HIVE CASE STUDY

(DSC25)

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PROBLEM STATEMENT :

In this modern era, Tech companies are exploring ways to improve their sales by analysing customer behaviour and gaining insights about product trends. In order to make better business decisions, E-commerce websites are finding their way by tracking the number of clicks made by customers and their spending time on websites in searching for patterns within them. This kind of collected data is called a click stream data. Furthermore, the websites make it easier for customers to find the products they require without much scavenging. In this case study, we are working with click stream data by getting insights and making decisions upon how the E-commerce websites can improve their sales.

OBJECTIVE :

The aim is to extract the data and gather insights from a real-life data set of an e-commerce company.

DATA :

The data used in this assignment is a public clickstream dataset of a cosmetics store. The clickstream data contains all the logs as to how one navigated through the ecommerce website. It also contains other details such as customer time spent on every page, number of clicks made, adding items to the cart, customer id etc.

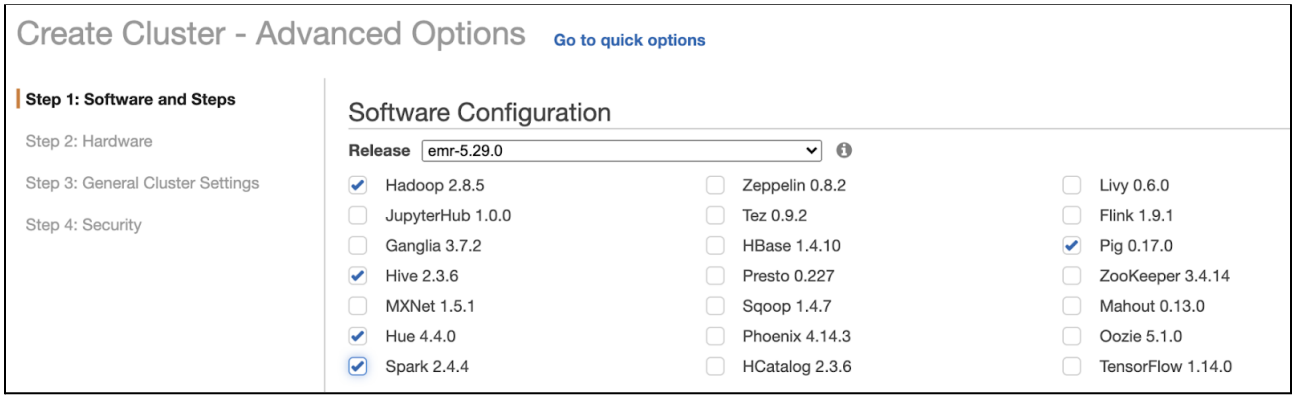
The data is available from the link provided:
https://e-commerce-events-ml.s3.amazonaws.com/2019-Oct.csv
https://e-commerce-events-ml.s3.amazonaws.com/2019-Nov.csv

OVERVIEW OF STEPS :

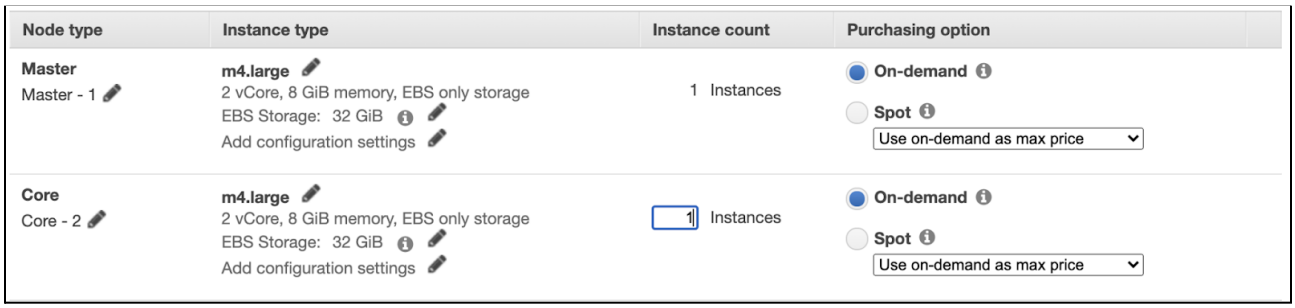
- Copying the data set into the HDFS:
    - Launch an EMR cluster that utilizes the Hive services, and
    - Move the data from the S3 bucket into the HDFS
- Creating the database and launching Hive queries on your EMR cluster:
    - Create the structure of your database,
    - Use optimized techniques to run your queries as efficiently as possible
    - Show the improvement of the performance after using optimization on any single query.
    - Run Hive queries to answer the questions given below.
- Cleaning up
    - Drop your database, and
    - Terminate your cluster

❖ EMR Cluster Creation

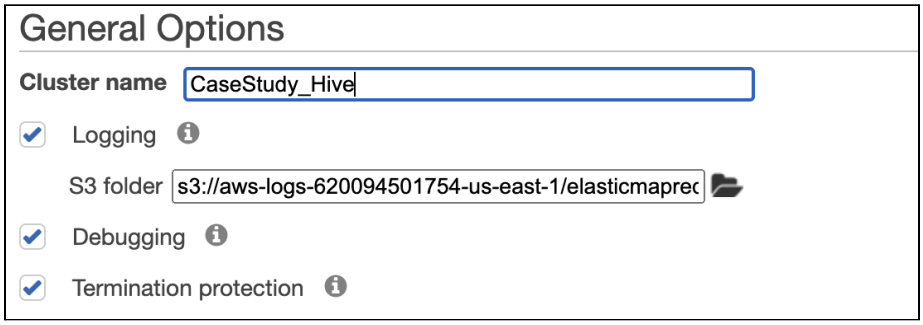
EMR Cluster Landing Page > Create Cluster > Advanced Options > Selecting the release emr-5.29 and the required services.



