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Creating Date-Partitioned Tables in BigQuery v1.5 | Google Cloud Skills Boost

Qwiklabs : 11-14 minutes

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 and requirements

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

1. Sign in to Qwiklabs using an **incognito window**.
2. Note the lab's access time (for example, `1:15:00`), and make sure you can finish within that time.
   There is no pause feature. You can restart if needed, but you have to start at the beginning.
3. When ready, click **Start lab**.
4. Note your lab credentials (**Username** and **Password**). You will use them to sign in to the Google Cloud Console.
5. Click **Open Google Console**.
6. Click **Use another account** and copy/paste credentials for **this** lab into the prompts.
   If you use other credentials, you'll receive errors or **incur charges**.
7. Accept the terms and skip the recovery resource page.

Open BigQuery Console

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

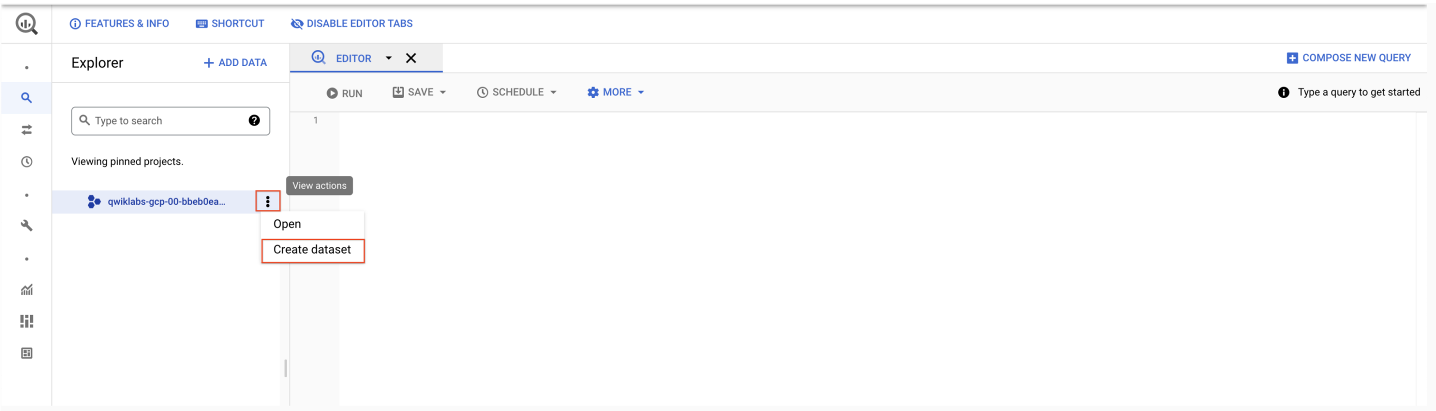
The **Welcome to BigQuery in the Cloud Console** message box opens. This message box provides a link to the quickstart guide and lists UI updates.

2. Click **Done**.

Task 1. Create a new dataset

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

1. In the left pane, under **Explorer** section, click on the **View actions** icon next to your project name (starts with `qwiklabs-gcp-...`), and then click **CREATE DATASET**.



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

Task 2. 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

1. 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

2. 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.

1. 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 results** will tell you how much data this query will process.

2. 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.

