Partitioned Tables in Google BigQuery | Qwiklabs

Monday, December 7, 2020 7:12 PM

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Overview

BigQuery is Google's fully managed, NoOps, low cost analytics database. With BigQuery you can query terabytes and terabytes of data without having any infrastructure to manage or needing a database administrator. BigQuery uses SQL and can take advantage of the pay-as-you-go model. BigQuery allows you to focus on analyzing data to find meaningful insights.

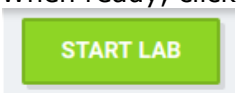
The dataset you'll use is an ecommerce dataset that has millions of Google Analytics records for the Google Merchandise Store loaded into BigQuery. You have a copy of that dataset for this lab and will explore the available fields and row for insights.

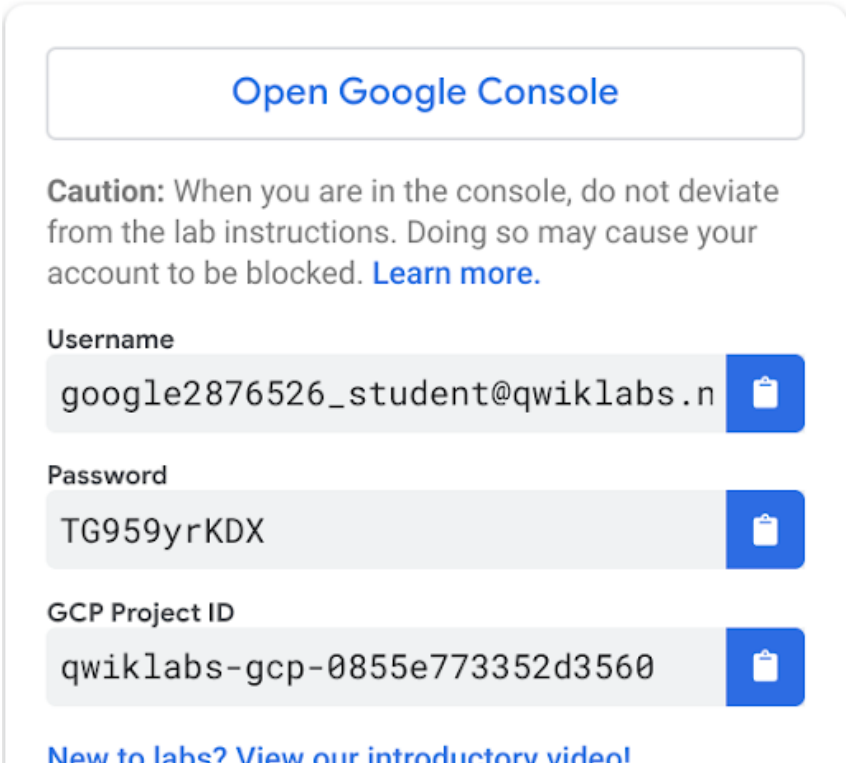
In this lab you will query partitioned datasets and create your own dataset partitions to improve query performance and reduce cost.

Setup

For each lab, you get a new GCP project and set of resources for a fixed time at no cost.

1. Make sure you signed into Qwiklabs using an **incognito window**.
2. Note the lab's access time (for example,
   

   and make sure you can finish in that time block.
3. When ready, click
   

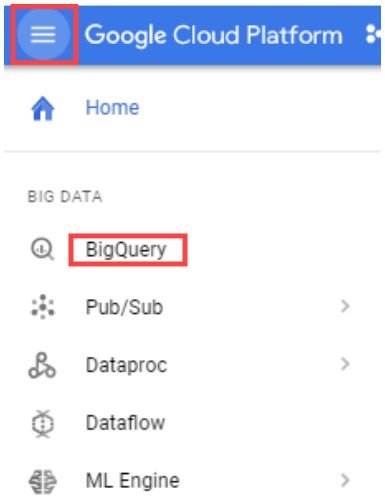
   .
4. Note your lab credentials. You will use them to sign in to Cloud Platform Console.
   

5. Click **Open Google Console**.
6. Click **Use another account** and copy/paste credentials for **this** lab into the prompts.

