Hive clickstream case study

Problem statement:

With online sales gaining popularity, tech companies are exploring ways to improve their sales by analyzing customer behavior and gaining insights about product trends. Furthermore, the websites make it easier for customers to find the products they require without much scavenging.

This case study is done with public clickstream dataset of a cosmetics store. This data is collected by tracking clicks. Extract valuable insights from the data.

Data:

Data set links:

https://e-commerce-events-ml.s3.amazonaws.com/2019-Oct.csv

https://e-commerce-events-ml.s3.amazonaws.com/2019-Nov.csv

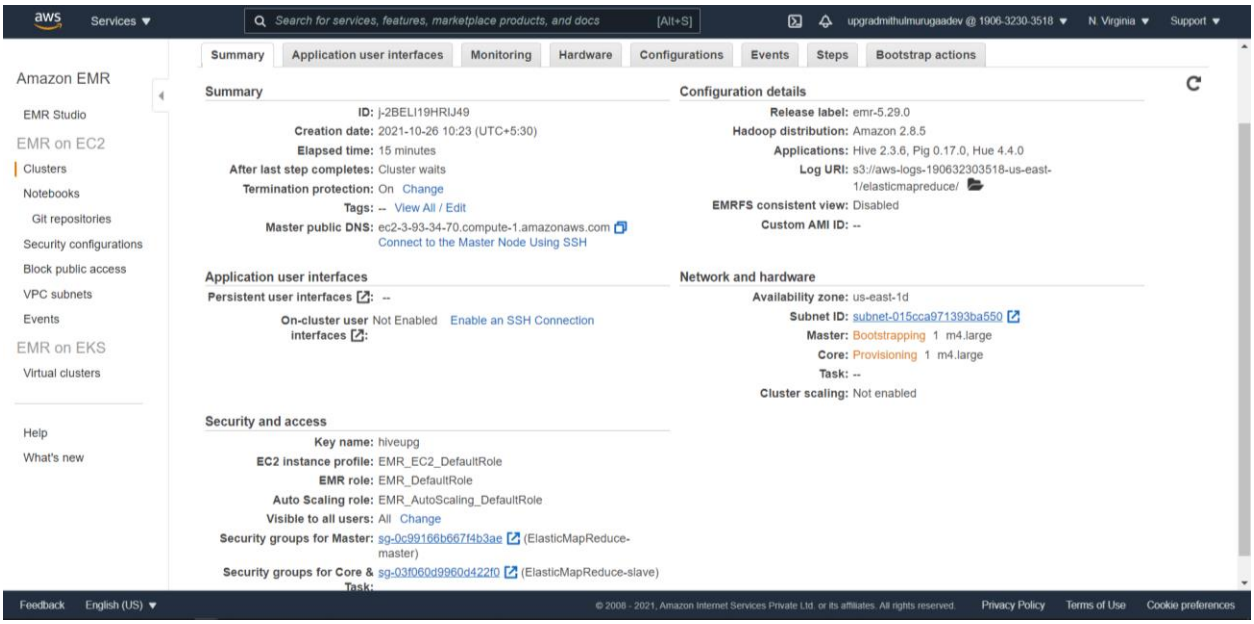
Instructions followed:

- 2-node cluster was created and used for the whole case study
- M4.large machines were used
- Putty was used to connect through SSH
- Emr-5.29.0 software configuration was used.
- CSVSerde used for loading the dataset into hive tables

Implementation steps:

- Importing dataset to Hadoop from aws.
- Creating and connecting EMR cluster
- Creating database and launching hive queries on the cluster
- Cleaning up by dropping the database and terminating the cluster.

Creating EMR:



Puttygen was used to convert a .pem file to a .ppk file.

Putty was used to connect from local machine to master node through SSH with the key value pair.

