HTW Winter Semester 2023/24 Cloud Computing Presentation

Developing ETL Pipelines Using API's

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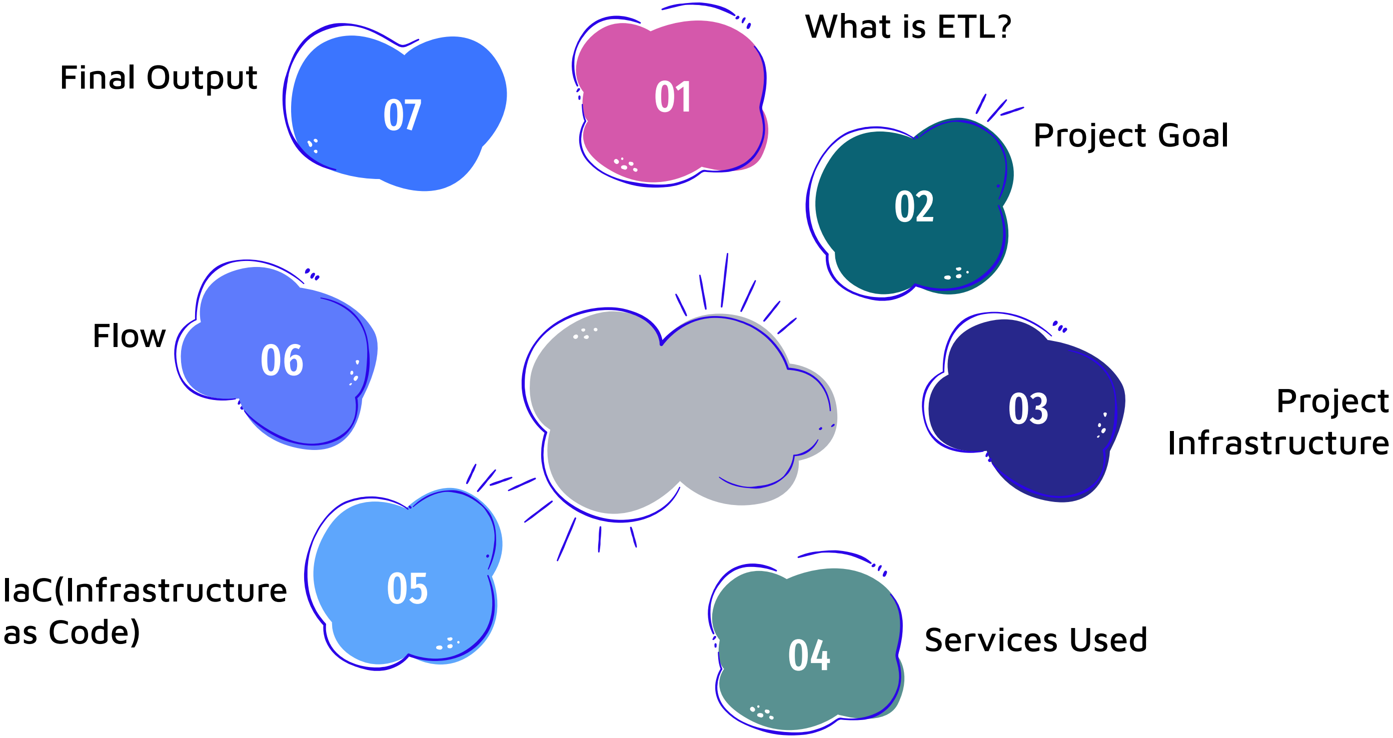

