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Creating Permanent Tables and Access-Controlled Views in BigQuery v1.5 | Google Cloud Skills Boost

Qwiklabs : 21-26 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.

This lab you will learn how to create new permanent reporting tables and logical reviews from an existing ecommerce dataset.

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.

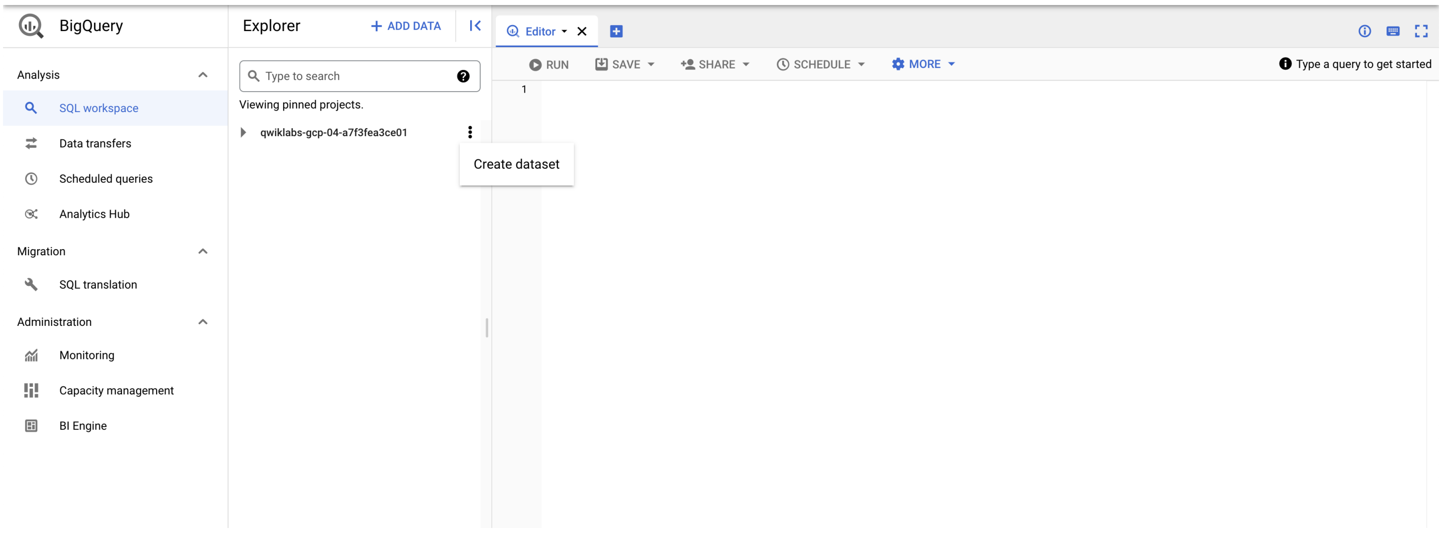
2. Click **Done**.

Task 1. Create a new dataset to store the tables

1. In BigQuery, click on view actions near your project name, then click **Create Dataset**.

2. In the **Dataset ID** field enter **ecommerce**. Leave the other options at their default values (Data Location, Default table Expiration).

3. Click **Create dataset**.



Task 2. Troubleshooting CREATE TABLE statements

Your data analyst team has provided you with the below query statements designed to create a permanent table in your new ecommerce dataset. Unfortunately they're not working properly.

Diagnose why each of the queries is broken and offer a solution.

Rules for creating tables with SQL in BigQuery

Read through these create table rules which you will use as your guide when fixing broken queries:

1. Either the specified **column list** or inferred columns from a **query_statement** (or both) must be present.

2. When both the column list and the as **query_statement** clause are present, BigQuery ignores the names in the as **query_statement** clause and matches the columns with the column list by position.

3. When the as **query_statement** clause is present and the column list is absent, BigQuery determines the column names and types from the as **query_statement** clause.

4. Column names must be specified either through the column list or as **query_statement** clause.

5. Duplicate column names are not allowed.

Query 1: Columns, columns, columns

- Add this query in the query **EDITOR**, then **Run** the query, diagnose the error, and answer the questions that follow:

#standardSQL # copy one day of ecommerce data to explore CREATE OR REPLACE TABLE ecommerce.all_sessions_raw_20170801 OPTIONS(description="Raw data from analyst team into our dataset for 08/01/2017") AS SELECT fullVisitorId, * FROM `data-to-insights.ecommerce.all_sessions_raw` WHERE date = '20170801' #56,989 records ;

```
Error: CREATE TABLE has columns with duplicate name fullVisitorId at [8:2]
```

Which one of the create table rules is violated in the above query?