Connecting EMR Master node through SSH:

```
Using username "hadoop".
Authenticating with public key "imported-openssh-key"
Last login: Tue Oct 26 08:54:08 2021

       __|  __|_  )
       _|  (     /   Amazon Linux AMI
      ___|\___|___|

https://aws.amazon.com/amazon-linux-ami/2018.03-release-notes/
68 package(s) needed for security, out of 106 available
Run "sudo yum update" to apply all updates.

EEEEEEEEEEEEEEEEEEEE MMMMMMMM           MMMMMMMM RRRRRRRRRRRRRRR
E::::::::::::::::::E M:::::::M         M:::::::M R::::::::::::::R
EE:::::EEEEEEEEE:::E M::::::::M       M::::::::M R:::::RRRRRR:::::R
  E::::E       EEEEE M:::::::::M     M:::::::::M RR::::R      R::::R
  E::::E             M::::::M:::M   M:::M::::::M   R:::R      R::::R
  E:::::EEEEEEEEEE   M:::::M M:::M M:::M M:::::M   R:::RRRRRR:::::R
  E::::::::::::::E   M:::::M  M:::M:::M  M:::::M   R:::::::::::RR
  E:::::EEEEEEEEEE   M:::::M   M:::::M   M:::::M   R:::RRRRRR::::R
  E::::E             M:::::M    M:::M    M:::::M   R:::R      R::::R
  E::::E       EEEEE M:::::M     MMM     M:::::M   R:::R      R::::R
EE:::::EEEEEEEE::::E M:::::M             M:::::M   R:::R      R::::R
E::::::::::::::::::E M:::::M             M:::::M RR::::R      R::::R
EEEEEEEEEEEEEEEEEEEE MMMMMMM             MMMMMMM RRRRRRR      RRRRRR

[hadoop@ip-172-31-15-71 ~]$ hadoop fs -ls /user/hive/ecom_cstudy
```

Create directory in hdfs to collect data:

hadoop fs -mkdir /user/hive/ecom_cstudy

```
[hadoop@ip-172-31-15-71 ~]$ hadoop fs -mkdir /user/hive/ecom_cstudy
[hadoop@ip-172-31-15-71 ~]$ aws s3 ls hivecstudy
2021-10-25 06:34:02  545839412 2019-Nov.csv
2021-10-25 06:34:02  482542278 2019-Oct.csv
```

To Import from aws s3:

Lisitng the s3 storage

aws s3 ls hivecstudy

```
[hadoop@ip-172-31-15-71 ~]$ aws s3 ls hivecstudy
2021-10-25 06:34:02  545839412 2019-Nov.csv
2021-10-25 06:34:02  482542278 2019-Oct.csv
```

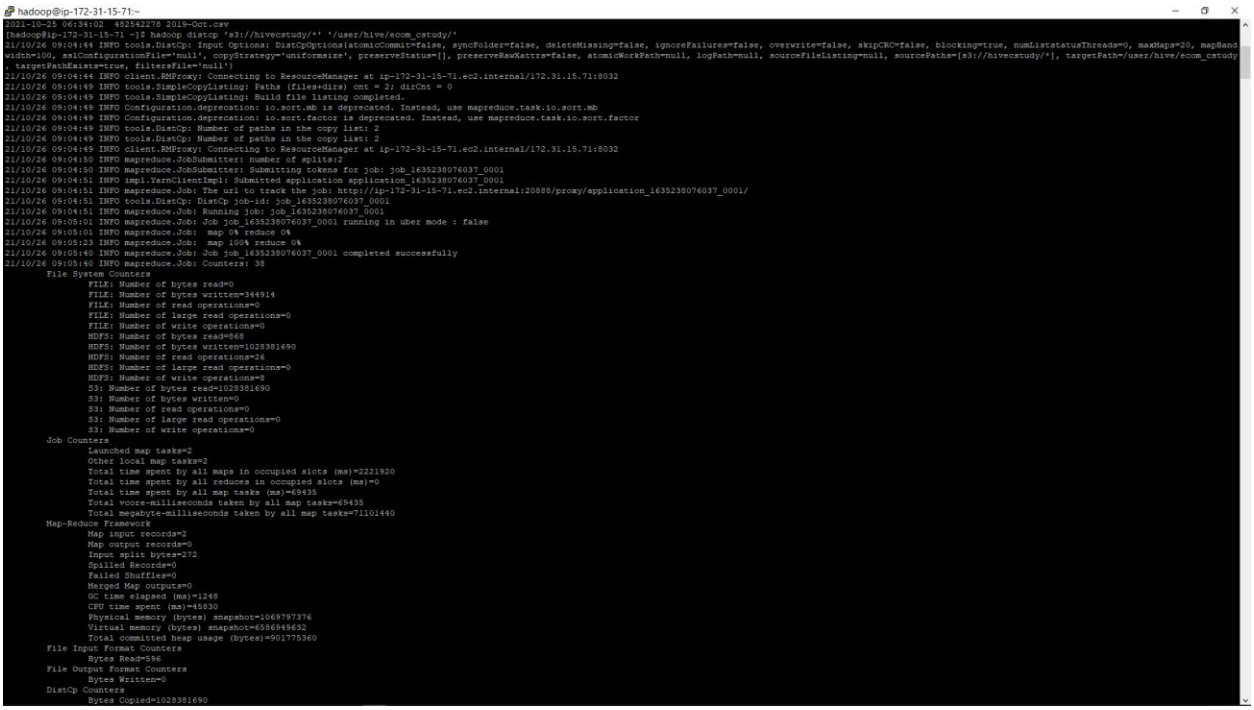
listing the hadoop files:

hadoop fs -ls /user/hive/ecom_cstudy/

```
[hadoop@ip-172-31-12-218 ~]$ hadoop fs -ls /
Found 4 items
drwxr-xr-x   - hdfs hadoop          0 2021-10-26 04:59 /apps
drwxrwxrwt   - hdfs hadoop          0 2021-10-26 05:01 /tmp
drwxr-xr-x   - hdfs hadoop          0 2021-10-26 04:59 /user
drwxr-xr-x   - hdfs hadoop          0 2021-10-26 04:59 /var
[hadoop@ip-172-31-12-218 ~]$ hadoop fs -ls /user/hive/
Found 2 items
drwxr-xr-x   - hadoop hadoop          0 2021-10-26 05:19 /user/hive/ecom_cstudy
drwxrwxrwt   - hdfs   hadoop          0 2021-10-26 04:59 /user/hive/warehouse
[hadoop@ip-172-31-12-218 ~]$
```

Copying data from aws s3 to Hadoop:

hadoop distcp 's3://hivecstudy/*' 'user/hive/ecom_cstudy/'



Create a database:

create database clickstream_info;

```
hive> create database clickstream_info;
OK
Time taken: 0.389 seconds
hive> use clickstream_info;
OK
Time taken: 0.049 seconds
hive> create external table if not exists clickstream(event_time timestamp, event_type string, product_id string,
    > category_id string, category_code string, brand string, price float, user_id bigint, user_session string)
    > ROW FORMAT SERDE
    > 'org.apache.hadoop.hive.serde2.OpenCSVSerde' WITH SERDEPROPERTIES ('separatorChar'= ',', 'escapeChar'= '\\')
    > stored as textfile
    > location '/user/hive/ecom_cstudy/'
    > tblproperties("skip.header.line.count"="1");
OK
Time taken: 0.568 seconds
hive> select * from clickstream limit 5 ;
OK
2019-11-01 00:00:02 UTC view    5802432 1487580009286598681                     0.32    562076640       09fafd6c-6c99-46b1-834f-33527f4de241
2019-11-01 00:00:09 UTC cart    5844397 1487580006317032337                     2.38    553329724       2067216c-31b5-455d-a1cc-af0575a34ffb
2019-11-01 00:00:10 UTC view    5837166 1783999064103190764             pnb     22.22   556138645       57ed222e-a54a-4907-9944-5a875c2d7f4f
```

Creating external base table:

create external table if not exists clickstream(event_time timestamp, event_type string, product_id string,

category_id string, category_code string, brand string, price float, user_id bigint, user_session string)