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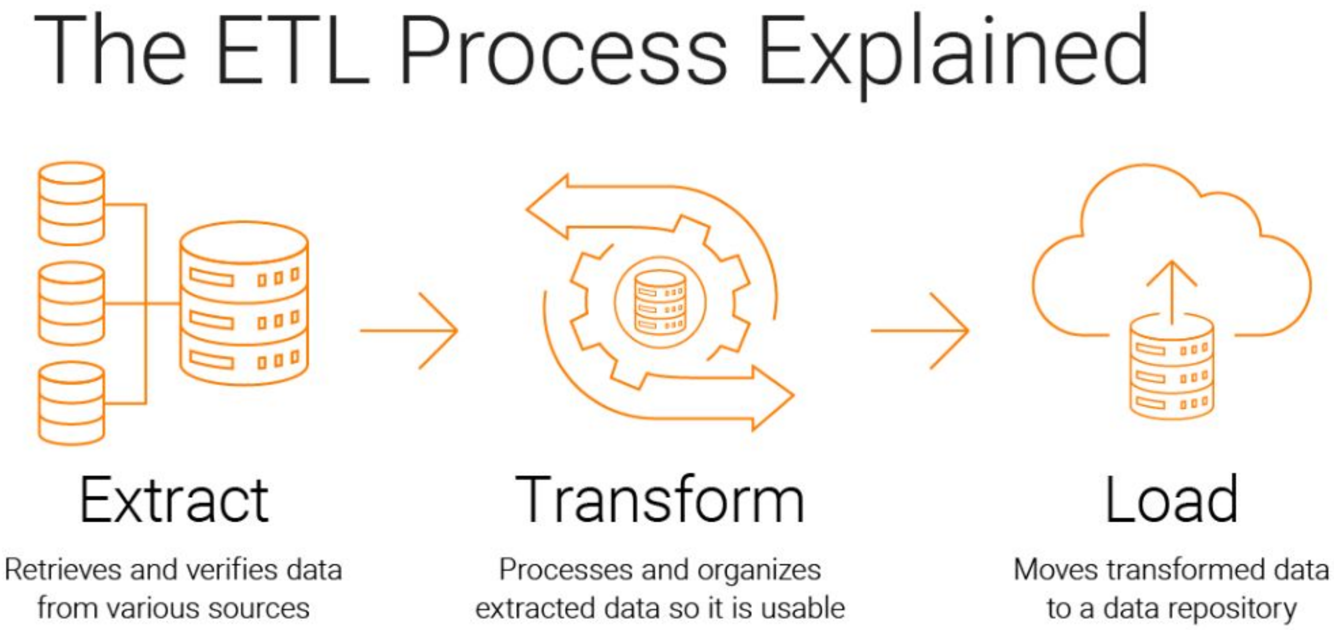
What is ETL ?



The ETL Process Explained

Extract

Retrieves and verifies data from various sources

Transform

Processes and organizes extracted data so it is usable

Load

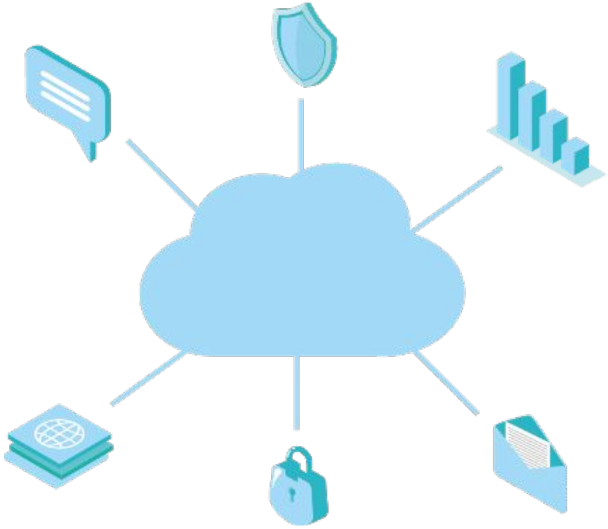
Moves transformed data to a data repository

