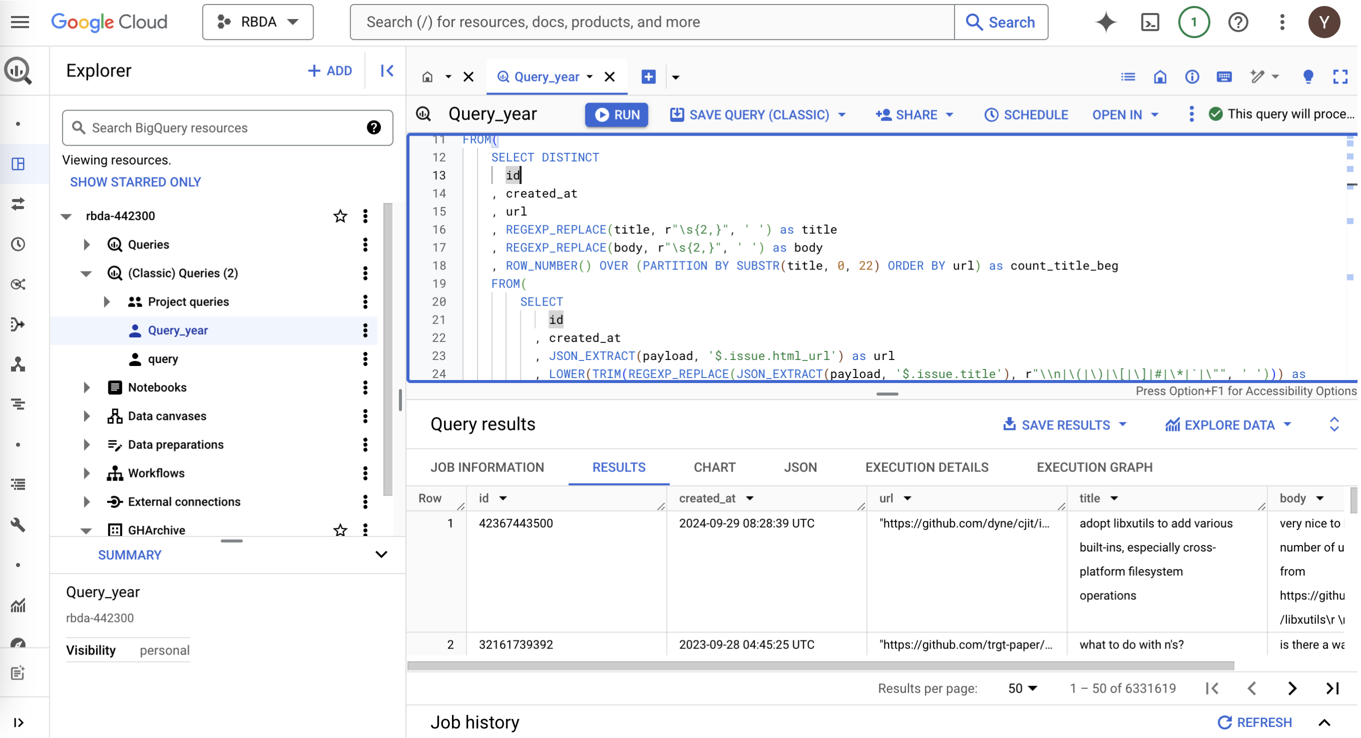
Data perparation and ingestion

In our project, I selected CH Archive of 2023 and 2024 as one of data source. CH Archive dataset includes all records of the public GitHub timeline, such as all kinds of issues. Therefore, we will use content of issues in recent two years to analyze the trend of technology that has been used with time.

Data Preparation

CH Archive dataset could be obtained from Google BigQuery with SQL query. The following picture shows the user interface of data fetching with BigQuery.



```
FROM(
    SELECT DISTINCT
      id
    , created_at
    , url
    , REGEXP_REPLACE(title, r"\s{2,}", ' ') as title
    , REGEXP_REPLACE(body, r"\s{2,}", ' ') as body
    , ROW_NUMBER() OVER (PARTITION BY SUBSTR(title, 0, 22) ORDER BY url) as count_title_beg
    FROM(
        SELECT
          id
        , created_at
        , JSON_EXTRACT(payload, '$.issue.html_url') as url
        , LOWER(TRIM(REGEXP_REPLACE(JSON_EXTRACT(payload, '$.issue.title'), r"\\n|\(|\)|\[|\]|#|\*|`|\"", ' '))) as
```

Row	id	created_at	url	title	body
1	42367443500	2024-09-29 08:28:39 UTC	"https://github.com/dyne/cjit/i...	adopt libxutils to add various built-ins, especially cross-platform filesystem operations	very nice to number of u from https://githu /libxutils\r \
2	32161739392	2023-09-28 04:45:25 UTC	"https://github.com/trgt-paper/...	what to do with n's?	is there a wa

Parts of SQL query over CH Archive table of 2023 and 2024 is listed as below:

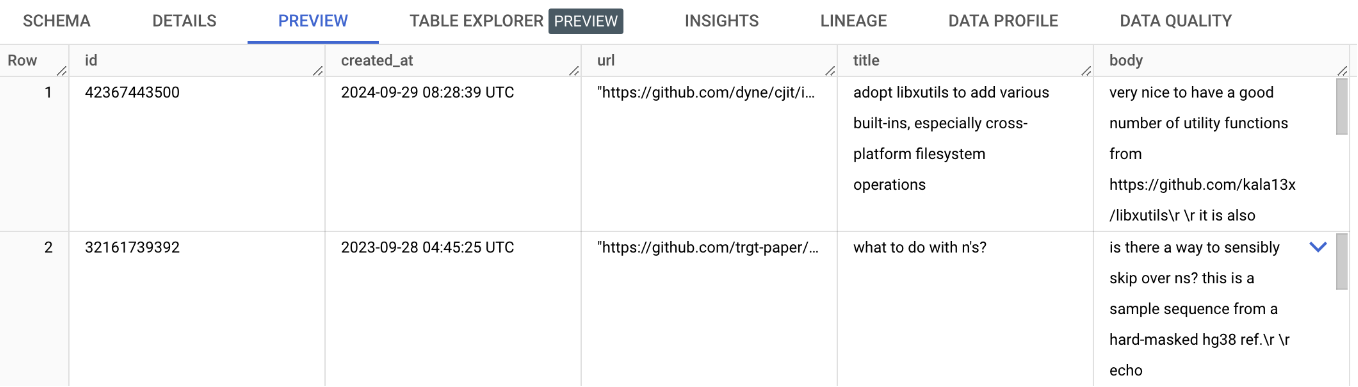
```
SELECT
    id,
    created_at,
    JSON_EXTRACT(payload, '$.issue.html_url') as url,
    LOWER(TRIM(REGEXP_REPLACE(JSON_EXTRACT(payload, '$.issue.title'),
r"\\n|\(|\)|\[|\]|#|\*|`|\"", ' '))) as title,
    LOWER(TRIM(REGEXP_REPLACE(JSON_EXTRACT(payload, '$.issue.body'), r"\\n|\
(|\)|\[|\]|#|\*|`|\"", ' '))) as body
FROM `githubarchive.day.2024*`
WHERE
```

```
    _TABLE_SUFFIX BETWEEN '0101' AND '1031'
    AND type="IssuesEvent"
    AND JSON_EXTRACT(payload, '$.action') = "\"opened\""
```

Finally we can get our raw dataset with following schema:

Field Name	Type	Description
id	STRING	id of each issue
created_at	TIMESTAMP	create time of each issue
url	STRING	url for each issue
title	STRING	issue title
body	STRING	content of issue

Here is a preview of raw dataset:



Row	id	created_at	url	title	body
1	42367443500	2024-09-29 08:28:39 UTC	"https://github.com/dyne/cjit/i...	adopt libxutils to add various built-ins, especially cross-platform filesystem operations	very nice to have a good number of utility functions from https://github.com/kala13x /libxutils\r \r it is also
2	32161739392	2023-09-28 04:45:25 UTC	"https://github.com/trgt-paper/...	what to do with n's?	is there a way to sensibly skip over ns? this is a sample sequence from a hard-masked hg38 ref.\r \r echo

The raw dataset consists of 6,331,619 rows, and it is 4.13 GB in size. Then the dataset is exported to bucket `gs://nyu-dataproc-hdfs-ingest/gharchive` for further ingestion.

Data ingestion

Data ingestion consists of several steps:

1. Total order sort for all data by `id`.
2. Normalize the `created_at` timestamp to a consistent format as `time` field.
3. Remove special characters or extra whitespaces from `title` and `body`, and combine them as `text` field.
4. Remove or replace non-printable characters, such as `\r`.
5. Add a `source` field with value `GH Archive`.

Design of Mapper and Reducer:

- Mapper:
  - For sampling phase, mapper should yield `id` from each line in JSON input file.
  - For total order sorting phase, only identity mapper is required.
- Reducer:
  - For sampling phase, we don't need any reducer.
  - For total order sorting phase, reducer should do data cleaning as mentioned above and then output values.

Execution:

Upload all `DataIngest.java` file to DataProc, compile source code and generate `*.jar` file.

```
javac -classpath `hadoop classpath` *.java
jar cvf dataIngest.jar *.class
```

Usage: `DataIngest <input_path> <output_path>`

Then we can run `DataIngest` job using `jar` file.

```
hadoop jar dataIngest.jar DataIngest gs://nyu-dataproc-hdfs-ingest/gharchive
gs://nyu-dataproc-hdfs-ingest/gharchive/output
```

Result:

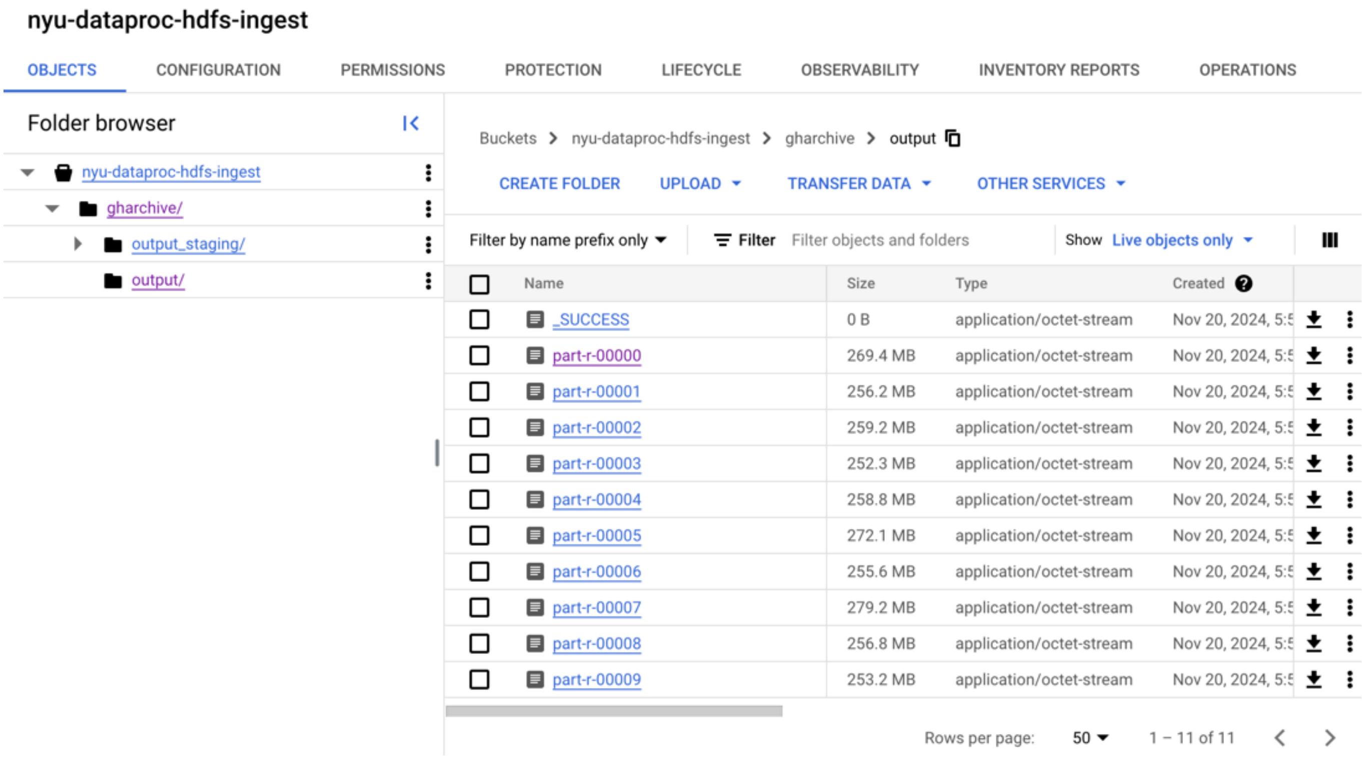
After data ingestion with steps above, we can get the processed data, which is a snippet of the whole output data:

```
{
  "id": "26163418660",
  "time": "2023-01-01 00:00:00 UTC",
  "text": "chart editor glitched out and overwrote a completed chart with a
blank chart, describe your bug here.....",
  "source": "GH Archive"
}

{
  "id": "26163419820",
  "time": "2023-01-01 00:00:08 UTC",
  "text":"not a problem but a request, is there any way of creating a column
for the numer of ratings......",
  "source": "GH Archive"
}
```

```
{
  "id": "26163424178",
  "time": "2023-01-01 00:00:51 UTC",
  "text": "play button doesn't work after processing all files or changing
the playlist......",
  "source": "GH Archive"
}
```

There are 10 partitions of data file in total, each partition is about 260Mb in size. Data files are located at `gs://nyu-dataproc-hdfs-ingest/gharchive/output` directory.



☐	Name	Size	Type	Created
☐	_SUCCESS	0 B	application/octet-stream	Nov 20, 2024, 5:5
☐	part-r-00000	269.4 MB	application/octet-stream	Nov 20, 2024, 5:5
☐	part-r-00001	256.2 MB	application/octet-stream	Nov 20, 2024, 5:5
☐	part-r-00002	259.2 MB	application/octet-stream	Nov 20, 2024, 5:5
☐	part-r-00003	252.3 MB	application/octet-stream	Nov 20, 2024, 5:5
☐	part-r-00004	258.8 MB	application/octet-stream	Nov 20, 2024, 5:5
☐	part-r-00005	272.1 MB	application/octet-stream	Nov 20, 2024, 5:5
☐	part-r-00006	255.6 MB	application/octet-stream	Nov 20, 2024, 5:5
☐	part-r-00007	279.2 MB	application/octet-stream	Nov 20, 2024, 5:5
☐	part-r-00008	256.8 MB	application/octet-stream	Nov 20, 2024, 5:5
☐	part-r-00009	253.2 MB	application/octet-stream	Nov 20, 2024, 5:5