Query 2: Columns revisited

- Add this query in the query **EDITOR**, then **Run** the query, diagnose the error, and answer the questions that follow:

#standardSQL # copy one day of ecommerce data to explore CREATE OR REPLACE TABLE ecommerce.all_sessions_raw_20170801 #schema (fullVisitorId STRING OPTIONS(description="Unique visitor ID"), channelGrouping STRING OPTIONS(description="Channel e.g. Direct, Organic, Referral...")) OPTIONS(description="Raw data from analyst team into our dataset for 08/01/2017") AS SELECT * FROM `data-to-insights.ecommerce.all_sessions_raw` WHERE date = '20170801' #56,989 records ;

```
Error: The number of columns in the column definition list does not match the number of columns produced by the query at [6:1]
```

Which one of the create table rules is violated in the above query?

Note: You cannot specify a schema of fields for a new table which does not match the number of columns returned by the query statement. In the above a two column schema was specified with `fullVisitorId` and `channelGrouping` but in the query statement all columns returned (*) was specified.

Query 3: It's valid! Or is it?

- Add this query in the query **EDITOR**, then **Run** the query, diagnose the error, and answer the questions that follow:

#standardSQL # copy one day of ecommerce data to explore CREATE OR REPLACE TABLE ecommerce.all_sessions_raw_20170801 #schema (fullVisitorId STRING OPTIONS(description="Unique visitor ID"), channelGrouping STRING OPTIONS(description="Channel e.g. Direct, Organic, Referral...")) OPTIONS(description="Raw data from analyst team into our dataset for 08/01/2017") AS SELECT fullVisitorId, city FROM `data-to-insights.ecommerce.all_sessions_raw` WHERE date = '20170801' #56,989 records ;

```
Valid: This query will process 1.05 GB when run.
```

Remember **Rule #2**: When both the column list and the `as query_statement` clause are present, BigQuery ignores the names in the `as query_statement` clause and matches the columns with the column list by position.

Query 4: The gatekeeper

1. Run the below query in the query **EDITOR**, then diagnose the error and answer the questions that follow:

#standardSQL # copy one day of ecommerce data to explore CREATE OR REPLACE TABLE ecommerce.all_sessions_raw_20170801 #schema (fullVisitorId STRING NOT NULL OPTIONS(description="Unique visitor ID"), channelGrouping STRING NOT NULL OPTIONS(description="Channel e.g. Direct, Organic, Referral..."), totalTransactionRevenue INT64 NOT NULL OPTIONS(description="Revenue * 10^6 for the transaction")) OPTIONS(description="Raw data from analyst team into our dataset for 08/01/2017") AS SELECT fullVisitorId, channelGrouping, totalTransactionRevenue FROM `data-to-insights.ecommerce.all_sessions_raw` WHERE date = '20170801' #56,989 records ;

```
Valid: This query will process 907.52 MB when run.
```

2. Fix and re-run the modified query to confirm it executes successfully.

Query 5: Working as intended

1. Run this query in the query **EDITOR**, then diagnose the error and answer the questions that follow:

#standardSQL # copy one day of ecommerce data to explore CREATE OR REPLACE TABLE ecommerce.all_sessions_raw_20170801 #schema (fullVisitorId STRING NOT NULL OPTIONS(description="Unique visitor ID"), channelGrouping STRING NOT NULL OPTIONS(description="Channel e.g. Direct, Organic, Referral..."), totalTransactionRevenue INT64 OPTIONS(description="Revenue * 10^6 for the transaction")) OPTIONS(description="Raw data from analyst team into our dataset for 08/01/2017") AS SELECT fullVisitorId, channelGrouping, totalTransactionRevenue FROM `data-to-insights.ecommerce.all_sessions_raw` WHERE date = '20170801' #56,989 records ;

2. Browse your **ecommerce** dataset panel to confirm the `all_sessions_raw_(1)` is present.

Why is the full table name not showing?

Answer: The table suffix 20170801 is automatically partitioned by day. If we created more tables for other days, the `all_sessions_raw_(N)` would increment by N distinct days of data. There is another lab that explores different ways of partitioning your data tables.