Project Goal

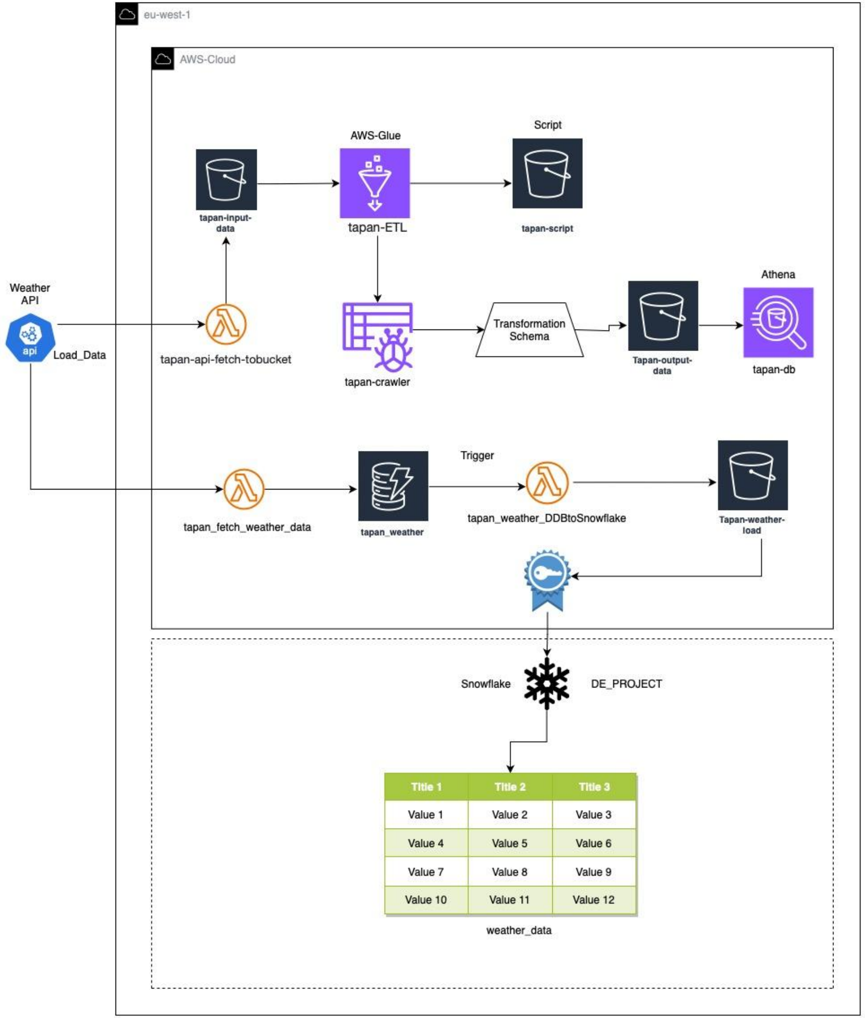
The overall goal of an ETL project using AWS is to efficiently and reliably integrate, transform, and load data into a target system for analysis and decision-making

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



Title 1	Title 2	Title 3
Value 1	Value 2	Value 3
Value 4	Value 5	Value 6
Value 7	Value 8	Value 9
Value 10	Value 11	Value 12

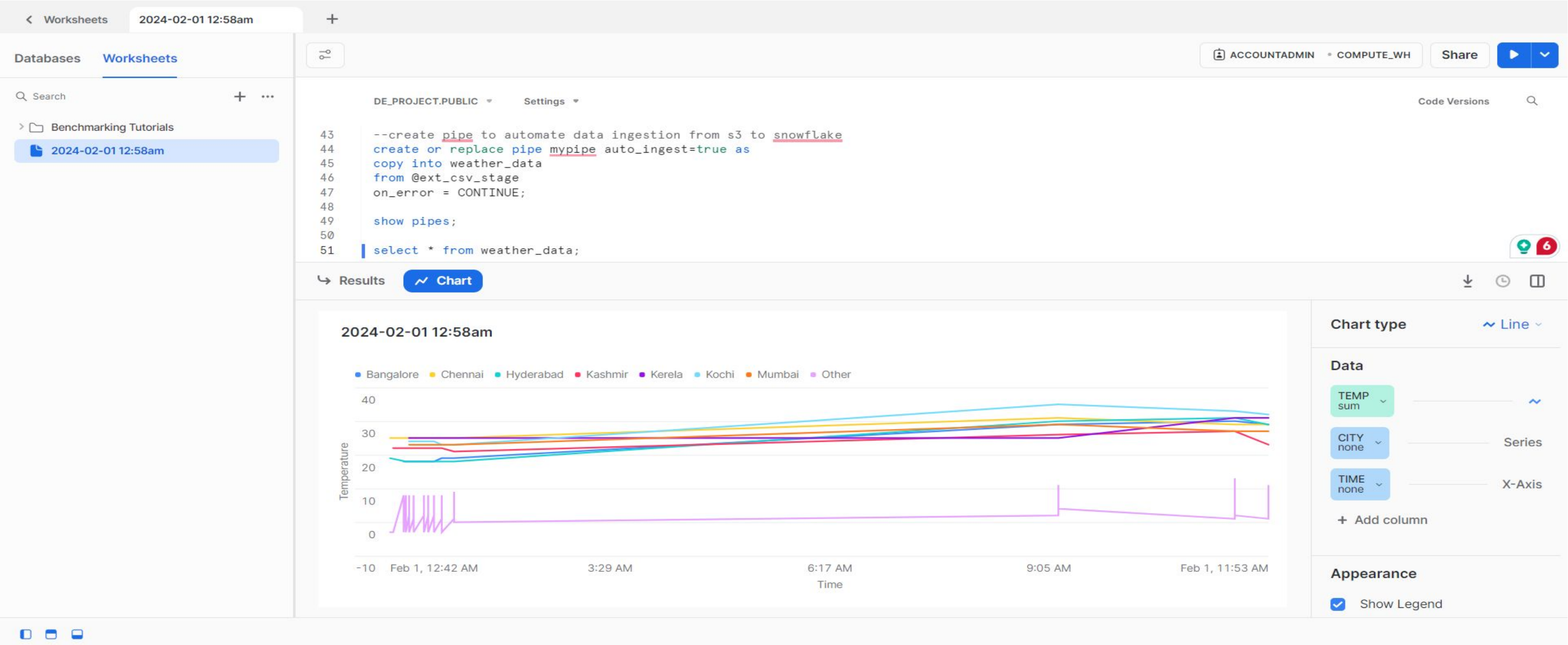
Services Used :