1. Accept the terms and skip the recovery resource page.

Open BigQuery Console

In the Google Cloud Console, select **Navigation menu** > **BigQuery**:



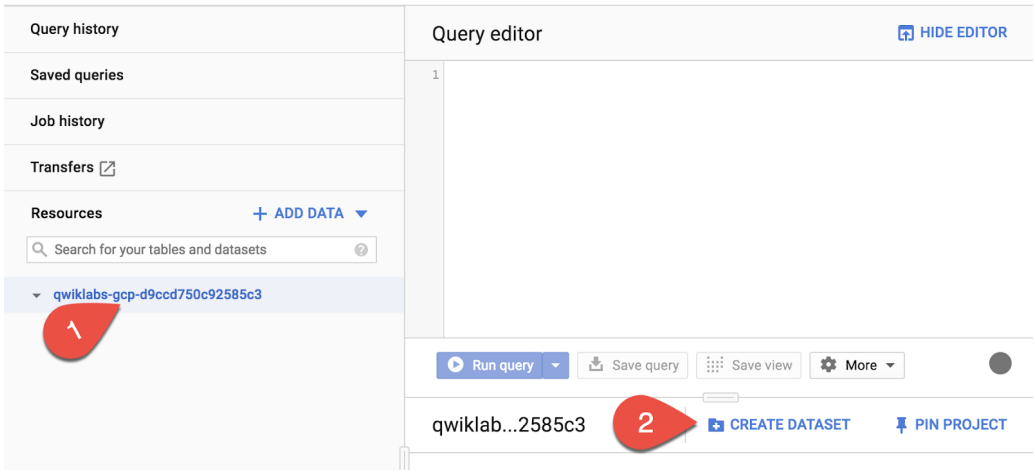
The **Welcome to BigQuery in the Cloud Console** message box opens. This message box provides a link to the quickstart guide and lists UI updates.

Click **Done**.

Create a new dataset

First, you will create a dataset to store your tables.

Click on your project name, then click **Create Dataset**.



Set the *Dataset ID* to `ecommerce`. Leave the other options at their default values (Data Location, Default table Expiration). Click **Create dataset**.

Creating tables with date partitions

A partitioned table is a table that is divided into segments, called partitions, that make it easier to manage and query your data. By dividing a large table into smaller partitions, you can improve query performance, and control costs by reducing the number of bytes read by a query.

Now you will create a new table and bind a date or timestamp column as a partition. Before we do that, let's explore the data in the non-partitioned

table first.

Query webpage analytics for a sample of visitors in 2017

In the **Query Editor**, add the below query. Before running, note the total amount of data it will process as indicated next to the query validator icon: "This query will process 1.74 GB when run".

```
#standardSQL
SELECT DISTINCT
  fullVisitorId,
  date,
  city,
  pageTitle
FROM `data-to-insights.ecommerce.all_sessions_raw`
WHERE date = '20170708'
LIMIT 5
```

Click **Run**.

The query returns 5 results.

Query webpage analytics for a sample of visitors in 2018

Let's modify the query to look at visitors for 2018 now.

In the **Query Editor**, add the below query:

```
#standardSQL
SELECT DISTINCT
  fullVisitorId,
  date,
  city,
  pageTitle
FROM `data-to-insights.ecommerce.all_sessions_raw`
WHERE date = '20180708'
LIMIT 5
```

The **Query Validator** will tell you how much data this query will process.

Click **Run**.

Notice that the query still processes 1.74 GB even though it returns 0 results. Why? The query engine needs to scan all records in the dataset to see if they satisfy the date matching condition in the WHERE clause. It must look at each record to compare the date against the condition of '20180708'.

Additionally, the LIMIT 5 does not reduce the total amount of data processed, which is a common misconception.

Common use-cases for date-partitioned tables

Scanning through the entire dataset everytime to compare rows against a WHERE condition is wasteful. This is especially true if you only really care about records for a specific period of time like:

- All transactions for the last year
- All visitor interactions within the last 7 days
- All products sold in the last month

Instead of scanning the entire dataset and filtering on a date field like we did in the earlier queries, we will now setup a date-partitioned table. This will allow us to completely ignore scanning records in certain partitions if they are irrelevant to our query.

