Writing queries in BigQuery

INTRODUCTION TO BIGQUERY

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Writing simple queries

A simple query in BigQuery

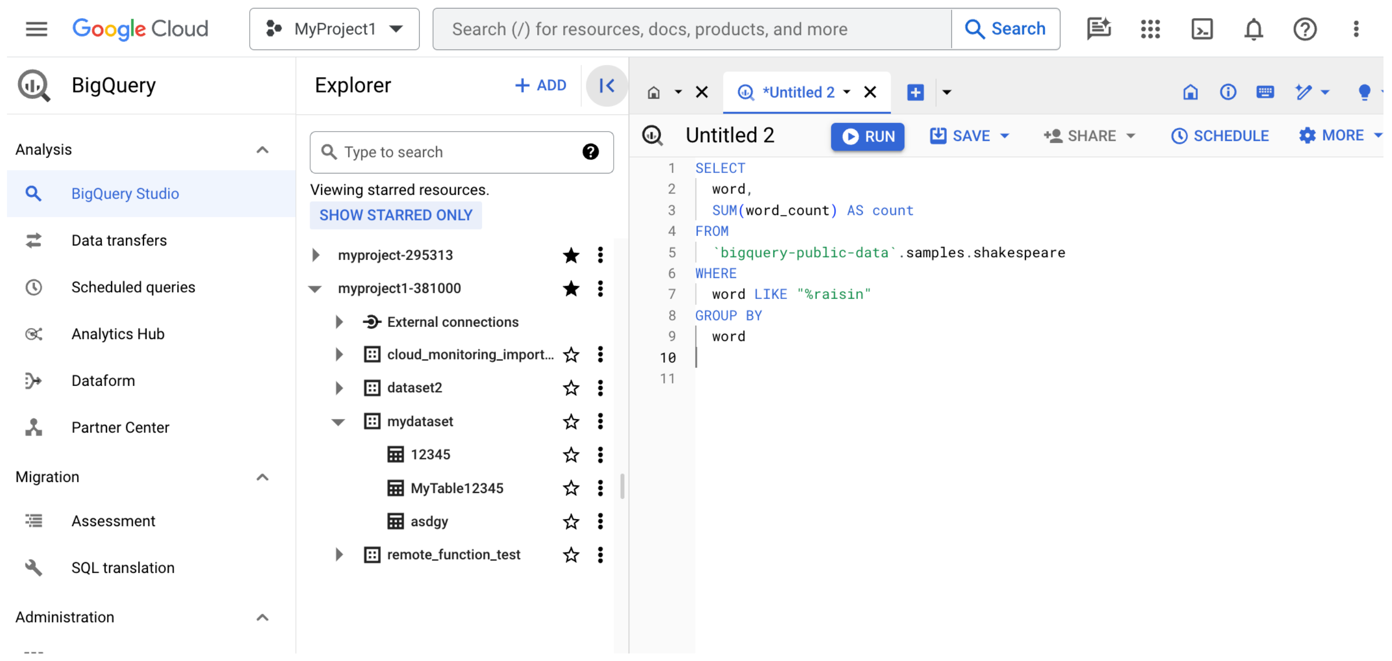
```
-- Note the table name structure

SELECT
    *
FROM
    `project.ecommerce.order_items`
```

Running queries in BigQuery

We can run queries in BigQuery via:

- BigQuery Studio
- Client libraries (e.g., Python)
- Google Cloud command line tool
- Pandas



```sql
SELECT
  word,
  SUM(word_count) AS count
FROM
  `bigquery-public-data`.samples.shakespeare
WHERE
  word LIKE "%raisin"
GROUP BY
  word
```

Using correct table names

```sql
-- Using the full table name structure


SELECT
    *
FROM
    `dataset.ecommerce.order_items`
```

```sql
/* Using the shorthand
table name structure */

SELECT
    *
FROM
    ecommerce.order_items
```

GoogleSQL

Legacy SQL	GoogleSQL	Notes
BOOL	BOOL	
INTEGER	INT64	
FLOAT	FLOAT64	
STRING	STRING	
BYTES	BYTES	
RECORD	STRUCT	

Our datasets: Olist E-Commerce

- **Orders:** Order number and order item information
- **Order details:** Customer id, order and shipping dates
- **Payments:** Payment type, split payments, amounts
- **Products:** Product category, description, dimensions

[1] https://www.kaggle.com/datasets/olistbr/brazilian-ecommerce

Products

- `product_id` - unique product ID
- `product_photos_qty` - number of product photos
- `product_weight_g` - weight of the product
- `product_category_name_english` - product category name