Query 6: Your turn to practice

1. **Goal**: In the query Editor, create a new permanent table that stores all the transactions with revenue for August 1st, 2017.

Use the below rules as a guide:

- Create a new table in your ecommerce dataset titled **revenue_transactions_20170801**. Replace the table if it already exists.
- Source your raw data from the **data-to-insights.ecommerce.all_sessions_raw table**.
- Divide the revenue field by **1,000,000** and store it as a **FLOAT64** instead of an **INTEGER**.
- Only include transactions with revenue in your final table (hint: use a WHERE clause).
- Only include transactions on 20170801.

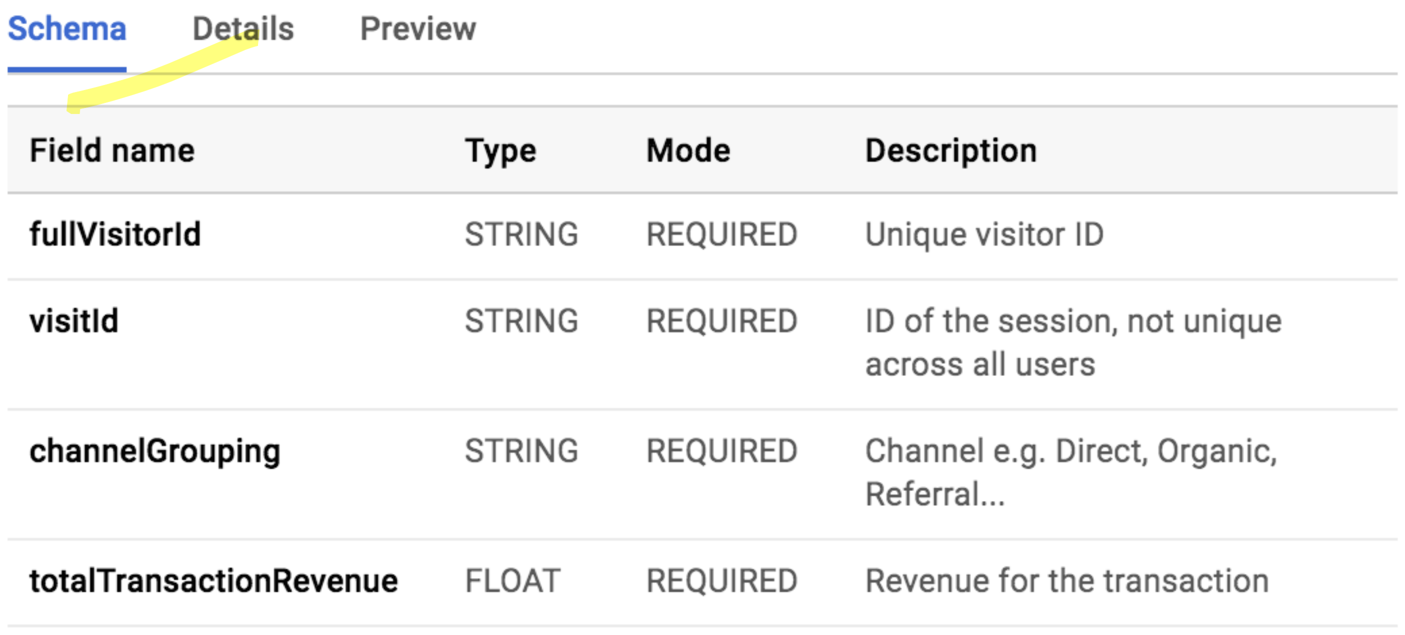
- Include these fields:
- fullVisitorId as a REQUIRED string field.
- visitId as a REQUIRED string field (hint: you will need to type convert).
- channelGrouping as a REQUIRED string field.
- totalTransactionRevenue as a FLOAT64 field.
- Add short descriptions for the above four fields by referring to the schema.
- Be sure to deduplicate records that have the same `fullVisitorId` and `visitId` (hint: use DISTINCT).