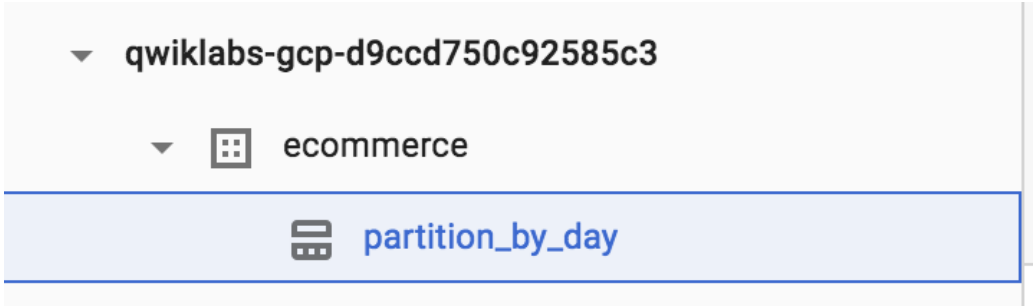
Create a new partitioned table based on date

Click **Create New Query** and add the below query, then **Run**:

```
#standardSQL
CREATE OR REPLACE TABLE ecommerce.partition_by_day
PARTITION BY date_formatted
OPTIONS(
   description="a table partitioned by date"
) AS
SELECT DISTINCT
PARSE_DATE("%Y%m%d", date) AS date_formatted,
fullvisitorId
FROM `data-to-insights.ecommerce.all_sessions_raw`
```

In this query, note the new option - PARTITION BY a field. The two options available to partition are DATE and TIMESTAMP. The PARSE_DATE function is used on the date field (stored as a string) to get it into the proper DATE type for partitioning.

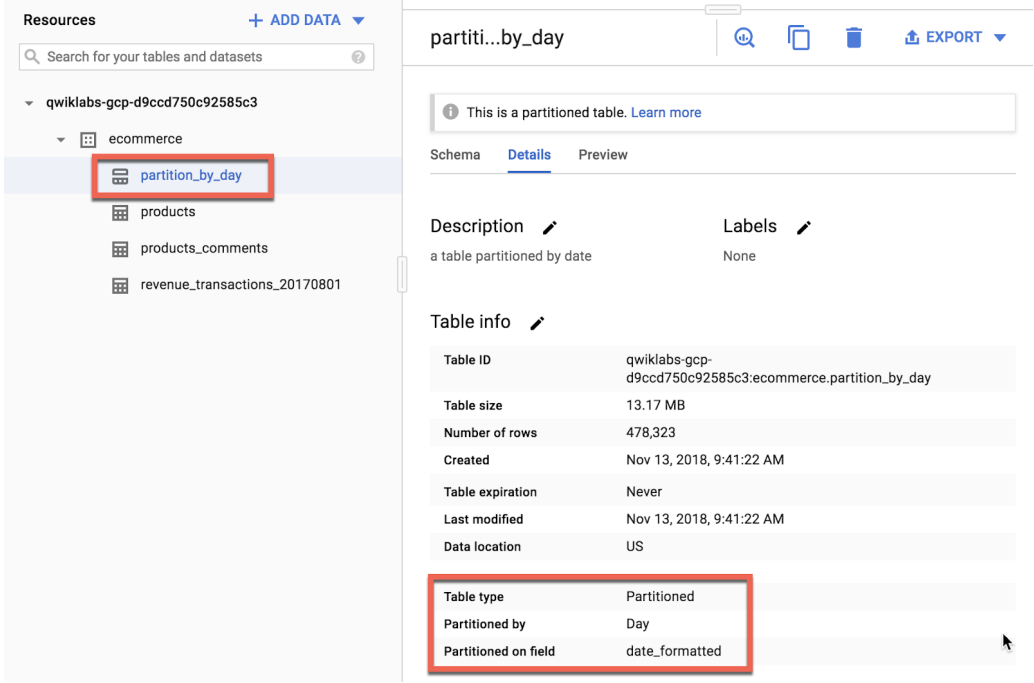
Click on the **ecommerce** dataset, then select the new **partiton_by_day** table:



Click on the **Details** tab.

Confirm that you see:

- Partitioned by: Day
- Partitioning on: date_formatted



View data processed with a partitioned table

Run the below query, and note the total bytes to be processed:

```
#standardSQL
SELECT *
FROM `data-to-insights.ecommerce.partition_by_day`
WHERE date_formatted = '2016-08-01'
```

This time ~25 KB or 0.025MB is processed, which is a fraction of what you queried.