Orders

- `order_id` - Order unique ID
- `order_items` - `STRUCT` containing information about the order items
  - `order_item_id` - Item number in the order
  - `product_id` - Unique product ID
  - `seller_id` - Unique seller ID
  - `price` - Price of the order item

Order details

- `order_id` - unique order ID
- `customer_id` - unique customer ID
- `order_status` - current order status
- `order_purchase_timestamp` - Timestamp when order was purchased
- `order_approved_at` - Timestamp when order was approved
- `order_delivered_carrier_date` - Timestamp when order was accepted by the carrier
- `order_delivered_customer_date` - Timestamp when order delivered
- `order_estimated_delivery_date` - Timestamp of estimated delivery date

Payments

- `order_id` - unique order ID
- `payment_type` - type of payment
- `payment_sequential` - payment number
- `payment_installments` - number of payment installments
- `payment_value` - value of that payment

Review of aggregations and joins

```
-- Count of orders per customers


SELECT
    d.customer_id,
    COUNT(o.order_id)
FROM
    dataset.order_details d
JOIN
    dataset.orders o
USING (order_id)
GROUP BY
    d.customer_id
```

Five key components:

1. Aggregate function
2. The left dataset
3. The right dataset
4. Join condition
5. Grouping condition

Let's practice!

INTRODUCTION TO BIGQUERY

Data ingestion in BigQuery

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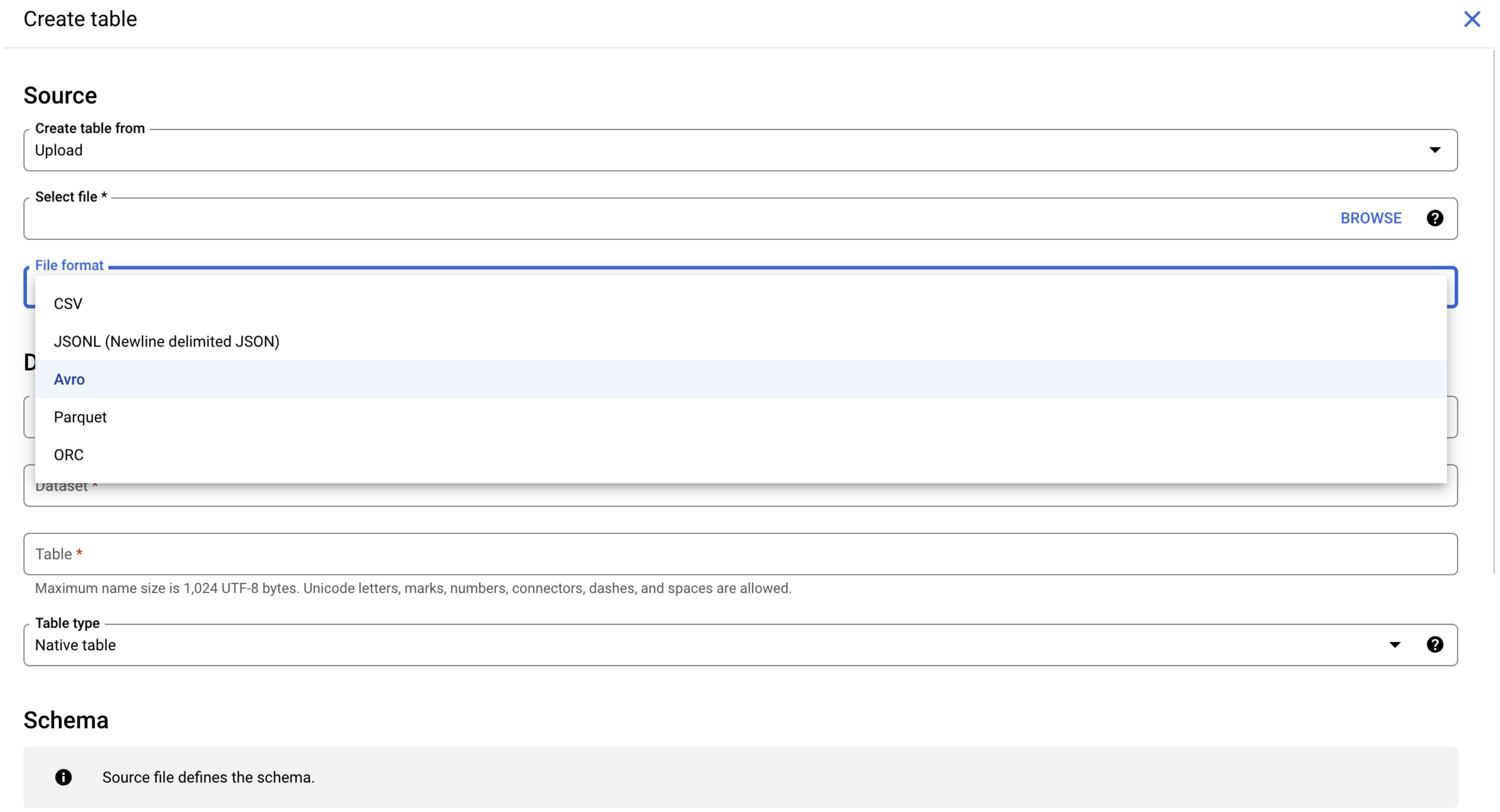
Methods of loading data