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



```
--create pipe to automate data ingestion from s3 to snowflake
create or replace pipe mypipe auto_ingest=true as
copy into weather_data
from @ext_csv_stage
on_error = CONTINUE;

show pipes;

select * from weather_data;
```

Chart type: Line

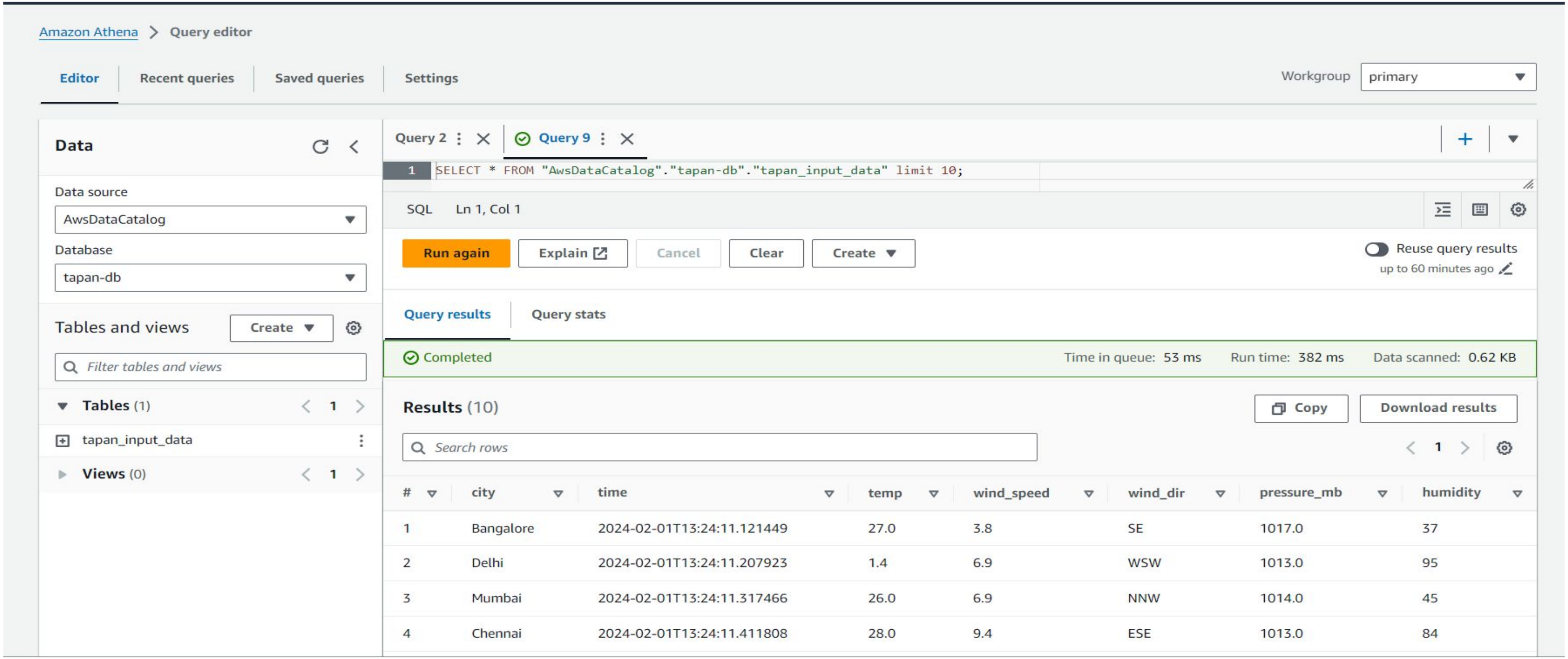
Data

- TEMP sum
- CITY none: Series
- TIME none: X-Axis

Appearance

☑ Show Legend

Final Data : Athena



Workgroup: primary

Data source: AwsDataCatalog

Database: tapan-db

