GCS to BigQuery using Bash – Complete Guide

Introduction

I will walk you through how to load data from Google Cloud Storage (GCS) to BigQuery using Bash. This process helps integrate GCS and BigQuery, making it easier to perform data analytics and streamline ETL (Extract, Transform, Load) pipelines. By the end of this guide, you will have a clear understanding of how to use the command line to automate the process of moving data from GCS to BigQuery.

Step-by-Step Process

1. Set Up Your Google Cloud Environment

To begin, I need to ensure that I have the necessary tools installed:

1.1 Install Google Cloud SDK: I followed the installation guide.

1.2 Authenticated with Google Cloud: Once the SDK is installed, I authenticated using my service account by running the following command in my terminal:

```
$ gcloud init
Welcome! This command will take you through the configuration of gcloud.

Settings from your current configuration [aramel-duality-452616-e6] are:
accessibility:
  screen_reader: 'False'
core:
  account: harshavardhan03467@gmail.com
  disable_usage_reporting: 'True'
  project: caramel-duality-452616-e6

Pick configuration to use:
 [1] Re-initialize this configuration [aramel-duality-452616-e6] with new settings
 [2] Create a new configuration
 [3] Switch to and re-initialize existing configuration: [default]
Please enter your numeric choice:  1

Your current configuration has been set to: [aramel-duality-452616-e6]

You can skip diagnostics next time by using the following flag:
  gcloud init --skip-diagnostics

Network diagnostic detects and fixes local network connection issues.
Checking network connection...done.
Reachability Check passed.
Network diagnostic passed (1/1 checks passed).

Choose the account you want to use for this configuration.
To use a federated user account, exit this command and sign in to the gcloud CLI with your login configuration file, then run this command again.

Select an account:
 [1] harshavardhan03467@gmail.com
 [2] Sign in with a new Google Account
 [3] Skip this step
Please enter your numeric choice:  1

You are signed in as: [harshavardhan03467@gmail.com].
```

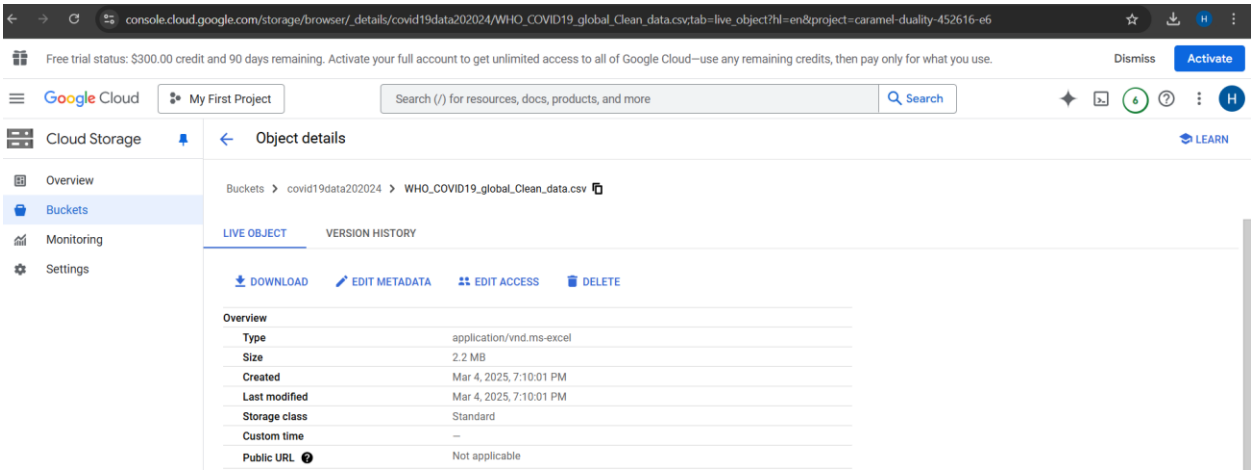
```
You are signed in as: [harshavardhan03467@gmail.com].

Pick cloud project to use:
 [1] caramel-duality-452616-e6
 [2] Enter a project ID
 [3] Create a new project
Please enter numeric choice or text value (must exactly match list item):  1

Your current project has been set to: [caramel-duality-452616-e6].

Not setting default zone/region (this feature makes it easier to use
[gcloud compute] by setting an appropriate default value for the
--zone and --region flag).
See https://cloud.google.com/compute/docs/gcloud-compute section on how to set
default compute region and zone manually. If you would like [gcloud init] to be
able to do this for you the next time you run it, make sure the
Compute Engine API is enabled for your project on the
https://console.developers.google.com/apis page.

The Google Cloud CLI is configured and ready to use!

* Commands that require authentication will use harshavardhan03467@gmail.com by default
* Commands will reference project `caramel-duality-452616-e6` by default
Run `gcloud help config` to learn how to change individual settings

This gcloud configuration is called [aramel-duality-452616-e6]. You can create additional configurations if you work with multiple accounts and/or projects.
Run `gcloud topic configurations` to learn more.

Some things to try next:

* Run `gcloud --help` to see the Cloud Platform services you can interact with. And run `gcloud help COMMAND` to get help on any gcloud command.
* Run `gcloud topic --help` to learn about advanced features of the CLI like arg files and output formatting
* Run `gcloud cheat-sheet` to see a roster of go-to `gcloud` commands.
```