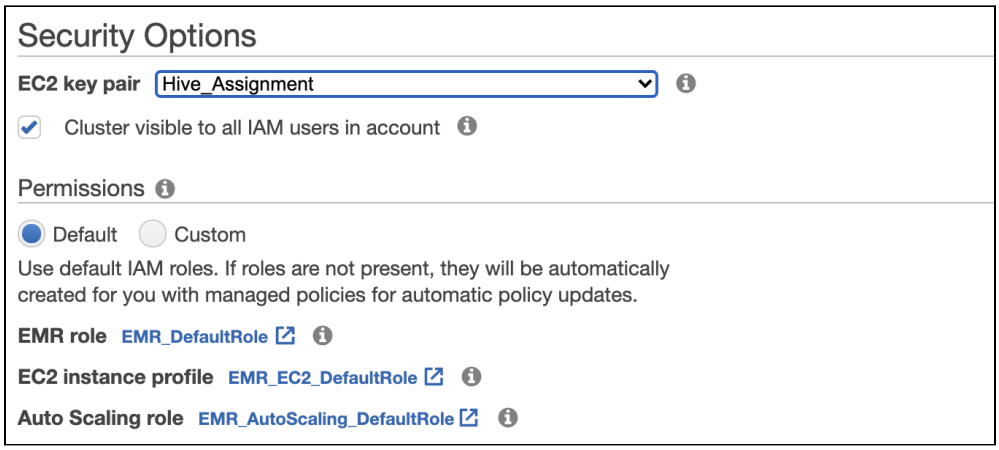
Hardware Configuration Page > To define the cluster & nodes : Instance type for both master & core nodes are M4.large



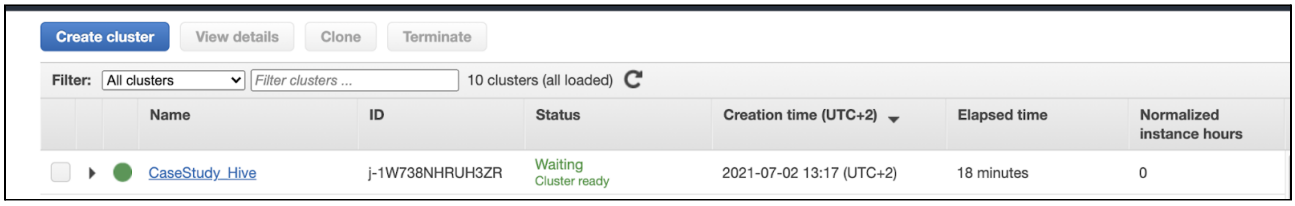
Naming the cluster uniquely.



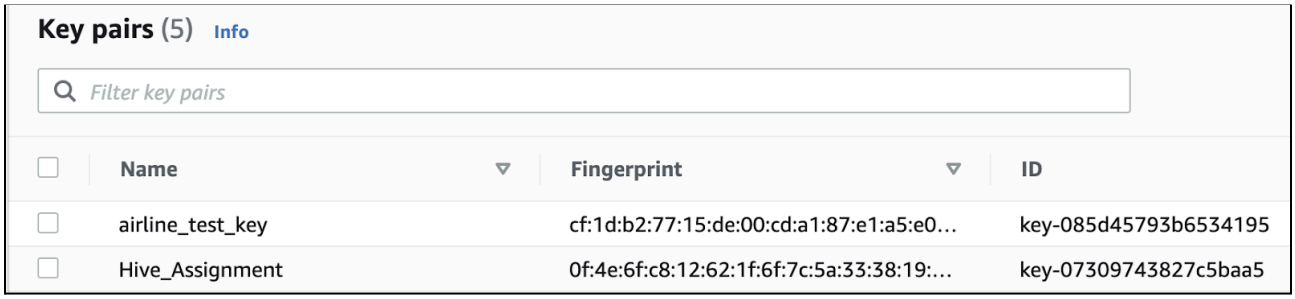
Selecting the key-pair (created before creating the cluster)



Cluster "CaseStudy_Hive" is successfully created and launched.



"Hive_Assignment" is the Key-Pair created for this case study.