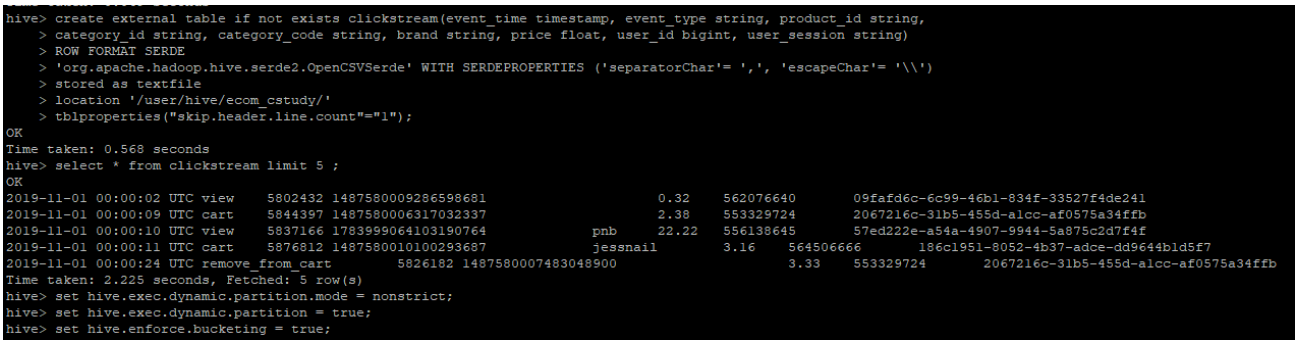
ROW FORMAT SERDE

'org.apache.hadoop.hive.serde2.OpenCSVSerde' WITH SERDEPROPERTIES ('separatorChar'= ',', 'escapeChar'= '\\')

stored as textfile

location '/user/hive/ecom_cstudy/'

tblproperties("skip.header.line.count"="1");



To enable partitioning and bucketing:

set hive.exec.dynamic.partition.mode = nonstrict;

set hive.exec.dynamic.partition = true;

set hive.enforce.bucketing = true;

Creating table for bucketing an partition:

create table if not exists sales_bucket(event_time timestamp, product_id string, category_id string,

category_code string, brand string, price float, user_id bigint, user_session string)

partitioned by (event_type string)

clustered by (category_code) into 10 buckets

ROW FORMAT SERDE 'org.apache.hadoop.hive.serde2.OpenCSVSerde'

stored as textfile;

```
hive> create table if not exists sales_bucket(event_time timestamp, product_id string, category_id string,
    > category_code string, brand string, price float, user_id bigint, user_session string)
    > partitioned by (event_type string)
    > clustered by (category_code) into 14 buckets
    > ROW FORMAT SERDE 'org.apache.hadoop.hive.serde2.OpenCSVSerde'
    > STORED AS textfile;
OK
Time taken: 0.124 seconds
```

Inserting data into table:

insert into table sales_bucket partition(event_type) select event_time, event_type, product_id, category_id,

category_code, brand, price, user_id, user_session from clickstream;

```
hive> insert into table sales_bucket partition(event_type) select event_time, product_id, category_id,
    > category_code, brand, price, user_id, user_session,event_type from clickstream;
Query ID = hadoop_20211026091027_59439857-8964-4fb1-9a32-2dde644942dd
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1635238076037_0002)

----------------------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
----------------------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      2          2        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      5          5        0        0       0       0
----------------------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 163.87 s
----------------------------------------------------------------------------------------------
Loading data to table clickstream_info.sales_bucket partition (event_type=null)

Loaded : 4/4 partitions.
        Time taken to load dynamic partitions: 1.058 seconds
        Time taken for adding to write entity : 0.004 seconds
OK
Time taken: 168.838 seconds
hive> desc sales_bucket;
```

desc clickstream;

```
event_type              string
Time taken: 0.34 seconds, Fetched: 14 row(s)
hive> desc clickstream;
OK
event_time              string                  from deserializer
event_type              string                  from deserializer
product_id              string                  from deserializer
category_id             string                  from deserializer
category_code           string                  from deserializer
brand                   string                  from deserializer
price                   string                  from deserializer
user_id                 string                  from deserializer
user_session            string                  from deserializer
Time taken: 0.053 seconds, Fetched: 9 row(s)
hive>
```

desc sales_bucket;

```
hive> desc sales_bucket;
OK
event_time              string                  from deserializer
product_id              string                  from deserializer
category_id             string                  from deserializer
category_code           string                  from deserializer
brand                   string                  from deserializer
price                   string                  from deserializer
user_id                 string                  from deserializer
user_session            string                  from deserializer
event_type              string

# Partition Information
# col_name              data_type               comment

event_type              string
Time taken: 0.34 seconds, Fetched: 14 row(s)
hive>
```