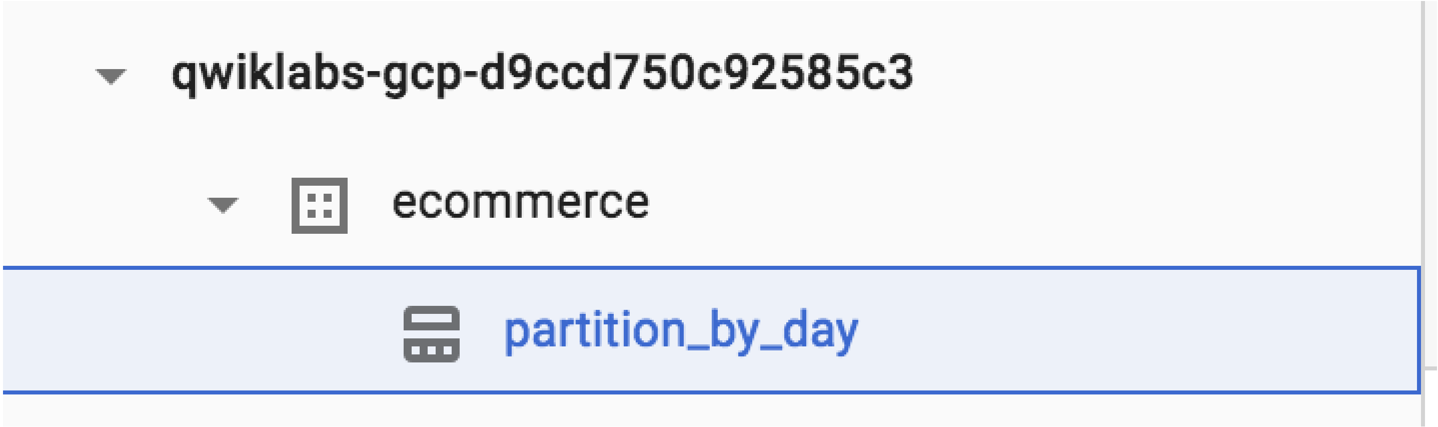
Create a new partitioned table based on date

1. Click **COMPOSE 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.

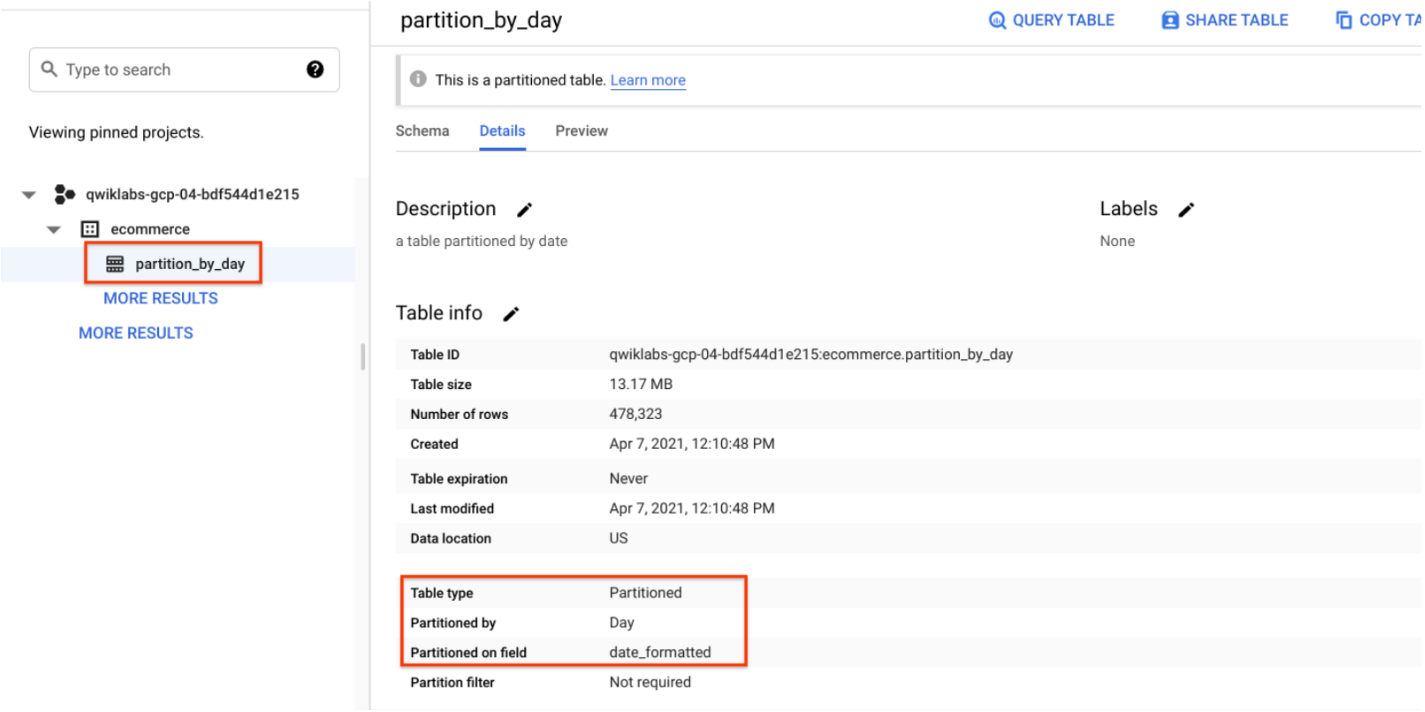
2. Click on the **ecommerce** dataset, then select the new **partiton_by_day** table:



3. Click on the **Details** tab.

Confirm that you see:

- Partitioned by: Day
- Partitioning on: date_formatted



This is a partitioned table. Learn more

Description

a table partitioned by date

Labels

None

Table info

Table ID	qwiklabs-gcp-04-bdf544d1e215:ecommerce.partition_by_day
Table size	13.17 MB
Number of rows	478,323
Created	Apr 7, 2021, 12:10:48 PM
Table expiration	Never
Last modified	Apr 7, 2021, 12:10:48 PM
Data location	US
Table type	Partitioned
Partitioned by	Day
Partitioned on field	date_formatted
Partition filter	Not required

Note: Partitions within partitioned tables on your Qwiklabs account will auto-expire after 60 days from the value in your date column. Your personal GCP account with billing-enabled will let you have partitioned tables that don't expire. For the purposes of this lab, the remaining queries will be ran against partitioned tables that have already been created.

Task 3. View data processed with a partitioned table

1. 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.

2. 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`.

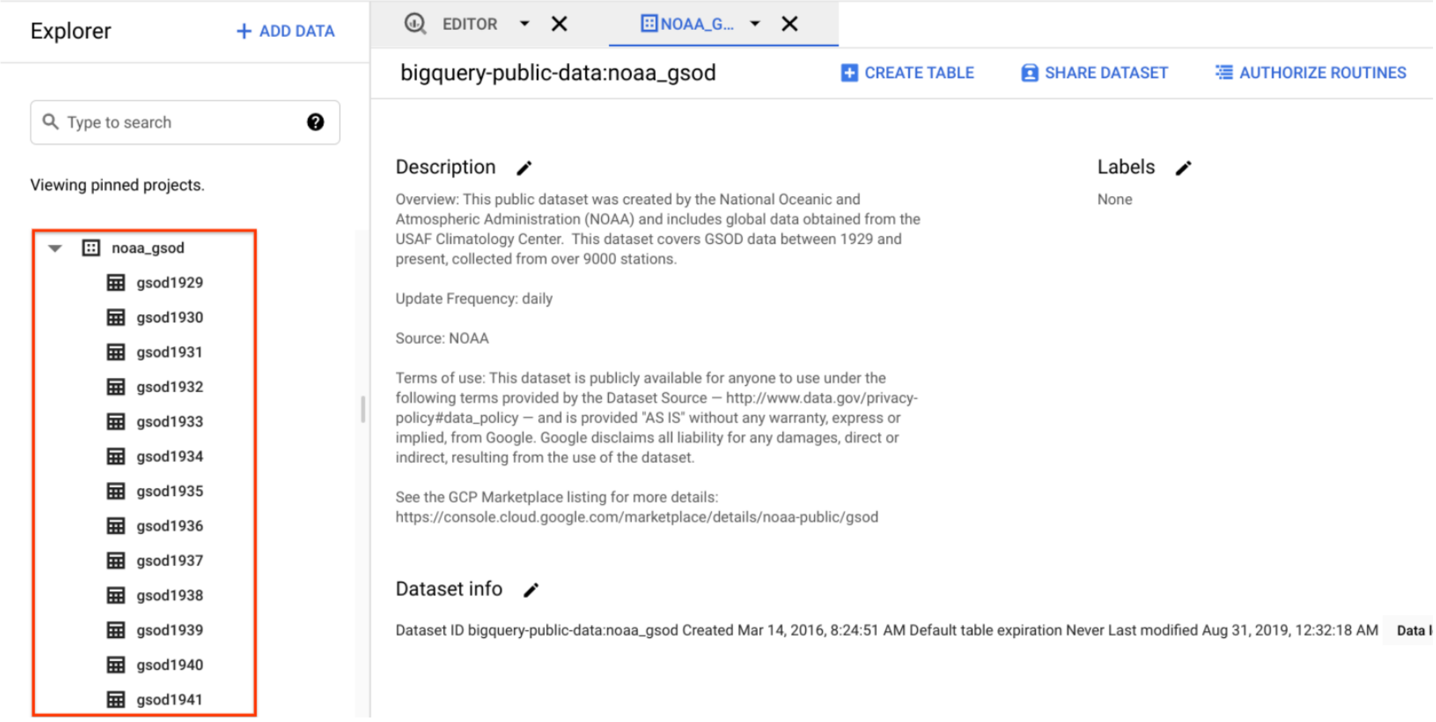
Why is there 0 bytes processed?