❖ Hadoop & Hive Queries :

Terminal > Connecting to EMR Cluster using ssh.

```
(base) pratyushachillarige@MacBook-Pro ~ % cd Desktop/Keys
(base) pratyushachillarige@MacBook-Pro Keys % chmod 400 Hive_assignment.pem
(base) pratyushachillarige@MacBook-Pro Keys % ssh -i Hive_Assignment.pem hadoop@ec2-3-238-98-119.compute-1.amazonaws.com
The authenticity of host 'ec2-3-238-98-119.compute-1.amazonaws.com (3.238.98.119)' can't be established.
ECDSA key fingerprint is SHA256:4cIAS8cBAGWJYIso0lPfRDb8cHKr0IMC+8p+ZGnJky4.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'ec2-3-238-98-119.compute-1.amazonaws.com,3.238.98.119' (ECDSA) to the list of known hosts.
Last login: Sat Jul  3 20:32:22 2021

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

https://aws.amazon.com/amazon-linux-ami/2018.03-release-notes/
56 package(s) needed for security, out of 102 available
Run "sudo yum update" to apply all updates.
-bash: warning: setlocale: LC_CTYPE: cannot change locale (UTF-8): No such file or directory

EEEEEEEEEEEEEEEEEEE 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
EEEEEEEEEEEEEEEEEEE MMMMMMM             MMMMMMM RRRRRRR      RRRRRR

[hadoop@ip-172-31-66-163 ~]$
```

Creating a directory “casestudy”

hadoop fs -mkdir /casestudy

hadoop fs -ls /

```
[hadoop@ip-172-31-66-163 ~]$ hadoop fs -ls /
Found 4 items
drwxr-xr-x   - hdfs hadoop          0 2021-07-03 20:28 /apps
drwxrwxrwt   - hdfs hadoop          0 2021-07-03 20:30 /tmp
drwxr-xr-x   - hdfs hadoop          0 2021-07-03 20:28 /user
drwxr-xr-x   - hdfs hadoop          0 2021-07-03 20:28 /var
[hadoop@ip-172-31-66-163 ~]$ hadoop fs -mkdir /casestudy
[hadoop@ip-172-31-66-163 ~]$ hadoop fs -ls /
Found 5 items
drwxr-xr-x   - hdfs   hadoop          0 2021-07-03 20:28 /apps
drwxr-xr-x   - hadoop hadoop          0 2021-07-03 20:36 /casestudy
drwxrwxrwt   - hdfs   hadoop          0 2021-07-03 20:30 /tmp
drwxr-xr-x   - hdfs   hadoop          0 2021-07-03 20:28 /user
drwxr-xr-x   - hdfs   hadoop          0 2021-07-03 20:28 /var
[hadoop@ip-172-31-66-163 ~]$
```

Loading the datasets into HDFS from S3:

hadoop distcp 's3://e-commerce-events-ml/2019-Oct.csv' /casestudy/2019_Oct.csv

```
[hadoop@ip-172-31-66-163 ~]$ hadoop distcp 's3://e-commerce-events-ml/2019-Oct.csv' /casestudy/2019_Oct.csv
21/07/03 20:37:03 INFO tools.DistCp: Input Options: DistCpOptions{atomicCommit=false, syncFolder=false, deleteMissing=false,
ignoreFailures=false, overwrite=false, skipCRC=false, blocking=true, numListstatusThreads=0, maxMaps=20, mapBandwidth=100, ss
lConfigurationFile='null', copyStrategy='uniformsize', preserveStatus=[], preserveRawXattrs=false, atomicWorkPath=null, logPa
th=null, sourceFileListing=null, sourcePaths=[s3://e-commerce-events-ml/2019-Oct.csv], targetPath=/casestudy/2019_Oct.csv, ta
rgetPathExists=false, filtersFile='null'}
```

```
        File Output Format Counters
                Bytes Written=0
        DistCp Counters
                Bytes Copied=482542278
                Bytes Expected=482542278
                Files Copied=1
```

hadoop distcp 's3://e-commerce-events-ml/2019-Nov.csv' /casestudy/2019_Nov.csv

```
[hadoop@ip-172-31-66-163 ~]$ hadoop distcp 's3://e-commerce-events-ml/2019-Nov.csv' /casestudy/2019_Nov.csv
21/07/03 20:39:47 INFO tools.DistCp: Input Options: DistCpOptions{atomicCommit=false, syncFolder=false, deleteMissing=false,
ignoreFailures=false, overwrite=false, skipCRC=false, blocking=true, numListstatusThreads=0, maxMaps=20, mapBandwidth=100, ss
lConfigurationFile='null', copyStrategy='uniformsize', preserveStatus=[], preserveRawXattrs=false, atomicWorkPath=null, logPa
th=null, sourceFileListing=null, sourcePaths=[s3://e-commerce-events-ml/2019-Nov.csv], targetPath=/casestudy/2019_Nov.csv, ta
rgetPathExists=false, filtersFile='null'}
```

```
        File Output Format Counters
                Bytes Written=0
        DistCp Counters
                Bytes Copied=545839412
                Bytes Expected=545839412
                Files Copied=1
```