Select * from sales_bucket limit 5;

```
hive> set hive.cli.print.header=true;
hive> select * from sales_bucket limit 5 ;
OK
sales_bucket.event_time sales_bucket.product_id sales_bucket.category_id        sales_bucket.category_code      sales_bucket.brand      sales_bucket.price      sales_bucket.user_id    sales_bucket.user_session       sales_bucket.event_ty
pe
2019-10-07 20:53:08 UTC 5635080 1487580005754995573                    4.44    527827629       b5f0f964-9457-4dfd-bade-239a9cde9c5d    cart
2019-10-01 00:00:03 UTC 5773353 1487580005134238553             runail  2.62    463240011       26dd6e6e-4dac-4778-8d2c-92e149dab885    cart
2019-10-01 00:00:07 UTC 5881589 2151191071051219817             lovely  13.48   429681830       49e8d843-adf3-428b-a2c3-fe8bc6a307c9    cart
2019-10-01 00:00:07 UTC 5723490 1487580005134238553             runail  2.62    463240011       26dd6e6e-4dac-4778-8d2c-92e149dab885    cart
2019-10-01 00:00:15 UTC 5881449 1487580013522845895             lovely  0.56    429681830       49e8d843-adf3-428b-a2c3-fe8bc6a307c9    cart
Time taken: 0.148 seconds, Fetched: 5 row(s)
hive>
```

Show partitions;

```
hive> show partitions sales_bucket;
OK
partition
event_type=cart
event_type=purchase
event_type=remove_from_cart
event_type=view
Time taken: 0.101 seconds, Fetched: 4 row(s)
hive>
```

Query Solutions to Questions:

1.Find the total revenue generated due to purchases made in October.

select sum(price)from sales_bucket where event_type= 'purchase' and month(event_time) = 10;

```
hive> select sum(price)from sales_bucket where event_type= 'purchase' and month(event_time) = 10;
Query ID = hadoop_20211026091517_a3661057-26dd-44e4-b02a-110e2221da7a
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1635238076037_0002)

----------------------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
----------------------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      2          2        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      1          1        0        0       0       0
----------------------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 22.91 s
----------------------------------------------------------------------------------------------
OK
1211538.4299998297
Time taken: 24.825 seconds, Fetched: 1 row(s)
hive>
```

The total revenue generated by purchases made in October is **1211538.4299.**

2.Write a query to yield the total sum of purchases per month in a single output.

select sum(price) from sales_bucket where event_type= 'purchase' group by month(event_time);

```
hive> select sum(price) from sales_bucket where event_type= 'purchase' group by month(event_time);
Query ID = hadoop_20211026091754_021a2082-1bdc-4197-a88f-370f8f8747e4
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1635238076037_0002)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      2          2        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      1          1        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 18.48 s
--------------------------------------------------------------------------------
OK
1211538.4299998297
1531016.9000001058
Time taken: 19.256 seconds, Fetched: 2 row(s)
hive>
```

The total sum of purchases made in October is **1211538.4299**, in November is **1531016.900**

3.Write a query to find the change in revenue generated due to purchases from October to November.

select (sum(case when month(event_time)=11 then price else 0 end) - sum(case when

month(event_time)=10 then price else 0 end)) as revenue_generated from sales_bucket where event_type='purchase' ;

```
hive> select (sum(case when month(event_time)=11 then price else 0 end) - sum(case when
    > month(event_time)=10 then price else 0 end)) as revenue_generated from sales_bucket where event_type='purchase' ;
Query ID = hadoop_20211026091938_a2117788-7d1f-4baf-adb5-74ab2d0d14c4
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1635238076037_0002)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      2          2        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      1          1        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 19.16 s
--------------------------------------------------------------------------------
OK
319478.4700002761
Time taken: 19.855 seconds, Fetched: 1 row(s)
hive>
```