```
SELECT * FROM "AwsDataCatalog"."tapan-db"."tapan_input_data" limit 10;
```

Completed   Time in queue: 53 ms   Run time: 382 ms   Data scanned: 0.62 KB

Results (10)

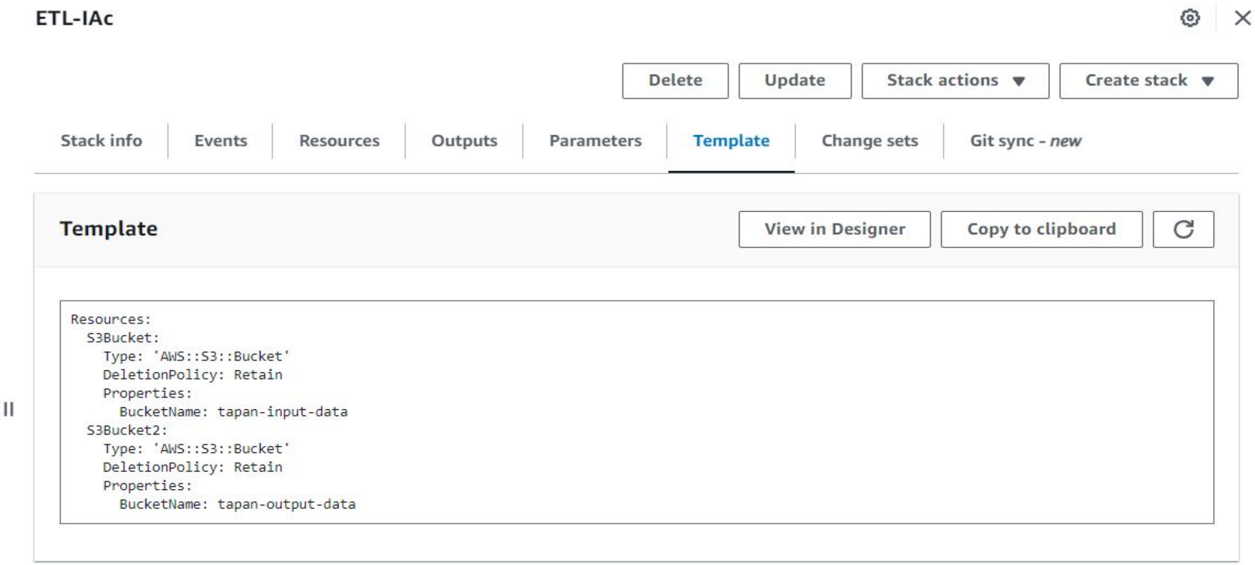
#	city	time	temp	wind_speed	wind_dir	pressure_mb	humidity
1	Bangalore	2024-02-01T13:24:11.121449	27.0	3.8	SE	1017.0	37
2	Delhi	2024-02-01T13:24:11.207923	1.4	6.9	WSW	1013.0	95
3	Mumbai	2024-02-01T13:24:11.317466	26.0	6.9	NNW	1014.0	45
4	Chennai	2024-02-01T13:24:11.411808	28.0	9.4	ESE	1013.0	84