Viewing the data

hadoop fs -cat /casestudy/2019_Oct.csv | head

```
[hadoop@ip-172-31-66-163 ~]$ hadoop fs -cat /casestudy/2019_Oct.csv | head
event_time,event_type,product_id,category_id,category_code,brand,price,user_id,user_session
2019-10-01 00:00:00 UTC,cart,5773203,1487580005134238553,,runail,2.62,463240011,26dd6e6e-4dac-4778-8d2c-92e149dab885
2019-10-01 00:00:03 UTC,cart,5773353,1487580005134238553,,runail,2.62,463240011,26dd6e6e-4dac-4778-8d2c-92e149dab885
2019-10-01 00:00:07 UTC,cart,5881589,2151191071051219817,,lovely,13.48,429681830,49e8d843-adf3-428b-a2c3-fe8bc6a307c9
2019-10-01 00:00:07 UTC,cart,5723490,1487580005134238553,,runail,2.62,463240011,26dd6e6e-4dac-4778-8d2c-92e149dab885
2019-10-01 00:00:15 UTC,cart,5881449,1487580013522845895,,lovely,0.56,429681830,49e8d843-adf3-428b-a2c3-fe8bc6a307c9
2019-10-01 00:00:16 UTC,cart,5857269,1487580005134238553,,runail,2.62,430174032,73dea1e7-664e-43f4-8b30-d32b9d5af04f
2019-10-01 00:00:19 UTC,cart,5739055,1487580008246412266,,kapous,4.75,377667011,81326ac6-daa4-4f0a-b488-fd0956a78733
2019-10-01 00:00:24 UTC,cart,5825598,1487580009445982239,,,0.56,467916806,2f5b5546-b8cb-9ee7-7ecd-84276f8ef486
2019-10-01 00:00:25 UTC,cart,5698989,1487580006317032337,,,1.27,385985999,d30965e8-1101-44ab-b45d-cc1bb9fae694
```

hadoop fs -cat /casestudy/2019_Nov.csv | head

```
[hadoop@ip-172-31-66-163 ~]$ hadoop fs -cat /casestudy/2019_Nov.csv | head
event_time,event_type,product_id,category_id,category_code,brand,price,user_id,user_session
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
2019-11-01 00:00:11 UTC,cart,5876812,1487580010100293687,,jessnail,3.16,564506666,186c1951-8052-4b37-adce-dd9644b1d5f7
2019-11-01 00:00:24 UTC,remove_from_cart,5826182,1487580007483048900,,,3.33,553329724,2067216c-31b5-455d-a1cc-af0575a34ffb
2019-11-01 00:00:24 UTC,remove_from_cart,5826182,1487580007483048900,,,3.33,553329724,2067216c-31b5-455d-a1cc-af0575a34ffb
2019-11-01 00:00:25 UTC,view,5856189,1487580009026551821,,runail,15.71,562076640,09fafd6c-6c99-46b1-834f-33527f4de241
2019-11-01 00:00:32 UTC,view,5837835,1933472286753424063,,,3.49,514649199,432a4e95-375c-4b40-bd36-0fc039e77580
2019-11-01 00:00:34 UTC,remove_from_cart,5870838,1487580007675986893,,milv,0.79,429913900,2f0bff3c-252f-4fe6-afcd-5d8a6a92839a
```

Datasets are successfully loaded.

Launch Hive

```
[hadoop@ip-172-31-66-163 ~]$ hive

Logging initialized using configuration in file:/etc/hive/conf.dist/hive-log4j2.properties Async: false
hive> show databases ;
OK
default
Time taken: 0.697 seconds, Fetched: 1 row(s)
```

Creating new database “Hive_assignment”

hive> CREATE DATABASE IF NOT EXISTS hive_assignment ;
hive> SHOW DATABASES ;
hive> DESCRIBE DATABASE hive_assignment ;

```
hive> CREATE DATABASE IF NOT EXISTS hive_assignment ;
OK
Time taken: 0.316 seconds
hive> SHOW DATABASES ;
OK
default
hive_assignment
Time taken: 0.021 seconds, Fetched: 2 row(s)
hive> DESCRIBE DATABASE hive_assignment ;
OK
hive_assignment         hdfs://ip-172-31-66-163.ec2.internal:8020/user/hive/warehouse/hive_assignment.db        hadoop  USER
Time taken: 0.046 seconds, Fetched: 1 row(s)
```

Creating new table “retail”

hive > CREATE EXTERNAL TABLE IF NOT EXISTS retail (event_time timestamp, event_type string, product_id string, category_id string, category_code string, brand string, price decimal(10,3), user_id bigint, user_session string) ROW FORMAT SERDE 'org.apache.hadoop.hive.serde2.OpenCSVSerde' WITH SERDEPROPERTIES ("separatorChar" = "," , "quoteChar" = "\"", "escapeChar" = "\\") stored as textfile LOCATION '/casestudy' TBLPROPERTIES ("skip.header.line.count"="1") ;

```
hive> CREATE EXTERNAL TABLE IF NOT EXISTS retail (event_time timestamp, event_type string, product_id string, category_id string, category_code
 string, brand string, price decimal(10,3), user_id bigint, user_session string) ROW FORMAT SERDE 'org.apache.hadoop.hive.serde2.OpenCSVSerde'
WITH SERDEPROPERTIES ("separatorChar" = "," , "quoteChar" = "\"", "escapeChar" = "\\") stored as textfile LOCATION '/casestudy' TBLPROPERTIES (
"skip.header.line.count"="1") ;
OK
Time taken: 0.33 seconds
```

hive> DESCRIBE retail ;

```
hive> DESCRIBE retail ;
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: 0.107 seconds, Fetched: 9 row(s)
```