Change in revenue due to purchases from October to November is **319478.4700.**

4.Find distinct categories of products. Categories with null category code can be ignored.

select distinct category_code from sales_bucket;

```
hive> select distinct category_code from sales_bucket;
Query ID = hadoop_20211026092121_79f5d6f9-a1d5-4333-bc9d-77b4306642b4
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1635238076037_0002)

----------------------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
----------------------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      7          7        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      5          5        0        0       0       0
----------------------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 66.32 s
----------------------------------------------------------------------------------------------
OK

accessories.cosmetic_bag
stationery.cartrige
accessories.bag
appliances.environment.vacuum
furniture.living_room.chair
sport.diving
appliances.personal.hair_cutter
appliances.environment.air_conditioner
apparel.glove
furniture.bathroom.bath
furniture.living_room.cabinet
Time taken: 67.028 seconds, Fetched: 12 row(s)
hive>
```

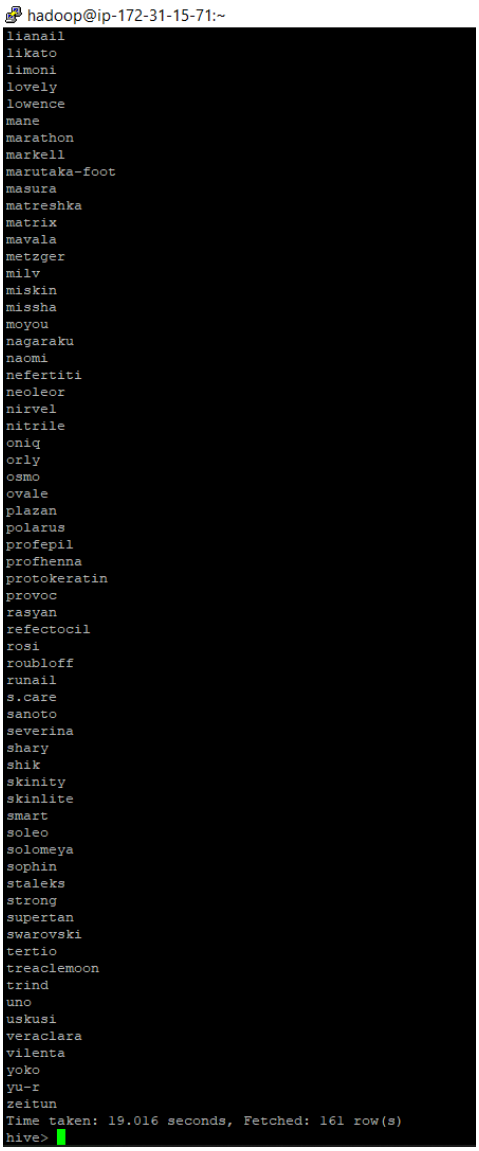
The result shows **11 categories** of product.

5.Find the total number of products available under each category.

select category_id, count(product_id) from sales_bucket group by category_id;

```
hive> select category_id, count(product_id) from sales_bucket group by category_id;
Query ID = hadoop_20211026092401_28cdc3e8-6838-44aa-a693-f63a88102d30
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1635238076037_0002)

----------------------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
----------------------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      7          7        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      5          5        0        0       0       0
----------------------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 69.58 s
----------------------------------------------------------------------------------------------
OK
1487580004966466385     16
1487580005050352469     83278
1487580005176181595     127
1487580005369119587     3
1487580005570446188     24
1487580005671109489     300570
1487580005687886706     14
1487580005922767741     640
1487580006056985476     1794
1487580006073762693     7556
1487580006174425994     466
1487580006216369036     3
1487580006585467807     17
1487580007281722301     34854
1487580007432717250     64400
1487580007508214725     36
1487580007592100809     12450
1487580007852147670     42694
1487580007894090712     4957
1487580007910867929     51488
1487580007952810971     24742
1487580008053474272     2629
1487580008070251489     1643
1487580008087028706     778
1487580008221246441     46
1487580008472904691     65
1487580008523236341     11
1487580009227878422     12922
1487580009336930331     5784
1487580009605365797     39093
1487580010955931741     835
1487580011098538083     3368
1487580011224367209     1
1487580011283087468     28420
1487580011408916594     20134
1487580011476025461     1871
1487580011677352062     17310
1487580011702517887     30290
1487580011970953351     4128
1487580012121948301     4731
```