Task 4. 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

1. In the left menu, in **Explorer**, click on **+ ADD DATA** and select **Pin a Project > Enter project name**.
2. Enter `bigquery-public-data` and click **Pin**.
3. Expand **bigquery-public-data** and search for **noaa_gsod**.
4. **Scroll through** the tables in the **noaa_gsod** dataset (which are manually sharded and not partitioned).



bigquery-public-data:noaa_gsod

Overview: This public dataset was created by the National Oceanic and Atmospheric Administration (NOAA) and includes global data obtained from the USAF Climatology Center. This dataset covers GSOD data between 1929 and present, collected from over 9000 stations.

Update Frequency: daily

Source: NOAA

Terms of use: This dataset is publicly available for anyone to use under the following terms provided by the Dataset Source — http://www.data.gov/privacy-policy#data_policy — and is provided "AS IS" without any warranty, express or implied, from Google. Google disclaims all liability for any damages, direct or indirect, resulting from the use of the dataset.

See the GCP Marketplace listing for more details: https://console.cloud.google.com/marketplace/details/noaa-public/gsod

Dataset ID bigquery-public-data:noaa_gsod Created Mar 14, 2016, 8:24:51 AM Default table expiration Never Last modified Aug 31, 2019, 12:32:18 AM Data l

1. 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 length(_TABLE_SUFFIX) = 4 AND CAST(_TABLE_SUFFIX AS int64) >= 2018 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

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

Notice that although a LIMIT 10 was added, this still does not reduce the total amount of data scanned (about 457.5 MB) since there are no partitions yet.

2. Click **RUN**.
3. Confirm the date is properly formatted and the precipitation field is showing non-zero values.

Task 5. 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 length(_TABLE_SUFFIX) = 4 AND CAST(_TABLE_SUFFIX AS int64) >= 2018 AND prcp > 0 -- Filter AND CAST(_TABLE_SUFFIX AS int64) >= 2018
```

Confirm data partition expiration is working

1. 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.

2. 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
```

Task 6. Confirm the oldest partition_age is at or below 60 days

1. Update the ORDER BY clause to show the oldest partitions first.

2. 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
```

Note: Your results will vary if you re-run the query in the future, as the weather data, and your partitions, are continuously updated.

Congratulations!

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

End your lab

When you have completed your lab, click **End Lab**. Google Cloud Skills Boost 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.