1. Loading data in the BigQuery Studio
2. Using the `bq` command line tools
3. Using the `LOAD DATA` command in SQL

Using the BigQuery Studio



Create table

Source

Create table from: Upload

Select file *

File format

CSV
JSONL (Newline delimited JSON)
Avro
Parquet
ORC

Dataset *

Table *

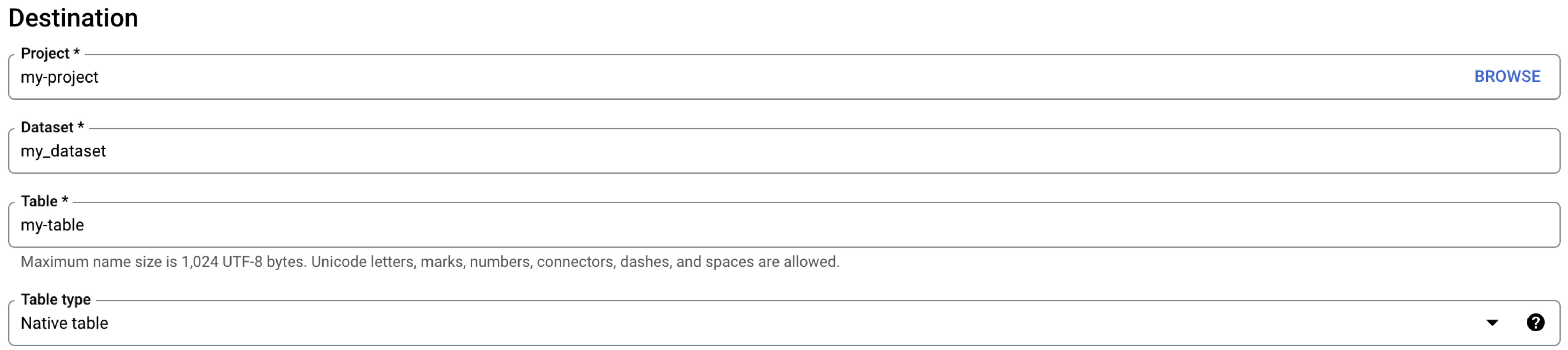
Maximum name size is 1,024 UTF-8 bytes. Unicode letters, marks, numbers, connectors, dashes, and spaces are allowed.

Table type: Native table

Schema

Source file defines the schema.

Using the BigQuery Studio

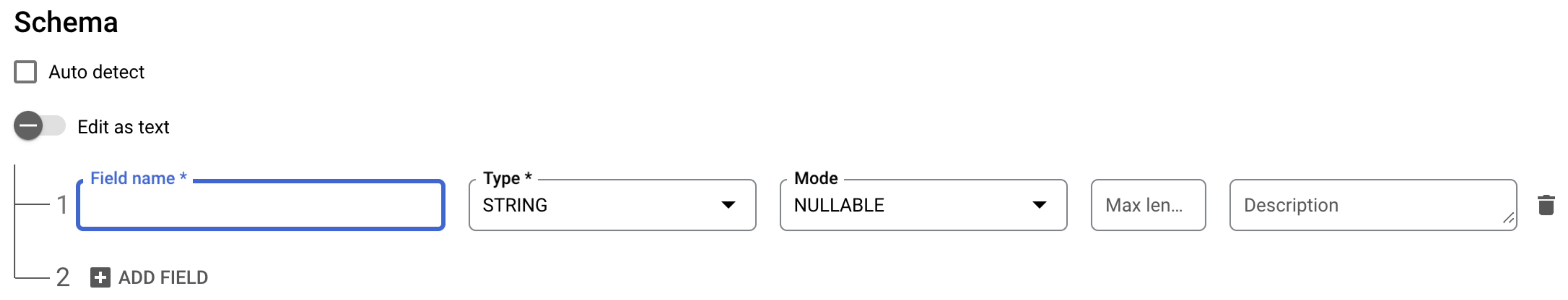


Destination

Project *	my-project
Dataset *	my_dataset
Table *	my-table
Table type	Native table

Maximum name size is 1,024 UTF-8 bytes. Unicode letters, marks, numbers, connectors, dashes, and spaces are allowed.