/* write the answer to the above prompt in BigQuery and compare it to the answer below */

Possible answer:

#standardSQL # copy one day of ecommerce data to explore CREATE OR REPLACE TABLE ecommerce.revenue_transactions_20170801 #schema (fullVisitorId STRING NOT NULL OPTIONS(description="Unique visitor ID"), visitId STRING NOT NULL OPTIONS(description="ID of the session, not unique across all users"), channelGrouping STRING NOT NULL OPTIONS(description="Channel e.g. Direct, Organic, Referral..."), totalTransactionRevenue FLOAT64 NOT NULL OPTIONS(description="Revenue for the transaction")) OPTIONS(description="Revenue transactions for 08/01/2017") AS SELECT DISTINCT fullVisitorId, CAST(visitId AS STRING) AS visitId, channelGrouping, totalTransactionRevenue / 1000000 AS totalTransactionRevenue FROM `data-to-insights.ecommerce.all_sessions_raw` WHERE date = '20170801' AND totalTransactionRevenue IS NOT NULL #XX transactions ;

2. After successfully running the query, confirm in your ecommerce dataset that the new table is present name as **revenue_transactions_20170801** and select it.
3. Confirm the schema against the below example. Note the field types, required, and optional description:



Field name	Type	Mode	Description
fullVisitorId	STRING	REQUIRED	Unique visitor ID
visitId	STRING	REQUIRED	ID of the session, not unique across all users
channelGrouping	STRING	REQUIRED	Channel e.g. Direct, Organic, Referral...
totalTransactionRevenue	FLOAT	REQUIRED	Revenue for the transaction

Handling upstream source data updates

What are ways to overcome stale data?

There are two ways to overcome stale data in reporting tables:

1. Periodically refresh the permanent tables by re-running queries that insert in new records. This can be done with BigQuery scheduled queries or with a Cloud Dataprep / Cloud Dataflow workflow.
2. Use logical views to re-run a stored query each time the view is selected

In the remainder of this lab you will focus on how to create logical views.

Task 3. Creating views

Views are saved queries that are run each time the view is called. In BigQuery, views are logical and not materialized. Only the query is stored as part of the view -- not the underlying data.

Query the latest 100 transactions

1. Copy and paste the below query and execute it in BigQuery:

```
#standardSQL SELECT DISTINCT date, fullVisitorId, CAST(visitId AS STRING) AS visitId,
channelGrouping, totalTransactionRevenue / 1000000 AS totalTransactionRevenue FROM `data-to-
insights.ecommerce.all_sessions_raw` WHERE totalTransactionRevenue IS NOT NULL ORDER BY date
DESC # latest transactions LIMIT 100 ;
```

2. Scan through for filter the results.

What was the latest transaction above $2,000?

Answer:

date	fullVisitorId	visitId	channelGrouping	totalTransactionRevenue
20170801	9947542428111966715	1501608078	Referral	2934.61

If new records were added to this public ecommerce dataset, the latest transaction would also update.

3. To save time and enable better organization and collaboration, you can save your common reporting queries as views as demonstrated below:

#standardSQL CREATE OR REPLACE VIEW ecommerce.vw_latest_transactions AS SELECT DISTINCT date, fullVisitorId, CAST(visitId AS STRING) AS visitId, channelGrouping, totalTransactionRevenue / 1000000 AS totalTransactionRevenue FROM `data-to-insights.ecommerce.all_sessions_raw` WHERE totalTransactionRevenue IS NOT NULL ORDER BY date DESC # latest transactions LIMIT 100 ; **Note:** It is often difficult to know whether or not you are SELECTing from a Table or a View by just looking at the name. A simple convention is to prefix the view name with `vw_` or add a suffix like `_vw` or `_view`.

4. You can also give your view a description and labels using **OPTIONS**. Copy and paste the below query and execute it in BigQuery:

#standardSQL CREATE OR REPLACE VIEW ecommerce.vw_latest_transactions OPTIONS(description="latest 100 ecommerce transactions", labels=[('report_type','operational')]) AS SELECT DISTINCT date, fullVisitorId, CAST(visitId AS STRING) AS visitId, channelGrouping, totalTransactionRevenue / 1000000 AS totalTransactionRevenue FROM `data-to-insights.ecommerce.all_sessions_raw` WHERE totalTransactionRevenue IS NOT NULL ORDER BY date DESC # latest transactions LIMIT 100 ;

5. Find the newly created `vw_latest_transactions` table in your ecommerce dataset and select it.

6. Select the **Details** tab.

7. Confirm your view **Description** and **Labels** are properly showing in the BigQuery UI.

You can also view the query that defines the view on the Details page. This is useful for understanding the logic of views you or your team created.

