Creating Date-Partitioned Tables in BigQuery

Open the 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 the release notes.

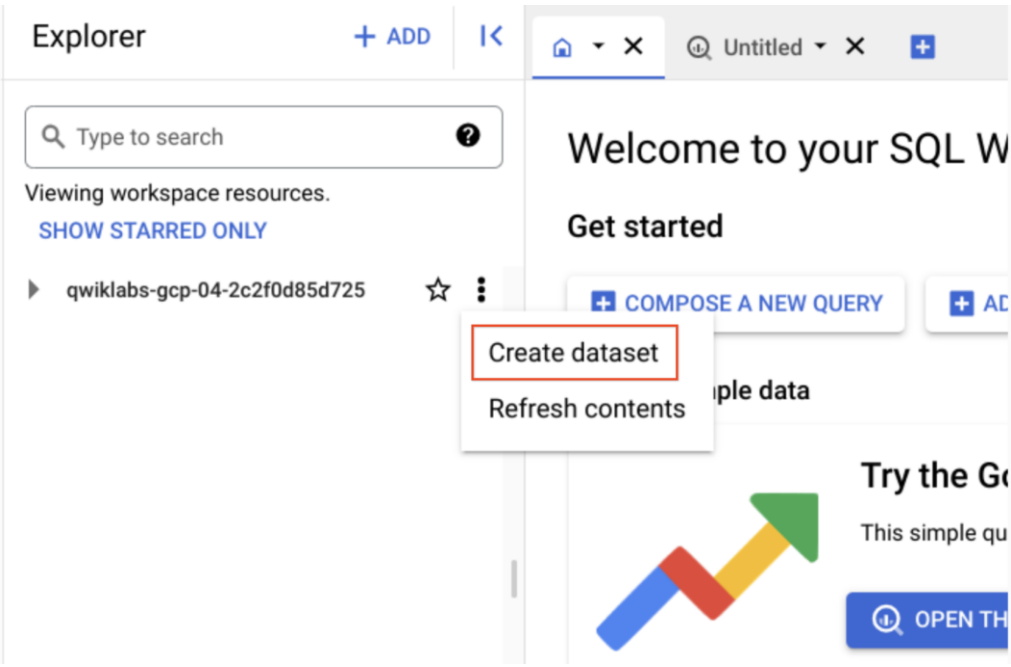
2. Click **Done**.

The BigQuery console opens.

Task 1. Create a new dataset

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

2. In the **Explorer pane**, near your project id, click on **View actions** then click **Create dataset**.



3. Set **Dataset ID** to **ecommerce**.

Leave the other options at their default values (Data Location, Default table Expiration).

4. Click **Create dataset**.

Task 2. Create 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 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 web page analytics for a sample of visitors in 2017

1. Click on **+ SQL query** and add the below query:

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

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".

2. Click **Run**.

The query returns 5 results.

Query web page analytics for a sample of visitors in 2018

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

1. Click **+ SQL query** to clear the **Query Editor**, then add this new query. Note the `WHERE date` parameter is changed to `20180708`:

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

The **Query Validator** tells 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, Now set up a date-partitioned table. This allows you to completely ignore scanning records in certain partitions if they are irrelevant to our query.

Create a new partitioned table based on date

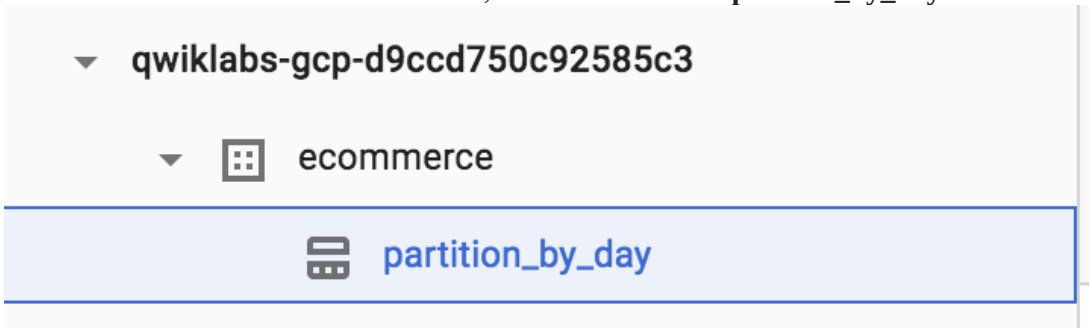
1. Click **+ SQL query** , add the below query, then click **Run**:

```
#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.

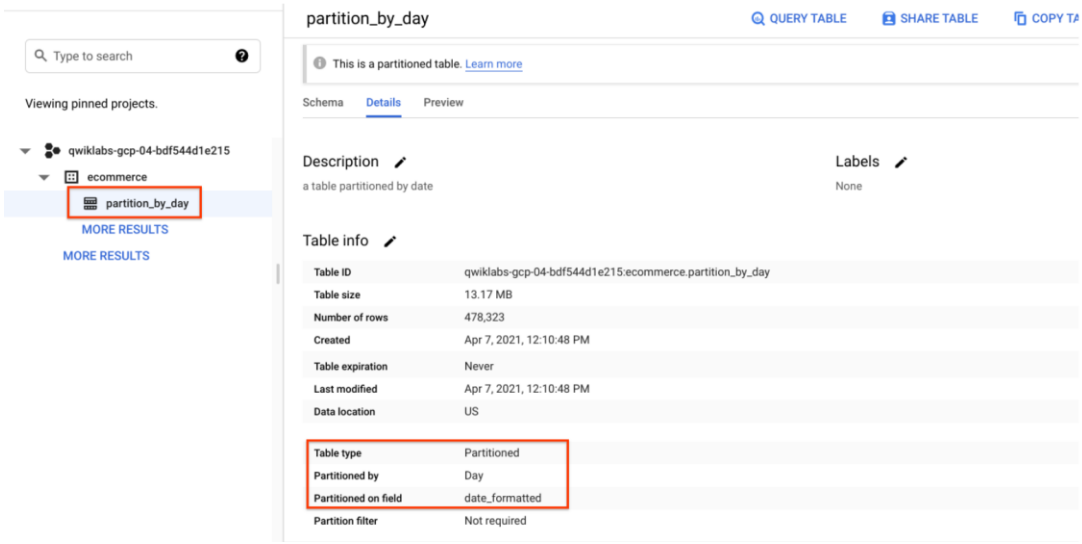
2. Click on the **ecommerce** dataset, then select the new **partiton_by_day** table:



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

Confirm that you see:

- Partitioned by: Day
- Partitioning on: date_formatted



Note: Partitions within partitioned tables on your lab account will auto-expire after 60 days from the value in your date column. Your personal Google Cloud 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 run against partitioned tables that have already been created.

Task 3. Review results from queries on 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.`

Task 4. Create 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 **Public datasets**.

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

3. Click on **View Dataset**.

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

Your goal is to create a table that:

- Queries on weather data from 2018 onward
- Filters to only include days that have had some precipitation (rain, snow, etc.)
- Only stores each partition of data for 90 days from that partition's date (rolling window)

1. First, **copy and paste** this below query:

```
#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 _TABLE_SUFFIX >= '2018'
 ORDER BY date DESC -- Where has it rained/snowed recently
 LIMIT 10
```

Note: The table wildcard * used in the FROM clause to limit the amount of tables referred to in the *TABLE_SUFFIX* filter.**Note:** Although a LIMIT 10 was added, this still does not reduce the total amount of data scanned (about 1.83 GB) 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 prcp > 0      -- Filter
   AND _TABLE_SUFFIX >= '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
```

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

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

- 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.