Using the BigQuery Studio



Schema

Auto detect

Edit as text

1 Field name * | Type * STRING | Mode NULLABLE | Max len... | Description

2 ADD FIELD

Using the bq command line tools

Example using the `bq` command line

```
bq load \
    dataset.table \
    gs://mybucket/mydata.csv \
    --source_format=CSV \
    --autodetect
```

[1] https://cloud.google.com/bigquery/docs/bq-command-line-tool#loading_data

Using LOAD DATA in SQL

An example `LOAD DATA` statement:

```
LOAD DATA INTO dataset.table
  FROM FILES(
    uris = ['gs://mybucket/mydata.csv']
    format='CSV',
    skip_leading_rows=1
  )
```

Data ingestion considerations

Using `LOAD DATA`

1. Cannot use local data.
2. Subject to load data limits.

Using `bq` and BigQuery Studio

1. Local data can be used, but files must be under 100 MB.
2. Subject to load data limits.

[1] https://cloud.google.com/bigquery/quotas#load_jobs

Let's practice!

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Data/time types in BigQuery

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Why date and times matter

1. Easily filter long datasets
2. Extract parts of dates/times
3. Partitioning strategies

Dates

Example of the DATE data type

```
SELECT
    DATE(2010, 05, 19) as launch

/*------------*
 | launch     |
 +------------+
 | 2010-05-19 |
 *------------*/
```

Timestamps

Example timestamp:

```
SELECT
    TIMESTAMP("2010-05-19 00:00:00+00") as launch

/*-------------------------*
 | launch                  |
 +-------------------------+
 | 2010-05-19 00:00:00 UTC |
 *-------------------------*/
```

Datetime and Time

Examples of time and datetime:

```
SELECT
  TIME(12, 00, 00) as noon,
  DATETIME(2019, 05, 19, 00, 00, 00) as launch

/*----------+----------------------*
 | noon     | launch               |
 +----------+----------------------+
 | 12:00:00 | 2019-05-19T00:00:00  |
 *----------+----------------------*/
```

Date and timestamp parts

Day

- `DAY` , `DAYOFWEEK` , `DAYOFYEAR` .

Week

- `WEEK` , `WEEKDAY` , `ISOWEEK` .

Month/Year

- `MONTH` , `QUARTER` , `YEAR` , `ISOYEAR` .

Time

- `HOUR` , `MINUTE` , `SECOND` , `MILLISECOND` , `MICROSECOND` .

[1] https://cloud.google.com/bigquery/docs/reference/standard-sql/timestamp_functions#timestamp_trunc

ADD, SUBTRACT, and DIFF

Adding five days

```
SELECT
    DATE_ADD(DATE '2010-05-19',
             INTERVAL 5 DAY)
             AS five_days_later;

/*---------------------*
 | five_days_later     |
 +---------------------+
 | 2010-05-24          |
 *---------------------*/
```

Finding the difference

```
SELECT
    DATE_DIFF(DATE '2010-05-24',
             DATE '2010-05-19', DAY)
             AS difference;

/*--------------*
 | difference   |
 +--------------+
 | 5            |
 *--------------*/
```

EXTRACT

Finding the day of the week

```
SELECT
    EXTRACT(DAYOFWEEK FROM DATE '2010-05-19')
             AS day_of_week;

/*---------------*
 | day_of_week  |
 +---------------+
 | 4            |
 *---------------*/
```

FORMAT

```
SELECT
    FORMAT_DATE(
      '%x', DATE '2010-05-19')
    AS with_slashes;

/*--------------*
 | with_slashes |
 +--------------+
 | 05/19/10     |
 *--------------*/
```

```
SELECT
    FORMAT_DATE(
      '%A', DATE '2010-05-19')
    AS dow;

/*--------------*
 | dow          |
 +--------------+
 | Wednesday    |
 *--------------*/
```

[1] https://cloud.google.com/bigquery/docs/reference/standard-sql/format-elements#format_elements_date_time