8. Now run this query to create a new view:

#standardSQL # top 50 latest transactions CREATE VIEW ecommerce.vw_latest_transactions # CREATE OPTIONS(description="latest 50 ecommerce transactions", labels=[('report_type','operational')]) AS SELECT DISTINCT date, fullVisitorId, CAST(visitId AS STRING) AS visitId, channelGrouping, totalTransactionRevenue / 1000000 AS totalTransactionRevenue FROM `data-to-insights.ecommerce.all_sessions_raw` WHERE totalTransactionRevenue IS NOT NULL ORDER BY date DESC # latest transactions LIMIT 50 ;

```
Error: Already Exists: Table project-name:ecommerce.vw_latest_transactions
```

You'll likely receive an error if you have already created the view before. Can you see why?

Answer: The view creation statement was updated to simply be CREATE instead of CREATE OR REPLACE which will not let you overwrite existing tables or views if they already exist. A third option, CREATE VIEW IF NOT EXISTS, will allow you to only create if the table or view doesn't exist or else it will skip the creation and not error.

View Creation: Your turn to practice

Scenario: Your anti-fraud team has asked you to create a report that lists the 10 most recent transactions that have an order amount of 1,000 or more for them to review manually.

Task: Create a new view that returns all the most recent 10 transactions with revenue greater than 1,000 on or after January 1st, 2017.

Use these rules as a guide:

- Create a new view in your ecommerce dataset titled "vw_large_transactions". Replace the view if it already exists.
- Give the view a description "large transactions for review".
- Give the view a label [("org_unit", "loss_prevention")].
- Source your raw data from the `data-to-insights.ecommerce.all_sessions_raw` table.
- Divide the revenue field by 1,000,000.
- Only include transactions with revenue greater than or equal to 1,000
- Only include transactions on or after 20170101 ordered by most recent first.
- Only include currencyCode = 'USD'.
- Return these fields:
  - date
  - fullVisitorId
  - visitId
  - channelGrouping
  - totalTransactionRevenue AS revenue
  - currencyCode
  - v2ProductName
- Be sure to deduplicate records (hint: use DISTINCT).

You try

/* write the answer to the above prompt in BigQuery and compare it to the answer given below */

Possible solution:

#standardSQL CREATE OR REPLACE VIEW ecommerce.vw_large_transactions OPTIONS(description="large transactions for review", labels=[('org_unit','loss_prevention')]) AS SELECT DISTINCT date, fullVisitorId, visitId, channelGrouping, totalTransactionRevenue / 1000000 AS revenue, currencyCode #v2ProductName FROM `data-to-insights.ecommerce.all_sessions_raw` WHERE (totalTransactionRevenue / 1000000) > 1000 AND currencyCode = 'USD' ORDER BY date DESC # latest transactions LIMIT 10 ; **Note:** You need to repeat the division in the WHERE clause because you cannot use aliased field names as filters.

Extra credit

Scenario: Your anti-fraud department is grateful for the query and they are monitoring it daily for suspicious orders. They have now asked you to include a sample of the products that are part of each order along with the results you returned previously.

- Using the BigQuery string aggregation function STRING_AGG and the `v2ProductName` field, modify your previous query to return 10 of the product names in each order, listed alphabetically.

Possible solution:

#standardSQL CREATE OR REPLACE VIEW ecommerce.vw_large_transactions OPTIONS(description="large transactions for review", labels=[('org_unit','loss_prevention')]) AS SELECT DISTINCT date, fullVisitorId, visitId, channelGrouping, totalTransactionRevenue / 1000000 AS totalTransactionRevenue, currencyCode, STRING_AGG(DISTINCT v2ProductName ORDER BY v2ProductName LIMIT 10) AS products_ordered FROM `data-to-insights.ecommerce.all_sessions_raw` WHERE (totalTransactionRevenue / 1000000) > 1000 AND currencyCode = 'USD' GROUP BY 1,2,3,4,5,6 ORDER BY date DESC # latest transactions LIMIT 10

Note the two additions here to aggregate the list of products in each order with STRING_AGG() and, since you're performing an aggregation, the necessary GROUP BY is added for the other fields.