IaC (Infrastructure as Code)

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

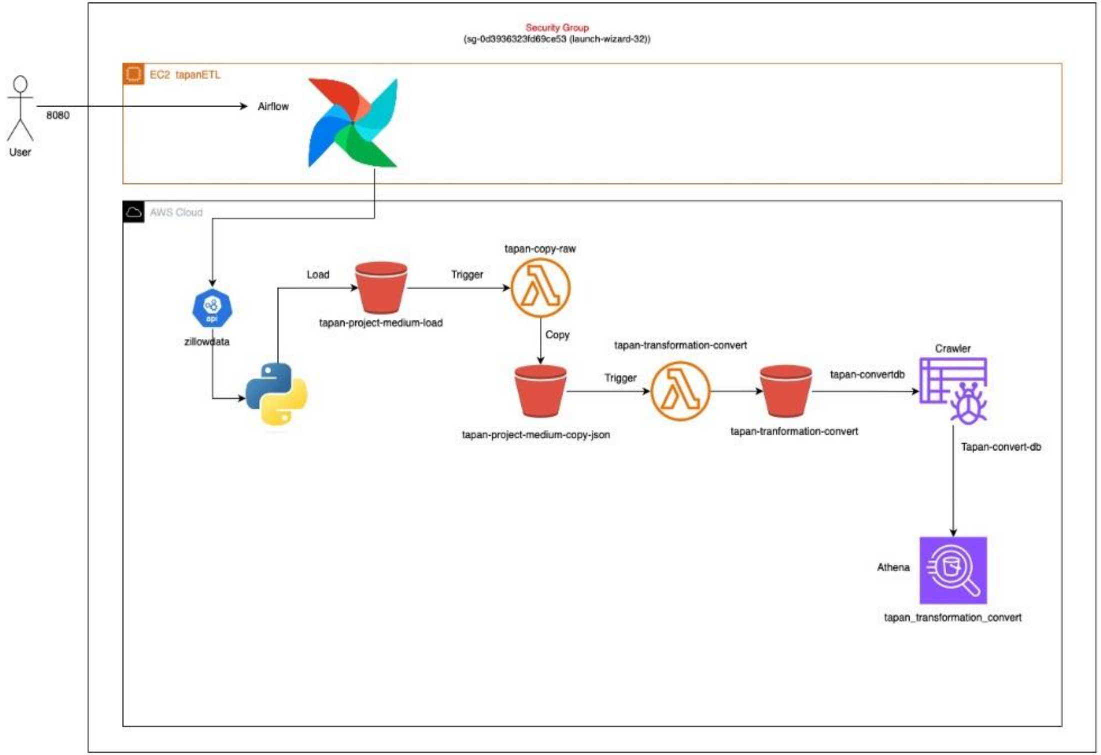
Created two S3 Buckets using this code.