Loading data into table “retail”;

hive> LOAD DATA INPATH '/casestudy/2019_Oct.csv' INTO TABLE retail ;
hive> LOAD DATA INPATH '/casestudy/2019_Nov.csv' INTO TABLE retail;

```
hive> LOAD DATA INPATH '/casestudy/2019_Oct.csv' INTO TABLE retail ;
Loading data to table default.retail
OK
Time taken: 1.353 seconds
hive> LOAD DATA INPATH '/casestudy/2019_Nov.csv' INTO TABLE retail;
Loading data to table default.retail
OK
Time taken: 0.673 seconds
```

Performing data check:

hive> SELECT * FROM retail WHERE MONTH(event_time)=11 limit 5 ;
hive> SELECT * FROM retail WHERE MONTH(event_time)=10 limit 5 ;

```
hive> SELECT *  FROM retail WHERE MONTH(event_time)=11 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
2019-11-01 00:00:11 UTC cart    5876812 1487580010100293687             jessnail        3.16    564506666       186c1951-8052-4b37-adce-dd9644b1d5f7
2019-11-01 00:00:24 UTC remove_from_cart        5826182 1487580007483048900                     3.33    553329724       2067216c-31b5-455d-a1cc-af0575a34ffb
Time taken: 0.209 seconds, Fetched: 5 row(s)
hive> SELECT *  FROM retail WHERE MONTH(event_time)=10 limit 5 ;
OK
2019-10-01 00:00:00 UTC cart    5773203 1487580005134238553             runail  2.62    463240011       26dd6e6e-4dac-4778-8d2c-92e149dab885
2019-10-01 00:00:03 UTC cart    5773353 1487580005134238553             runail  2.62    463240011       26dd6e6e-4dac-4778-8d2c-92e149dab885
2019-10-01 00:00:07 UTC cart    5881589 2151191071051219817             lovely  13.48   429681830       49e8d843-adf3-428b-a2c3-fe8bc6a307c9
2019-10-01 00:00:07 UTC cart    5723490 1487580005134238553             runail  2.62    463240011       26dd6e6e-4dac-4778-8d2c-92e149dab885
2019-10-01 00:00:15 UTC cart    5881449 1487580013522845895             lovely  0.56    429681830       49e8d843-adf3-428b-a2c3-fe8bc6a307c9
Time taken: 0.195 seconds, Fetched: 5 row(s)
```

QUESTION 1:

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

hive> SELECT SUM(price) FROM retail WHERE MONTH(event_time)=10 AND event_type='purchase' ;

```
hive> SELECT SUM(price) FROM retail WHERE MONTH(event_time)=10 AND event_type='purchase' ;
Query ID = hadoop_20210703205507_ed5f7747-bed8-43fe-8928-96a4c51de12e
Total jobs = 1
Launching Job 1 out of 1
Tez session was closed. Reopening...
Session re-established.
Status: Running (Executing on YARN cluster with App id application_1625344162494_0004)

--------------------------------------------------------------------------------
        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: 61.27 s
--------------------------------------------------------------------------------
OK
1211538.4299997438
Time taken: 70.514 seconds, Fetched: 1 row(s)
```

Time Taken to execute the above query is 70.5 sec.

This is very high. Hence, to reduce this execution time, we will dynamically partition the table “retail” and add buckets to create an optimised table.

DYNAMIC PARTITIONING

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

```
hive> set hive.exec.dynamic.partition=true;
hive> set hive.exec.dynamic.partition.mode=nonstrict;
```

PARTITION TABLE 1: retail_part_1

Partition on : event_type (there are 4 types and all questions are related to ‘purchase’)

hive> CREATE EXTERNAL TABLE IF NOT EXISTS retail_part_1 (event_time timestamp, product_id string, category_id string, category_code string, brand string, price decimal(10,3), user_id bigint, user_session string) PARTITIONED BY(event_type string) CLUSTERED BY (user_id) INTO 5 buckets ROW FORMAT SERDE 'org.apache.hadoop.hive.serde2.OpenCSVSerde' STORED AS textfile ;

hive> DESCRIBE retail_part_1 ;

```
hive> CREATE EXTERNAL TABLE IF NOT EXISTS retail_part_1 (event_time timestamp, product_id string, category_id string, category_code
string, brand string, price decimal(10,3), user_id bigint, user_session string) PARTITIONED BY(event_type string) CLUSTERED BY (user
_id) INTO 5 buckets ROW FORMAT SERDE 'org.apache.hadoop.hive.serde2.OpenCSVSerde' STORED AS textfile ;
OK
Time taken: 0.091 seconds
hive> DESCRIBE retail_part_1
    > ;
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: 0.11 seconds, Fetched: 14 row(s)
```

hive> INSERT INTO TABLE retail_part_1 PARTITION (event_type) SELECT event_time, product_id, category_id, category_code, brand, price, user_id, user_session, event_type FROM retail ;

```
hive> INSERT INTO TABLE retail_part_1 PARTITION (event_type) SELECT event_time, product_id, category_id, category_code, brand, price
, user_id, user_session, event_type FROM retail ;
Query ID = hadoop_20210703210049_7f21892f-38a2-4a94-936b-e5832bf3e4c2
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1625344162494_0004)

--------------------------------------------------------------------------------
        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: 157.65 s
--------------------------------------------------------------------------------
Loading data to table default.retail_part_1 partition (event_type=null)

Loaded : 4/4 partitions.
        Time taken to load dynamic partitions: 0.396 seconds
        Time taken for adding to write entity : 0.002 seconds
OK
Time taken: 159.703 seconds
```

