Athena:**(*tapan-db*) A serverless, interactive query service that enables users to analyze data in Amazon S3 using standard SQL, without the need for infrastructure management.

Final Data : Snowflake

Final Data : Athena



IaC (Infrastructure as Code)

In our infrastructure we have used Cloud Formation for implementing Infrastructure as code.

Created two S3 Buckets using this code.

- tapan-input-data
- tapan-output-data

ETL-IAc

Delete | Update | Stack actions | Create stack

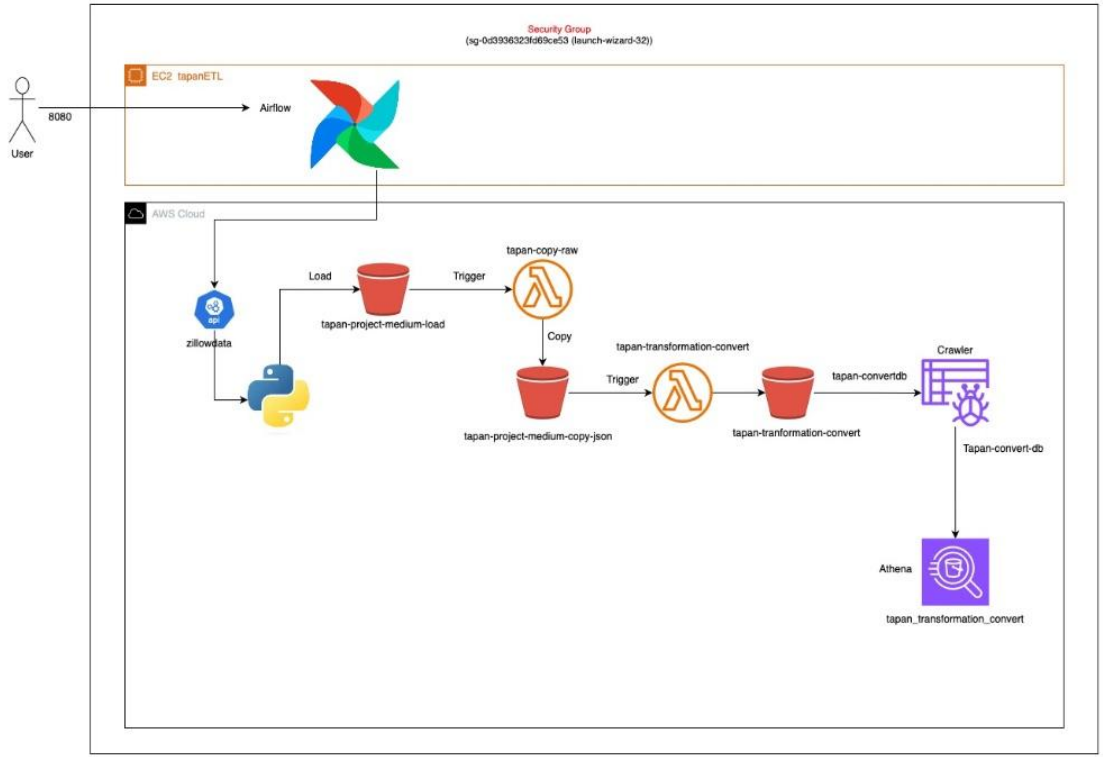
Stack info | Events | Resources | Outputs | Parameters | Template | Change sets | Git sync - *new*

Template

View in Designer | Copy to clipboard

```
Resources:
  S3Bucket:
    Type: 'AWS::S3::Bucket'
    DeletionPolicy: Retain
    Properties:
      BucketName: tapan-input-data
  S3Bucket2:
    Type: 'AWS::S3::Bucket'
    DeletionPolicy: Retain
    Properties:
      BucketName: tapan-output-data
```