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



```
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


Security Group
(sg-0d3936323fd69ce53 (launch-wizard-32))
EC2 tapanETL
User
8080
Airflow
AWS Cloud
zillowdata
Load
tapan-project-medium-load
Trigger
tapan-copy-raw
Copy
tapan-project-medium-copy-json
Trigger
tapan-transformation-convert
tapan-tranformation-convert
tapan-convertdb
Crawler
Tapan-convert-db
Athena
tapan_transformation_convert

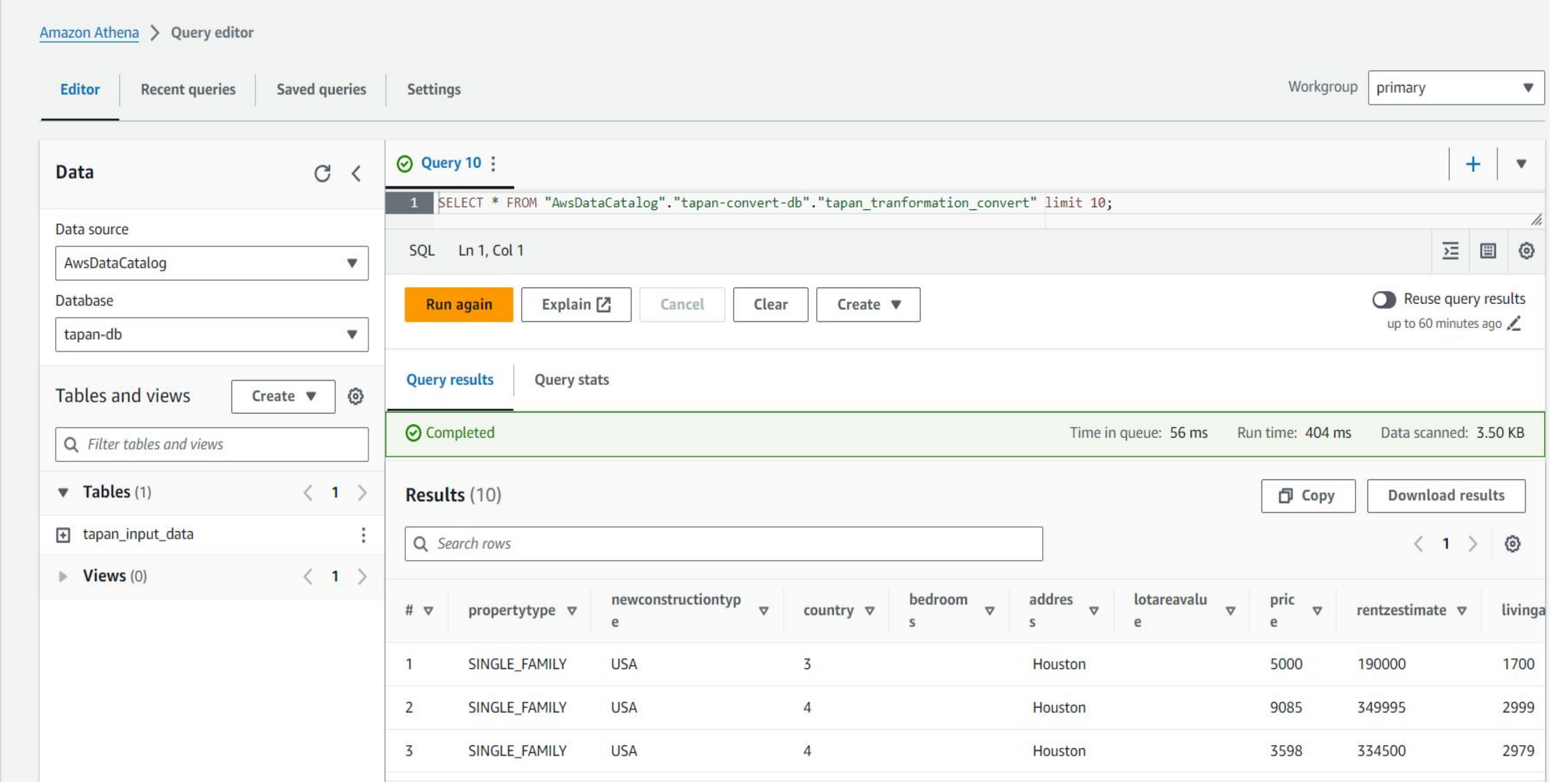
Services Used:

- 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



Workgroup: primary

Data

Data source: AwsDataCatalog

Database: tapan-db

Tables and views

Filter tables and views

- tapan_input_data

Query 10

```
SELECT * FROM "AwsDataCatalog"."tapan-convert-db"."tapan_tranformation_convert" limit 10;
```

SQL Ln 1, Col 1

Completed Time in queue: 56 ms Run time: 404 ms Data scanned: 3.50 KB

Results (10)

Search rows

#	propertytype	newconstructiontype	country	bedrooms	address	lotareavalue	price	rentzestimate	livinga
1	SINGLE_FAMILY	USA	3		Houston		5000	190000	1700
2	SINGLE_FAMILY	USA	4		Houston		9085	349995	2999
3	SINGLE_FAMILY	USA	4		Houston		3598	334500	2979

THANK YOU