Executing the same query with the new table “retail_part_1” to check the time.

hive> SELECT SUM(price) FROM retail_part_1 WHERE MONTH(event_time)=10 AND event_type='purchase' ;

```
hive> SELECT SUM(price) FROM retail_part_1 WHERE MONTH(event_time)=10 AND event_type='purchase' ;
Query ID = hadoop_20210703210459_b8fc7436-88e8-45ae-a5a6-ed362fbc8db1
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1625344162494_0004)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 1 ..........   container     SUCCEEDED      3          3        0        0       0       0
Reducer 2 ......   container     SUCCEEDED      1          1        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 24.26 s
--------------------------------------------------------------------------------
OK
1211538.4299998982
Time taken: 25.365 seconds, Fetched: 1 row(s)
```

Time Taken to execute the above query is 25.36 sec.

PARTITION TABLE 2: retail_part_3

Partition on : month

hive> CREATE EXTERNAL TABLE IF NOT EXISTS retail_part_3 (event_time timestamp, event_type string, product_id string, category_id string, category_code string, brand string, price decimal(10,3), user_id bigint, user_session string) PARTITIONED BY(month int) CLUSTERED BY (brand) INTO 5 buckets ROW FORMAT SERDE 'org.apache.hadoop.hive.serde2.OpenCSVSerde' STORED AS textfile ;

hive> DESCRIBE retail_part_3 ;

```
hive> CREATE EXTERNAL TABLE IF NOT EXISTS retail_part_3 (event_time timestamp, event_type string, product_id string, category_id string, category_code
string, brand string, price decimal(10,3), user_id bigint, user_session string) PARTITIONED BY(month int) CLUSTERED BY (brand) INTO 5 buckets ROW FORMA
T SERDE 'org.apache.hadoop.hive.serde2.OpenCSVSerde' STORED AS textfile ;
OK
Time taken: 0.096 seconds
hive> DESCRIBE retail_part_3
    > ;
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
month                   int

# Partition Information
# col_name              data_type               comment

month                   int
Time taken: 0.046 seconds, Fetched: 15 row(s)
```

hive> INSERT INTO TABLE retail_part_3 PARTITION (month) SELECT event_time, event_type, product_id, category_id, category_code, brand, price, user_id, user_session, MONTH(CAST(REPLACE(event_time,’UTC’,’’) AS timestamp)) FROM retail ;

```
hive> INSERT INTO TABLE retail_part_3 PARTITION (month) SELECT event_time, event_type, product_id, category_id, category_code, brand, price,
user_id, user_session, MONTH(CAST(REPLACE(event_time,'UTC','') AS timestamp)) FROM retail ;
Query ID = hadoop_20210703214135_edc02768-9163-475d-8361-ca592e0ea982
Total jobs = 1
Launching Job 1 out of 1
Tez session was closed. Reopening...
Session re-established.
Status: Running (Executing on YARN cluster with App id application_1625344162494_0005)

--------------------------------------------------------------------------------
        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: 182.32 s
--------------------------------------------------------------------------------
Loading data to table default.retail_part_3 partition (month=null)

Loaded : 2/2 partitions.
         Time taken to load dynamic partitions: 0.137 seconds
         Time taken for adding to write entity : 0.0 seconds
OK
Time taken: 191.306 seconds
```

Executing the same query with the new table “retail_part_3” to check the time.

hive> SELECT SUM(price) FROM retail_part_3 WHERE MONTH(event_time)=10 AND event_type='purchase' ;

```
hive> SELECT SUM(price) FROM retail_part_3 WHERE MONTH(event_time)=10 AND event_type='purchase' ;
Query ID = hadoop_20210703214854_e7370545-f651-4db1-8459-f900bc422d4c
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1625344162494_0005)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      8          8        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      1          1        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 77.27 s
--------------------------------------------------------------------------------
OK
1211538.4299999713
Time taken: 77.853 seconds, Fetched: 1 row(s)
```

Time Taken to execute the above query is 77.85 sec.

We get an optimised table by Partitioning on “event_type” and clustering by “user_id” . Hence, for all the following analysis, we will be using the optimised table “retail_part_1”.

QUESTION 1:

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

hive> SELECT SUM(price) FROM retail_part_1 WHERE MONTH(event_time)=10 AND event_type='purchase' ;

```
hive> SELECT SUM(price) FROM retail_part_1 WHERE MONTH(event_time)=10 AND event_type='purchase' ;
Query ID = hadoop_20210703210459_b8fc7436-88e8-45ae-a5a6-ed362fbc8db1
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1625344162494_0004)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      3          3        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      1          1        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 24.26 s
--------------------------------------------------------------------------------
OK
1211538.4299998982
Time taken: 25.365 seconds, Fetched: 1 row(s)
```

Time Taken to execute the above query is 25.36 sec.