6.Which brand had the maximum sales in October and November combined?

select brand, sum(price) as sales from sales_bucket where event_type = 'purchase'

group by brand

order by sales

desc limit 2;

```
hive> select brand, sum(price) as sales from sales_bucket where event_type = 'purchase' group by brand order by sales
    > desc limit 2;
Query ID = hadoop_20211026094742_3ad36080-6343-4fd7-8a3c-c61da9a6d48e
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1635238076037_0002)

----------------------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
----------------------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      2          2        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      1          1        0        0       0       0
Reducer 3 ...... container     SUCCEEDED      1          1        0        0       0       0
----------------------------------------------------------------------------------------------
VERTICES: 03/03  [==========================>>] 100%  ELAPSED TIME: 16.68 s
----------------------------------------------------------------------------------------------
OK
        1094188.299999976
runail  148297.93999999133
Time taken: 17.307 seconds, Fetched: 2 row(s)
hive>
```

There is lot of data that have blank spaces in the field of brand. **Runail** has the maximum sallies in October and November combined.

7.Which brands increased their sales from October to November?

with brand_sales as (select brand, sum(case when month(event_time)=10 then price else 0 end) as oct_sales,

sum(case when month(event_time)=11 then price else 0 end) as nov_sales

from sales_bucket where event_type='purchase' group by

brand) select brand from brand_sales where (nov_sales-oct_sales)>0 ;

```
hive> with brand_sales as ( select brand, sum(case when month(event_time)=10 then price else 0 end) as oct_sales,
    > sum(case when month(event_time)=11 then price else 0 end) as nov_sales
    > from sales_bucket where event_type='purchase' group by
    > brand ) select brand from brand_sales where (nov_sales-oct_sales)>0 ;
Query ID = hadoop_20211026094017_02e3f9a6-d8f0-4a2c-af0f-e27004d22a26
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1635238076037_0002)

----------------------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
----------------------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      2          2        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      1          1        0        0       0       0
----------------------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 18.48 s
----------------------------------------------------------------------------------------------
OK

airnails
art-visage
artex
aura
balbcare
barbie
batiste
beautix
beauty-free
beautyblender
beauugreen
benovy
binacil
bioaqua
biore
blixz
bluesky
bodyton
bpw.style
browxenna
candy
carmex
chi
coifin
concept
cosima
cosmoprofi
cristalinas
cutrin
de.lux
```

These brands increased their sales from October to November.

8.Your company wants to reward the top 10 users of its website with a Golden Customer plan. Write a query to generate a list of top 10 users who spend the most.

select user_id, sum(price) as sales from sales_bucket where event_type = 'purchase'

group by user_id order by sales desc limit 10;

```
hive> select user_id, sum(price) as sales from sales_bucket where event_type = 'purchase'
    > group by user_id order by sales desc limit 10;
Query ID = hadoop_20211026094257_6eb19588-c251-4fcd-825b-ca6c525e95b3
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1635238076037_0002)

----------------------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
----------------------------------------------------------------------------------------------
Map 1 ..........   container     SUCCEEDED      2          2        0        0       0       0
Reducer 2 ......   container     SUCCEEDED      1          1        0        0       0       0
Reducer 3 ......   container     SUCCEEDED      1          1        0        0       0       0
----------------------------------------------------------------------------------------------
VERTICES: 03/03  [==========================>>] 100%  ELAPSED TIME: 18.83 s
----------------------------------------------------------------------------------------------
OK
557790271       2715.869999999996
150318419       1645.97
562167663       1352.85
531900924       1329.4500000000003
557850743       1295.4799999999998
522130011       1185.3899999999996
561592095       1109.7
431950134       1097.5899999999997
566576008       1056.3599999999997
521347209       1040.9099999999999
Time taken: 19.441 seconds, Fetched: 10 row(s)
hive>
```

The above result shows the top 10 customers to be rewarded golden customer plan.

Cleaning:

Drop database clickstream_info;

--- End ---