Now run the below query, and note the total bytes to be processed:

```
#standardSQL
SELECT *
FROM `data-to-insights.ecommerce.partition_by_day`
WHERE date_formatted = '2018-07-08'
```

You should see `This query will process 0 B when run.`

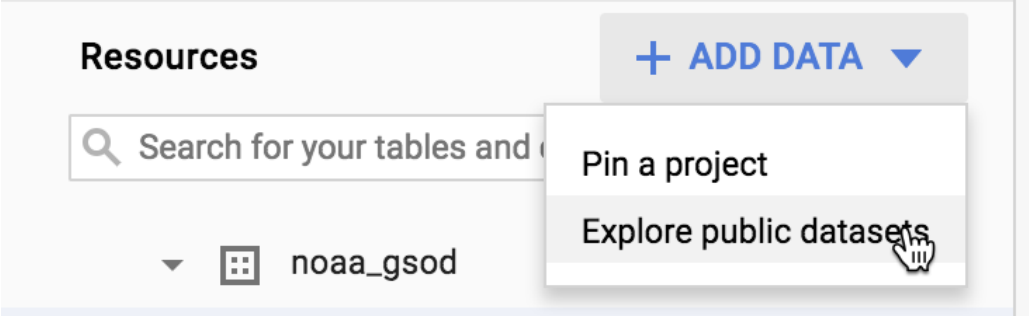
Why is there 0 bytes processed?

Creating an auto-expiring partitioned table

Auto-expiring partitioned tables are used to comply with data privacy statutes, and can be used to avoid unnecessary storage (which you'll be charged for in a production environment). If you want to create a rolling window of data, add an expiration date so the partition disappears after you're finished using it.

Explore the available NOAA weather data tables

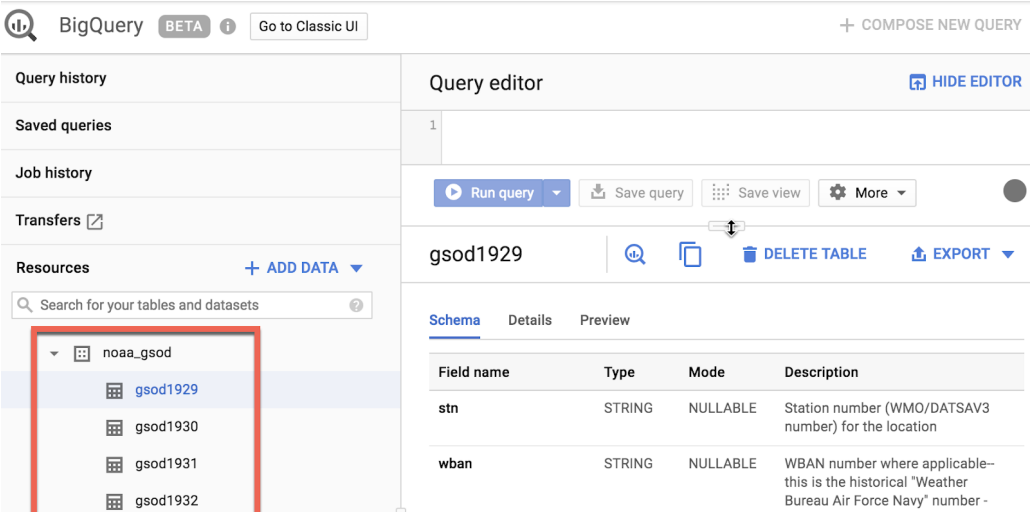
In the left menu, in **Resources**, click on **Add Data** and select **Explore public datasets**.



Search for **GSOD NOAA** then select the dataset.

Click on View Dataset.