QUESTION 2:

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

hive> SELECT MONTH(event_time), SUM(price) as sum_purchase, COUNT(event_type) as cnt FROM retail_part_1 WHERE event_type='purchase' GROUP BY MONTH(event_time) ;

```
hive> SELECT MONTH(event_time), SUM(price) as sum_purchase, COUNT(event_type) as cnt FROM retail_part_1 WHERE event_type='purchase'
GROUP BY MONTH(event_time) ;
Query ID = hadoop_20210703210616_7fcdc1ca-76a8-4348-b534-f8d12e1a161d
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1625344162494_0004)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      3          3        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      1          1        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 23.37 s
--------------------------------------------------------------------------------
OK
10      1211538.4299998982      245624
11      1531016.8999999384      322417
Time taken: 24.33 seconds, Fetched: 2 row(s)
```

In October month, 245624 purchases generated revenue of 1211538. Similarly in November month, 322417 purchases generated revenue of 1531016.89

QUESTION 3:

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

hive>WITH diff AS (SELECT SUM(CASE WHEN date_format(event_time,'MM')=10 THEN price ELSE 0 END) AS October, SUM(CASE WHEN date_format(event_time,'MM')=11 THEN price ELSE 0 END) AS November FROM retail_part_1 WHERE date_format(event_time,'MM') IN (10,11) AND event_type='purchase') SELECT October, November, (November - October) as Difference FROM diff ;

```
hive> WITH diff AS ( SELECT SUM(CASE WHEN date_format(event_time,'MM')=10 THEN price ELSE 0 END) AS October, SUM(CASE WHEN
date_format(event_time,'MM')=11 THEN price ELSE 0 END) AS November FROM retail_part_1 WHERE date_format(event_time,'MM') IN
 (10,11) AND event_type='purchase') SELECT October, November, (November - October) as Difference FROM diff ;
Query ID = hadoop_20210703210953_a38a14aa-84c8-41a5-ae6e-bf0888c0084e
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1625344162494_0004)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      3          3        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      1          1        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 38.57 s
--------------------------------------------------------------------------------
OK
1211538.429999898       1531016.8999999384      319478.4700000405
Time taken: 39.19 seconds, Fetched: 1 row(s)
```

The change in revenue generated from October to November is 319478.47

QUESTION 4:

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

hive>SELECT DISTINCT split(category_code,'\\.')[0] AS category FROM retail_part_1 WHERE split(category_code,'\\.')[0]<>'' ;

```
hive> SELECT DISTINCT split(category_code,'\\.')[0] AS category FROM retail_part_1 WHERE split(category_code,'\\.')[0]<>'' ;
Query ID = hadoop_20210703211146_29be0e65-1d20-4e3a-b38c-02df54611237
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1625344162494_0004)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      6          6        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      5          5        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 66.68 s
--------------------------------------------------------------------------------
OK
furniture
appliances
accessories
apparel
sport
stationery
```

There are 6 distinct categories of products. They are: Furniture, appliances, accessories, apparel, sport and stationary.

QUESTION 5:

Find the total number of products available under each category.

hive>SELECT split(category_code,'\\.')[0] AS category, COUNT(product_id) AS prd FROM retail_part_1 GROUP BY split(category_code,'\\.')[0] ORDER BY prd DESC ;

```
hive> SELECT split(category_code,'\\.')[0] AS category, COUNT(product_id) AS prd FROM retail_part_1 GROUP BY split
(category_code,'\\.')[0] ORDER BY prd DESC ;
Query ID = hadoop_20210703211417_e390ef09-668a-47dc-be35-f21d8eb9ebfb
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1625344162494_0004)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      6          6        0        0       0       0
Reducer 2 ...... container     SUCCEEDED      5          5        0        0       0       0
Reducer 3 ...... container     SUCCEEDED      1          1        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 03/03  [==========================>>] 100%  ELAPSED TIME: 71.77 s
--------------------------------------------------------------------------------
OK
        8594895
appliances      61736
stationery      26722
furniture       23604
apparel 18232
accessories     12929
sport   2
Time taken: 72.472 seconds, Fetched: 7 row(s)
```

"Sport" category has the least number of products, whereas "appliances" has 61736 products.

QUESTION 6:

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

SELECT brand, SUM(price) AS Sales FROM retail_part_1 WHERE brand <>'' AND event_type='purchase' GROUP BY brand ORDER BY Sales DESC LIMIT 1 ;

```
hive> SELECT brand, SUM(price) AS Sales FROM retail_part_1 WHERE brand <>'' AND event_type='purchase' GROUP BY brand
 ORDER BY Sales DESC LIMIT 1 ;
Query ID = hadoop_20210703211729_b13c2a75-929c-4df6-a5dd-433eb654c55f
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1625344162494_0004)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      3          3        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: 21.99 s
--------------------------------------------------------------------------------
OK
runail  148297.93999999898
Time taken: 22.623 seconds, Fetched: 1 row(s)
```

Brand "runail" has the maximum sales for both months combined.