ETL: Pipeline Using Airflow



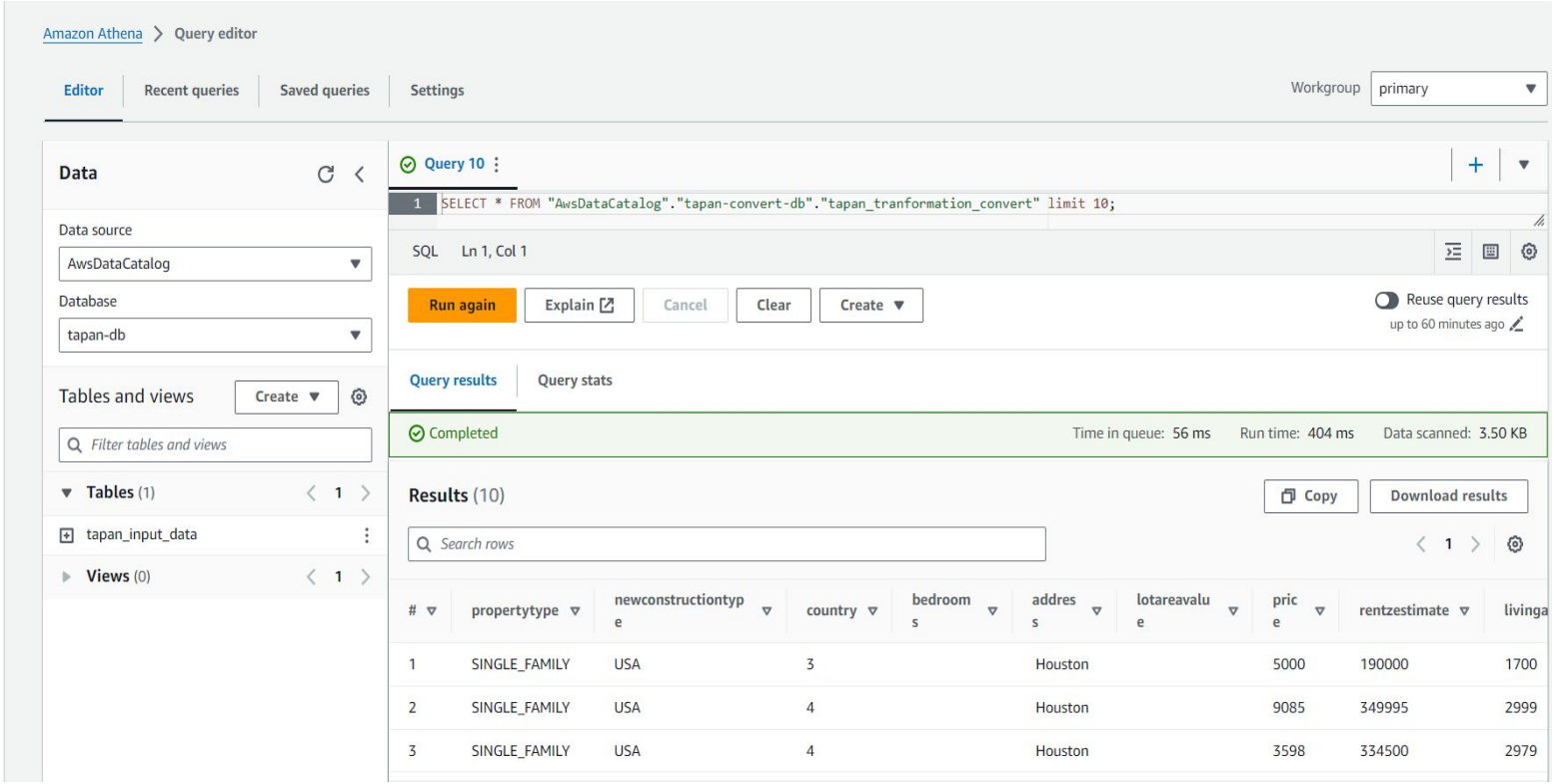
Services Used:

- Zillow Rapid API
- EC2 : Medium Instance
- Apache Airflow
- S3 Buckets
- Lambda Functions
- AWS Crawler
- Athena

Amazon Services Overview:

1. **Zillow API**: Get real time Housing data in .json format.
2. Airflow : We are using Python operators to fetch and load data into S3 bucket.
3. **S3 Bucket** (*tapan-project-medium-load*): Get data from the API (**Extract**) and getting loaded in this bucket.
4. **Lambda Function (tapan_copy_raw)**: To copy the data we get from API to new S3 Bucket.
5. **S3 Bucket** *(tapan-project-medium-copy-json*): json stored in previous Bucket get copied to this Bucket.
6. **Lambda Function (tapan-transformation-convert)**: Transform json data to csv and pass it to S3 Bucket.
7. **S3 Bucket (***tapan-transformation-convert***)**: Generated csv file will get stored in this Bucket for further use.
8. **AWS Crawler:**(*tapan-convert-db*) An AWS Glue component that automatically discovers, classifies, and extracts metadata from various data sources, facilitating efficient data cataloging and ETL processes.
9. **AWS Athena:**(*tapan_transformation_convert*) A serverless, interactive query service that enables users to analyze data in Amazon S3 using standard SQL, without the need for infrastructure management.

Final Output : using Apache AirFlow



THANK YOU