Current date/timestamp

Finding the current timestamp:

```
SELECT
  CURRENT_TIMESTAMP();


/*---------------------------------*
 | current_timestamp               |
 +---------------------------------+
 | 2023-11-13 17:35:25.951432 UTC  |
 *---------------------------------*/
```

Finding the current date:

```
SELECT
  CURRENT_DATE();


/*----------------*
 | current_date   |
 +----------------+
 | 2023-11-13     |
 *----------------*/
```

Cheat sheet

Data types

- Dates are exact days, timestamps are absolute dates and times

Date/timestamp parts

- Parts of a date/timestamp (e.g. `MONTH` , or `HOUR`)

Add and subtract

- Functions to add or subtract date parts (e.g. `DATE_ADD`)

Difference

- Difference between two dates by date part (e.g. `TIMESTAMP_SUB`)

Extract and format

- Extract a part of a date using date parts, format a date (e.g. `EXTRACT` and `FORMAT`)

Current date/timestamp

- Return the current date or timestamp (e.g. `CURRENT_TIMESTAMP`)

Let's practice!

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Unstructured data

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Why unstructured data is important

Example with unstructured data:

```
/*--------------+------------------------------------------*
 | customer_id  | emails                                   |
 +--------------+------------------------------------------+
 | 12345        | ['mark@google.com', 'mark@gmail.com']    |
 *--------------+------------------------------------------*/
```

ARRAYs

```
SELECT ARRAY
  (SELECT 'bigquery' UNION ALL
   SELECT 'analytics' UNION ALL
   SELECT 'sql') AS new_array;

/*-------------------------------------*
 | new_array                           |
 +-------------------------------------+
 | ['bigquery', 'analytics', 'sql']   |
 *-------------------------------------*/
```

```
SELECT ARRAY
  (SELECT 'bigquery' UNION ALL
   SELECT 'analytics' UNION ALL
   SELECT 'sql')[1] as result;

/*----------------*
 | result          |
 +----------------+
 | 'analytics'   |
 *----------------*/
```

STRUCTs

```
SELECT
  STRUCT
  <skill string, learning bool>
  ('big query', true)
  as skills;

/*--------------+--------------*
 | skills.skill | learning     |
 +--------------+------------- +
 | 'big query'  | true         |
 *--------------+--------------*/
```

```
SELECT
  STRUCT
  <skill string, learning bool>
  ('big query', true).skill
  as key;

/*---------------+
 | key.          |
 +---------------+
 | 'big query'   |
 *---------------*/
```

ARRAY_LENGTH and ARRAY_CONCAT

```
SELECT
  ARRAY_LENGTH(
    [
      'mark@google.com',
      'mark@gmail.com'
    ]) as len;

/*-------*
 | len   |
 +-------+
 | 2     |
 *-------*/
```

```
SELECT
  ARRAY_CONCAT(
    ['one'], ['two']) as new_array;

/*--------------------*
 | new_array          |
 +--------------------+
 | ['one', 'two']     |
 *--------------------*/
```

UNNEST

Unnest-ing our email data:

```
SELECT
    *
FROM
    UNNEST(['mark@google.com', 'mark@gmail.com']) as emails;

/*--------------------+
 | emails             |
 +--------------------+
 | 'mark@google.com'  |
 | 'mark@gmail.com'   |
 *--------------------*/
```

UNNEST with STRUCTs

Example data - STRUCT inside an ARRAY:

```
[
    {'big query': true},
    {'sql': true}
]
```

```
SELECT
    my_skills.skill,
    my_skills.learned
FROM
    UNNEST(skills) as my_skills
/*--------------+--------------*
 | skill        | learned      |
 +--------------+------------- +
 | 'big query'  | true         |
 +--------------+------------- +
 | 'sql'        | true         |
 *--------------+--------------*/
```

SEARCH

Using search with email data:

```
SELECT
    SEARCH(['mark@google.com', 'mark@gmail.com'], 'gmail.com') as results;

/*----------*
 | results  |
 +----------+
 | true     |
 *----------*/
```

Unstructured data cheat sheet

ARRAYs

- Similar to lists with ordered values
- Values can accessed via a base 0 index (e.g., `my_array[0]`)

STRUCTs

- Similar to JSON or a dictionary
- Can have any structure with multiple data types
- Structure must be the same for all rows in that column

ARRAY_CONCAT/ARRAY_LENGTH

- Concatenate two or more arrays and measure an array length

UNNEST

- Allows you to flatten ARRAY data

SEARCH

- Search across ARRAYs or STRUCTs to find matching values

Let's practice!