QUESTION 7:

Which brands increased their sales from October to November?

hive>WITH monthly_diff AS (SELECT brand, SUM(CASE WHEN date_format(event_time,'MM')=10 THEN price ELSE 0 END) AS October, SUM(CASE WHEN date_format(event_time,'MM')=11 THEN price ELSE 0 END) AS November FROM retail_part_1 WHERE event_type='purchase' GROUP BY brand) SELECT brand, October, November, (November-October) as Sales_diff FROM monthly_diff WHERE (November-October) >0 ORDER BY Sales_diff ;

```
hive> WITH monthly_diff AS ( SELECT brand, SUM(CASE WHEN date_format(event_time,'MM')=10 THEN price ELSE 0 END) AS October, SUM(C
ASE WHEN date_format(event_time,'MM')=11 THEN price ELSE 0 END) AS November FROM retail_part_1 WHERE event_type='purchase' GROUP
BY brand) SELECT brand, October, November, (November-October) as Sales_diff FROM monthly_diff WHERE (November-October) >0 ORDER B
Y Sales_diff ;
Query ID = hadoop_20210703212211_f102df0a-d3aa-49cb-b1d6-721a62ddd4ea
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1625344162494_0004)

----------------------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
----------------------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      3          3        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: 33.93 s
----------------------------------------------------------------------------------------------
OK
ovale   2.54    3.1     0.56
cosima  20.229999999999997      20.93   0.7000000000000028
grace   100.91999999999999      102.61000000000001      1.6900000000000261
helloganic      0.0     3.1     3.1
skinity 8.88    12.440000000000001      3.5600000000000005
bodyton 1376.3400000000006      1380.6400000000003      4.299999999999727
moyou   5.71    10.280000000000001      4.570000000000001
neoleor 43.41   51.7    8.290000000000006
```

```
beautix 10493.949999999984      12222.949999999992      1729.0000000000073
milv    3904.9399999999796      5642.0099999999875      1737.070000000008
masura  31266.079999998827      33058.46999999955       1792.3900000007234
f.o.x   6624.229999999996       8577.279999999995       1953.0499999999993
kapous  11927.159999999969      14093.080000000014      2165.9200000000455
concept 11032.139999999992      13380.399999999941      2348.2599999999493
estel   21756.749999999916      24142.670000000035      2385.9200000001183
kaypro  881.34  3268.6999999999994      2387.359999999999
benovy  409.6199999999999       3259.970000000001       2850.3500000000013
italwax 21940.239999999896      24799.369999999915      2859.130000000019
yoko    8756.91 11707.879999999986      2950.9699999999866
haruyama        9390.689999999879       12352.910000000069      2962.2200000001903
marathon        7280.750000000003       10273.099999999999      2992.349999999996
lovely  8704.379999999994       11939.05999999998       3234.6799999999857
bpw.style       11572.150000000083      14837.44000000017       3265.2900000000864
staleks 8519.730000000014       11875.610000000015      3355.880000000001
freedecor       3421.779999999996       7671.799999999959       4250.019999999963
runail  71539.279999999 76758.65999999984       5219.380000000849
polarus 6013.719999999999       11371.930000000004      5358.210000000005
cosmoprofi      8322.809999999994       14536.990000000042      6214.180000000048
jessnail        26287.840000000127      33345.23000000014       7057.390000000014
strong  29196.630000000005      38671.27000000002       9474.640000000014
ingarden        23161.389999999883      33566.210000000225      10404.820000000342
lianail 5892.8399999999865      16394.23999999996       10501.399999999976
uno     35302.030000000006      51039.75000000007       15737.720000000067
grattol 35445.53999999993       71472.71000000341       36027.17000000348
        474679.0600000175       619509.2400000119       144830.17999999435
Time taken: 34.519 seconds, Fetched: 161 row(s)
```

Total of 161 brands have increased their sales from October to November.

QUESTION 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.

hive>SELECT user_id, SUM(price) AS expense FROM retail_part_1 WHERE event_type='purchase' GROUP BY user_id ORDER BY expense DESC LIMIT 10 ;

```
hive> SELECT user_id, SUM(price) AS expense FROM retail_part_1 WHERE event_type='purchase' GROUP BY user_id
ORDER BY expense DESC LIMIT 10 ;
Query ID = hadoop_20210703212639_400e03e8-b947-4da4-839e-8ae7020c6264
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1625344162494_0004)

--------------------------------------------------------------------------------
        VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 1 .......... container     SUCCEEDED      3          3        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: 23.20 s
--------------------------------------------------------------------------------
OK
557790271       2715.869999999991
150318419       1645.9700000000005
562167663       1352.85
531900924       1329.45
557850743       1295.4800000000005
522130011       1185.3899999999999
561592095       1109.7000000000005
431950134       1097.5899999999997
566576008       1056.3600000000004
521347209       1040.9099999999999
Time taken: 23.839 seconds, Fetched: 10 row(s)
```

Above is the list of the top 10 users (User_ids alongwith the amount spent) who spend the most.

❖ Cleaning up :

Once the analysis is completed, deleting the database & terminating the cluster.

```
hive> SHOW DATABASES ;
OK
default
hive_assignment
Time taken: 0.012 seconds, Fetched: 2 row(s)
hive> DROP DATABASE hive_assignment ;
OK
Time taken: 0.204 seconds
hive> SHOW DATABASES ;
OK
default
Time taken: 0.009 seconds, Fetched: 1 row(s)
```