Google Cloud Storage (GCS):

In the below screenshot, Here are the details:

bucket-name: covid19data202024

blob-name: WHO_COVID19_globaldata.csv



Create a BigQuery Dataset

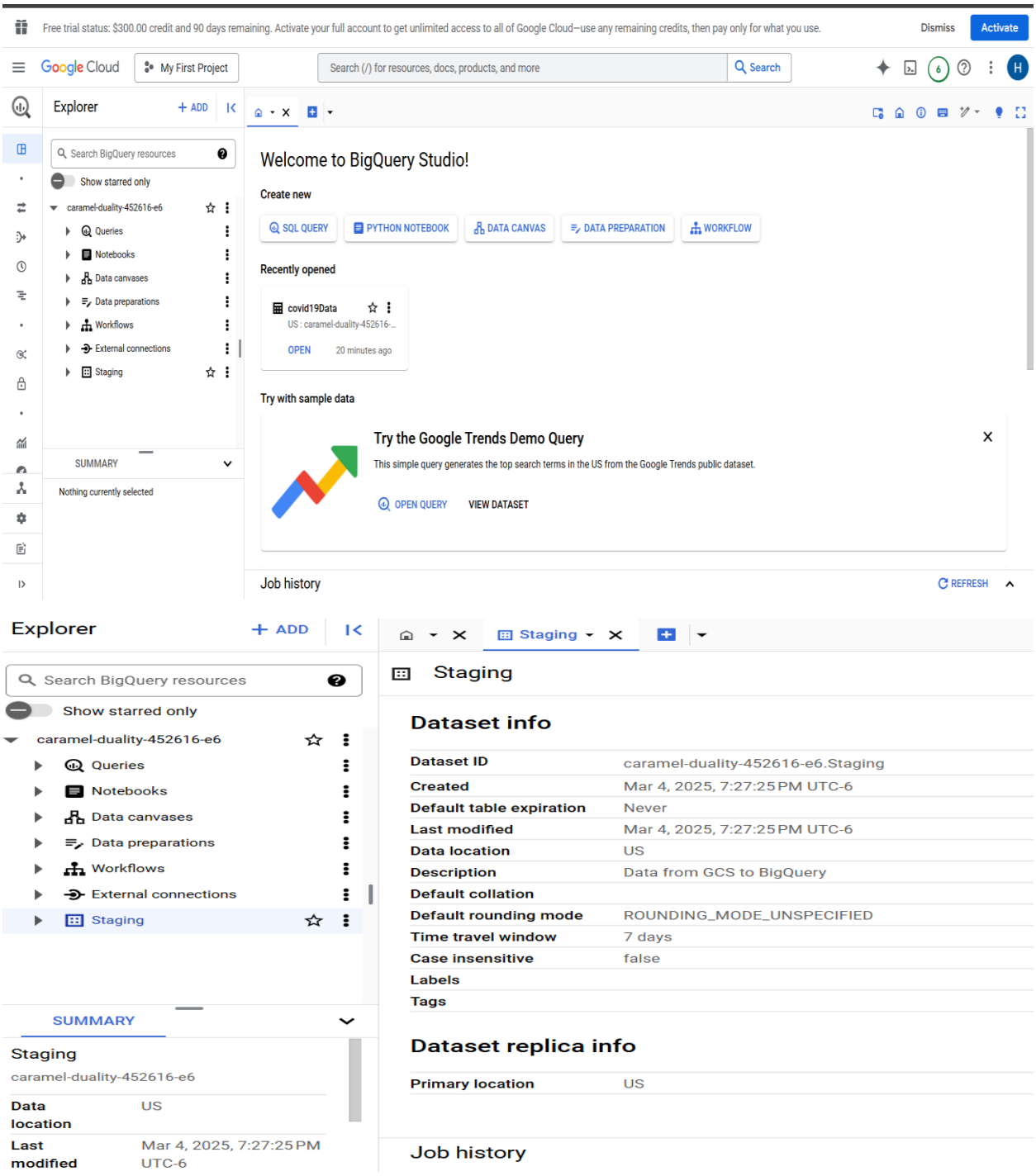
Before I can load data into BigQuery, I need to set up a dataset. If the dataset already exists, I can skip this step.