Using SESSION_USER() in views for limiting data access

Scenario: Your data team lead has asked you to come up with a way to limit who in your organization can see the data returned by the view you just created. Order information is especially sensitive and needs to be shared only with users that have a need to see such information.

Task: Modify the view you created earlier to only allow logged in users with a qwiklabs.net session domain to be able to see the data in the underlying view. (Note: You will be creating specific user group whitelists in a later lab on access; for now you are validating based on the session user's domain).

1. To view your own session login information, run the below query that uses SESSION_USER():

#standardSQL SELECT SESSION_USER() AS viewer_ldap;

You will see xxxx@qwiklabs.net.

2. Modify the below query to add an additional filter to only allow users in the `qwiklabs.net` domain to see view results:

#standardSQL SELECT DISTINCT SESSION_USER() AS viewer_ldap, REGEXP_EXTRACT(SESSION_USER(), r'@(.+)') AS domain, date, fullVisitorId, visitId, channelGrouping, totalTransactionRevenue / 1000000 AS totalTransactionRevenue, currencyCode, STRING_AGG(DISTINCT v2ProductName ORDER BY v2ProductName LIMIT 10) AS products_ordered FROM `data-to-insights.ecommerce.all_sessions_raw` WHERE (totalTransactionRevenue / 1000000) > 1000 AND currencyCode = 'USD' # add filter here GROUP BY 1,2,3,4,5,6,7,8 ORDER BY date DESC # latest transactions LIMIT 10

Possible solution:

#standardSQL SELECT DISTINCT SESSION_USER() AS viewer_ldap, REGEXP_EXTRACT(SESSION_USER(), r'@(.+)') AS domain, date, fullVisitorId, visitId, channelGrouping, totalTransactionRevenue / 1000000 AS totalTransactionRevenue, currencyCode, STRING_AGG(DISTINCT v2ProductName ORDER BY v2ProductName LIMIT 10) AS products_ordered FROM `data-to-insights.ecommerce.all_sessions_raw` WHERE (totalTransactionRevenue / 1000000) > 1000 AND currencyCode = 'USD' AND REGEXP_EXTRACT(SESSION_USER(), r'@(.+)') IN ('qwiklabs.net') GROUP BY 1,2,3,4,5,6,7,8 ORDER BY date DESC # latest transactions LIMIT 10

3. Execute the above query to confirm you can see records returned.

4. Now, remove all domains from the IN filter `REGEXP_EXTRACT(SESSION_USER(), r'@(.+)') IN ('')`, execute the query again, and confirm you see zero records returned.

5. Re-create and replace the **vw_large_transactions** view with the new query above. As an additional OPTIONS parameter, add an `expiration_timestamp` for the entire view to be 90 days from now:

expiration_timestamp=TIMESTAMP_ADD(CURRENT_TIMESTAMP(), INTERVAL 90 DAY).

Possible solution:

#standardSQL CREATE OR REPLACE VIEW ecommerce.vw_large_transactions OPTIONS(description="large transactions for review", labels=[('org_unit','loss_prevention')], expiration_timestamp=TIMESTAMP_ADD(CURRENT_TIMESTAMP(), INTERVAL 90 DAY)) AS #standardSQL SELECT DISTINCT SESSION_USER() AS viewer_ldap, REGEXP_EXTRACT(SESSION_USER(), r'@(.+)') AS domain, date, fullVisitorId, visitId, channelGrouping, totalTransactionRevenue / 1000000 AS totalTransactionRevenue, currencyCode, STRING_AGG(DISTINCT v2ProductName ORDER BY v2ProductName LIMIT 10) AS products_ordered FROM `data-to-insights.ecommerce.all_sessions_raw` WHERE (totalTransactionRevenue / 1000000) > 1000 AND currencyCode = 'USD' AND REGEXP_EXTRACT(SESSION_USER(), r'@(.+)') IN ('qwiklabs.net') GROUP BY 1,2,3,4,5,6,7,8 ORDER BY date DESC # latest transactions LIMIT 10; **Note:** The `expiration_timestamp` option can also be applied to permanent tables.

6. Confirm with the below SELECT statement you can see the data returned in the view (given your domain access) and the expiration timestamp in the view details.

#standardSQL SELECT * FROM ecommerce.vw_large_transactions;

Congratulations!

You've successfully created tables and access-controlled views using SQL DDL (Data Definition Language) inside of 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
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For feedback, suggestions, or corrections, please use the **Support** tab.