Scroll through the tables in the **noaa_gsod** dataset (which are manually sharded and not partitioned)



			with WBAN being the acronym
year	STRING	NULLABLE	The year
mo	STRING	NULLABLE	The month
da	STRING	NULLABLE	The day
temp	FLOAT	NULLABLE	Mean temperature for the day in degrees Fahrenheit to tenths. Missing = 9999.9
count_temp	INTEGER	NULLABLE	Number of observations used in calculating mean temperature

First, **copy and paste** this below query to **Query editor**:

```
#standardSQL
SELECT
   DATE(CAST(year AS INT64), CAST(mo AS INT64), CAST(da AS INT64)) AS
date,
   (SELECT ANY_VALUE(name) FROM `bigquery-public-
data.noaa_gsod.stations` AS stations
    WHERE stations.usaf = stn) AS station_name,  -- Stations may have
multiple names
   prcp
FROM `bigquery-public-data.noaa_gsod.gsod*` AS weather
WHERE prcp < 99.9  -- Filter unknown values
   AND prcp > 0      -- Filter stations/days with no precipitation
   AND CAST(_TABLE_SUFFIX AS int64) >= 2018
ORDER BY date DESC -- Where has it rained/snowed recently
LIMIT 10
```

Note that the table wildcard * used in the FROM clause to limit the amount of tables referred to in the *TABLE_SUFFIX* filter.

Note that although a LIMIT 10 was added, this still does not reduce the total amount of data scanned (about 141.6 MB) since there are no partitions yet.

Click **Run**.

Confirm the date is properly formatted and the precipitation field is showing non-zero values.

Your turn: Create a Partitioned Table

Modify the previous query to create a table with the below specifications:

- Table name: ecommerce.days_with_rain
- Use the date field as your PARTITION BY
- For OPTIONS, specify partition_expiration_days = 60
- Add the table description = "weather stations with precipitation, partitioned by day"

Your query should look like this:

```
#standardSQL
CREATE OR REPLACE TABLE ecommerce.days_with_rain
PARTITION BY date
OPTIONS (
   partition_expiration_days=60,
   description="weather stations with precipitation, partitioned by
day"
) AS
SELECT
   DATE(CAST(year AS INT64), CAST(mo AS INT64), CAST(da AS INT64)) AS
date,
   (SELECT ANY_VALUE(name) FROM `bigquery-public-
data.noaa_gsod.stations` AS stations
    WHERE stations.usaf = stn) AS station_name,  -- Stations may have
multiple names
   prcp
```

```
FROM `bigquery-public-data.noaa_gsod.gsod*` AS weather
WHERE prcp < 99.9  -- Filter unknown values
   AND prcp > 0      -- Filter
   AND CAST(_TABLE_SUFFIX AS int64) >= 2018
```

Confirm data partition expiration is working

To confirm you are only storing data from 60 days in the past up until today, run the DATE_DIFF query to get the age of your partitions, which are set to expire after 60 days.

Below is a query which tracks the average rainfall for the NOAA weather station in Wakayama, Japan which has significant precipitation.

Add this query and run it:

```
#standardSQL
# avg monthly precipitation
SELECT
  AVG(prcp) AS average,
  station_name,
  date,
  CURRENT_DATE() AS today,
  DATE_DIFF(CURRENT_DATE(), date, DAY) AS partition_age,
  EXTRACT(MONTH FROM date) AS month
FROM ecommerce.days_with_rain
WHERE station_name = 'WAKAYAMA' #Japan
GROUP BY station_name, date, today, month, partition_age
ORDER BY date DESC; # most recent days first
```

Confirm the oldest partition_age is at or below 60 days

Update the ORDER BY clause to show the oldest partitions first. The date you see there Add this query and run it:

```
#standardSQL
# avg monthly precipitation

SELECT
  AVG(prcp) AS average,
  station_name,
  date,
  CURRENT_DATE() AS today,
  DATE_DIFF(CURRENT_DATE(), date, DAY) AS partition_age,
  EXTRACT(MONTH FROM date) AS month
FROM ecommerce.days_with_rain
WHERE station_name = 'WAKAYAMA' #Japan
GROUP BY station_name, date, today, month, partition_age
ORDER BY partition_age DESC
```

Congratulations!

You've successfully created and queried partitioned tables in BigQuery.

End your lab

When you have completed your lab, click **End Lab**. Qwiklabs removes the resources you've used and cleans the account for you.

You will be given an opportunity to rate the lab experience. Select the applicable number of stars, type a comment, and then click **Submit**.

The number of stars indicates the following:

- 1 star = Very dissatisfied
- 2 stars = Dissatisfied
- 3 stars = Neutral
- 4 stars = Satisfied
- 5 stars = Very satisfied

You can close the dialog box if you don't want to provide feedback.

For feedback, suggestions, or corrections, please use the **Support** tab.

Manual Last Updated: March 25, 2019

Lab Last Tested: March 25, 2019