I use the following command to create a new dataset in BigQuery:

bq mk --dataset --description "Data from GCS to BigQuery" <project-id>:<dataset-name>

```
$ bq mk --dataset --description "Data from GCS to BigQuery" caramel-duality-452616-e6:Staging
Dataset 'caramel-duality-452616-e6:Staging' successfully created.
```

We can see in the below Screenshot that “Staging” Dataset has been created under my project ID: caramel-duality-452616-e6



3. Define the GCS File and BigQuery Table

Next, I specify the source file in Google Cloud Storage (GCS) and the destination table in BigQuery.

- Here are the variables I set:

- GCS_FILE: This is the GCS file path I want to load into BigQuery.
- ROJECT_ID: My Google Cloud project ID.
- DATASET_ID: The dataset in BigQuery where I want to store my data.
- TABLE_ID: The name of the table in BigQuery where the data will be loaded.

```
$ GCS_FILE="gs://covid19data202024/WHO_COVID19_global_Clean_data.csv"
PROJECT_ID="caramel-duality-452616-e6"
DATASET_ID="Staging"
TABLE_ID="covid19Data"
```

4. Load Data from GCS to BigQuery

Now, I can load the data into BigQuery using the bq load command. The following command loads the CSV data from GCS into BigQuery:

bq load --source_format=CSV --autodetect \

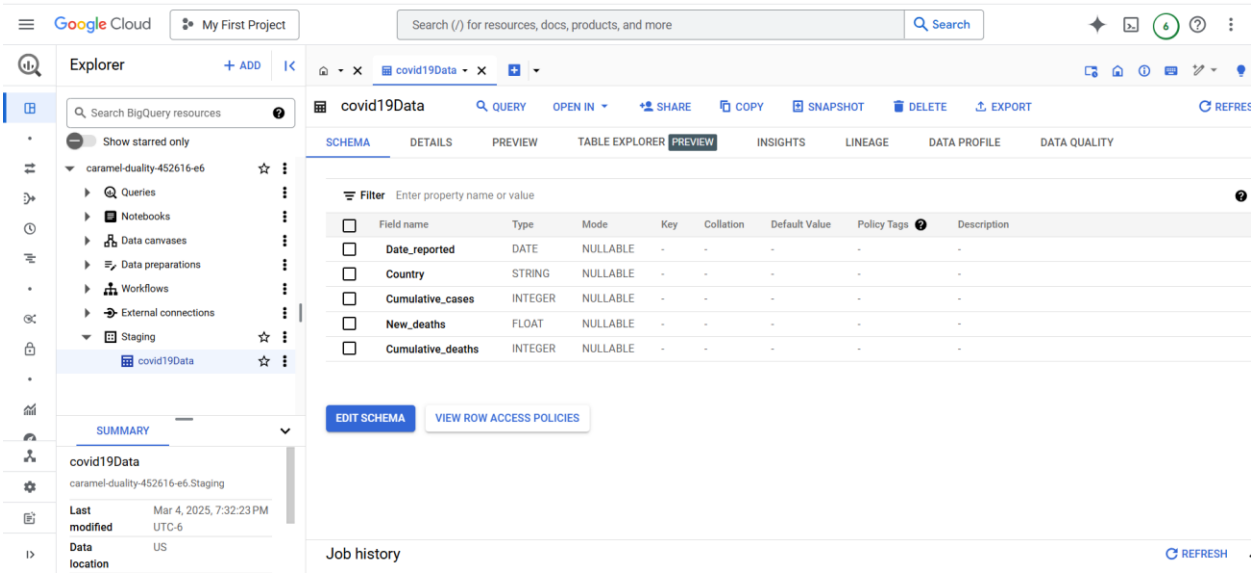
$PROJECT_ID:$DATASET_ID.$TABLE_ID $GCS_FILE

```
$ bq load --source_format=CSV --autodetect \
    $PROJECT_ID:$DATASET_ID.$TABLE_ID $GCS_FILE
Waiting on bqjob_r7429bd075c53bbc8_0000019563ee701e_1 ... (23s) Current status: DONE
```

Explanation of Parameters:

- --source format=CSV: I specify that the source file is in CSV format.
- --autodetect: BigQuery will automatically detect the schema of the CSV file.
- $PROJECT_ID:$DATASET_ID.$TABLE_ID: Specifies where in BigQuery the data will go.
- $GCS_FILE: Specifies the path to the file in Google Cloud Storage.

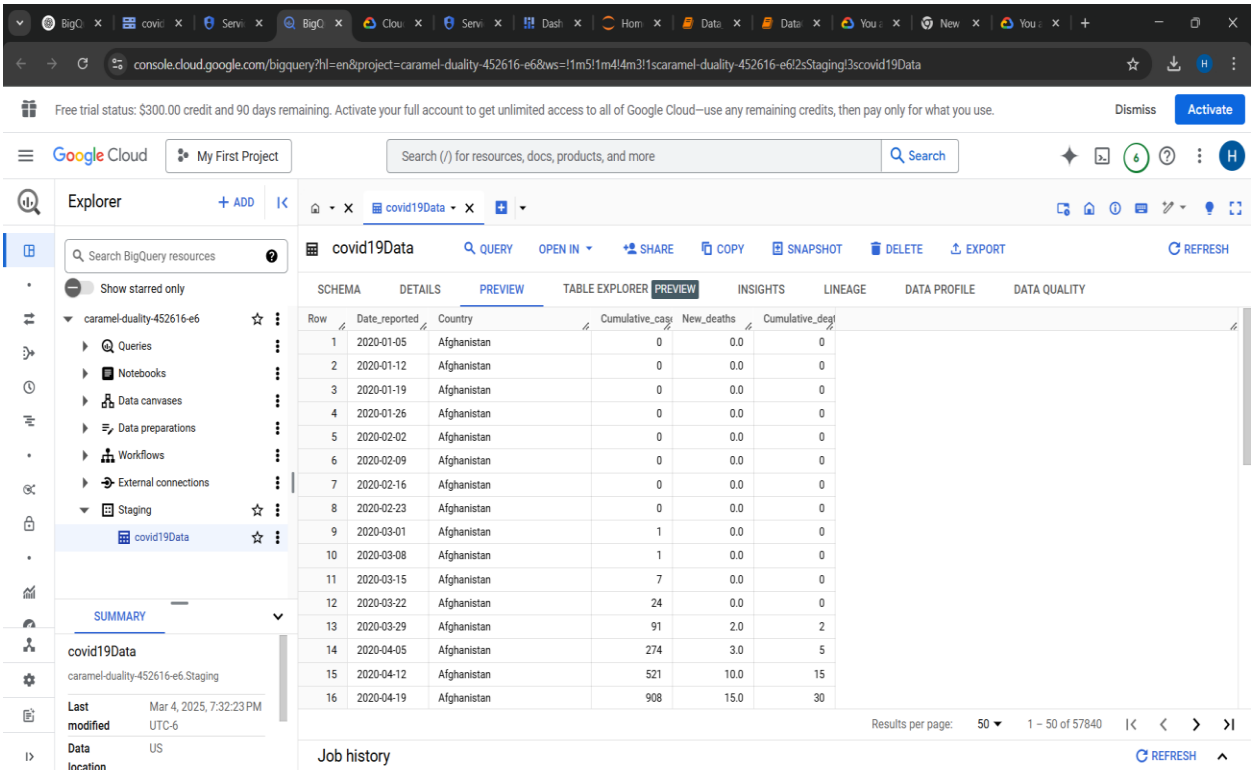
View the BigQuery in the following screenshot and can see covid19Data under Staging and can see the data below:



Once I run the command, the data begins loading into BigQuery. The job status will be displayed in the terminal.

bq query --use_legacy_sql=false "SELECT * FROM \`$PROJECT_ID.$DATASET_ID.$TABLE_ID\` LIMIT 10"

```
$ bq query --use_legacy_sql=false "SELECT * FROM \`$PROJECT_ID.$DATASET_ID.$TABLE_ID\` LIMIT 10"
+---------------+-------------+-----------------+-------------+-------------------+
| Date_reported |   Country   | Cumulative_cases | New_deaths | Cumulative_deaths |
+---------------+-------------+-----------------+-------------+-------------------+
|    2020-01-05 | Afghanistan |               0 |         0.0 |                 0 |
|    2020-01-12 | Afghanistan |               0 |         0.0 |                 0 |
|    2020-01-19 | Afghanistan |               0 |         0.0 |                 0 |
|    2020-01-26 | Afghanistan |               0 |         0.0 |                 0 |
|    2020-02-02 | Afghanistan |               0 |         0.0 |                 0 |
|    2020-02-09 | Afghanistan |               0 |         0.0 |                 0 |
|    2020-02-16 | Afghanistan |               0 |         0.0 |                 0 |
|    2020-02-23 | Afghanistan |               0 |         0.0 |                 0 |
|    2020-03-01 | Afghanistan |               1 |         0.0 |                 0 |
|    2020-03-08 | Afghanistan |               1 |         0.0 |                 0 |
+---------------+-------------+-----------------+-------------+-------------------+
```



Why GCS to BigQuery in Real-Time?

Moving data from Google Cloud Storage (GCS) to BigQuery has several real-time use cases:

1. Data Analytics: I can store raw data in GCS and then load it into BigQuery for complex analyses using SQL queries. This is particularly useful for large datasets that require powerful analytics tools.

2. Automated ETL Pipelines: By automating the process of moving data from GCS to BigQuery, I can build efficient ETL pipelines that run at scheduled intervals, ensuring my data is always up to date.

3. Business Intelligence: BigQuery is ideal for running business intelligence queries on large datasets. I can use the data loaded from GCS to generate reports, dashboards, and other insights.

4. Machine Learning: Once the data is in BigQuery, I can use it for feature extraction and even run machine learning models directly within BigQuery using BigQuery ML.

5. Real-time Decision Making: By continuously loading data from GCS into BigQuery, I can enable real-time analytics, which helps with faster decision-making for businesses.

Conclusion

In this guide, I've demonstrated how to load data from Google Cloud Storage (GCS) into BigQuery using Git Bash. By following these steps, I can easily move large datasets into BigQuery for advanced data analysis, reporting, and business intelligence. This process is highly beneficial for automating ETL pipelines and leveraging BigQuery's powerful analytics capabilities for real-time insights.