Management of Big Data and Tools – DS8003 – Fall 2016

Assignment 03

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Dataset:

1. We are going to use the Dataset : **hive2_dataset.zip** (The entire dataset is available here Dataset and Scripts -> Movielens & IMDB -> movielens.zip.)
2. Unzip the **hive2_dataset.zip**.
3. The zip contains 4 files: action, thriller, comedy, action_comedy_thriller
4. Copy files **action, thriller, comedy, action_comedy_thriller** to the virtual machine (**Filezilla**)
5. Copy files **action, thriller, comedy, action_comedy_thriller** from virtual machine into HDFS (**hadoop fs -put**)

Submission:

1. Submit both the hive commands and the results (copy it into a file and submit)

Example: if you submit a file called assignment1.txt. It should contain the following information for every question.

Question XX: (XX is the question number)

HiveQL: Select count (*) from u.data;

Result: 100000

2. Submit using Assessment -> Dropbox -> Assignment 3: Advanced Hive

Assignment (10 points)

```
-------------------------------------------
-- Partitioning data in hive
-------------------------------------------
```

1. create table called movies_whole with 3 columns (movieid, movie_name, genre)

2. load action_comedy_thriller file into table

3. create a table called movies_part with 2 columns (movieid, movie_name) that is partitioned on genre **(1)**

4. load each file (action, comedy, and thriller) into a partitions ("Action", "Comedy", and "Thriller") **(1)**

5. describe the structure of the table and list the partitions (hint: describe and show partitions command)

6. navigate to the location of movie_part on HDFS. How does the partitioned table look on HDFS? Write 1 line on what you think is happening when partitioned tables are created. **(0.5)**

7. Run the following queries on both **movies_part and movies_whole** table and find out the time it takes to execute the query. **(2.5)**

-- Substitute *table* with actual table name

(a) Select * from *table* limit 20;
(b) Select count(*) from *table* where genre='Action';
(c) Select count(*) from *table*;
(d) Select t.year, count(*) as count from (Select regexp_extract(movie_name, '([1-2][0-9][0-9][0-9])',1) as year from *table*) t group by year order by count desc limit 5;
(e) Select t.year, count(*) as count from (Select regexp_extract(movie_name, '([1-2][0-9][0-9][0-9])',1) as year from *table* where genre='Thriller') t group by year order by count desc limit 5;

Answer the following two questions for each of the queries above

(7.1) On which table do you think queries should run faster?
(7.2) On which tables (movie_part or movie_whole) do they actually run faster.

8. With some help from the "select" statement in 7(e) -> create a table called movie_year_temp with following columns (movieid, movie_title, movie_year) **(1)**

Bucketing data in hive

9. create a table called year_buckets with the same column definitions as movie_year_temp, but with 8 buckets, clustered on movie_year **(1)**

10. use insert overwrite table to load the rows in movie_year_temp into year_buckets. **(1)**
(set "hive.enforce.bucketing" to true)

[http://www.dummies.com/how-to/content/hive-insert-command-examples.html]

11. Navigate to the location of year_buckets on HDFS. How does the partitioned table look on HDFS?

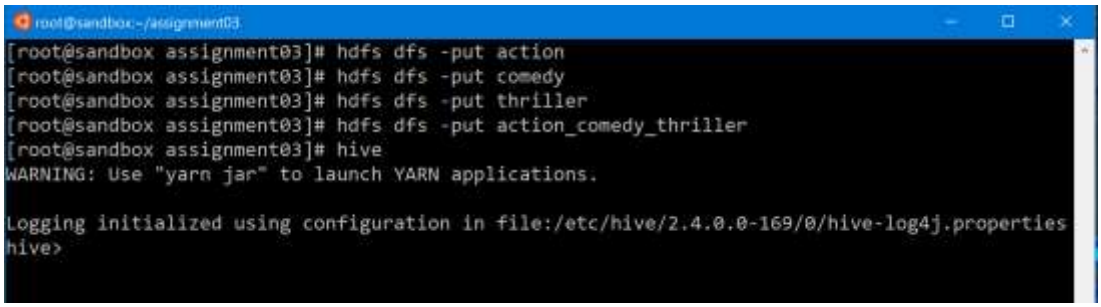
Apply Histogram function

12. Using the table **movie_year_temp** apply the histogram function (with 5 buckets) on **movie_year** to get get the distribution of year values in the table **(2)**

Resolution

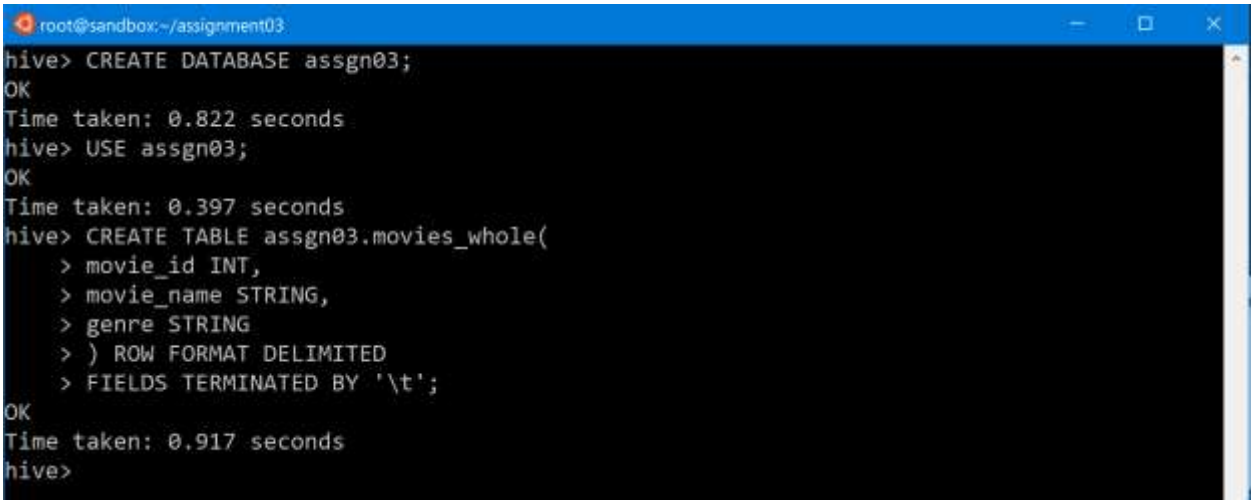
0. Environment setup
    a. Files copied into HDFS and invoke hive.

```
hdfs dfs -put action
hdfs dfs -put comedy
hdfs dfs -put thriller
hdfs dfs -put action_comedy_thriller
hive
```



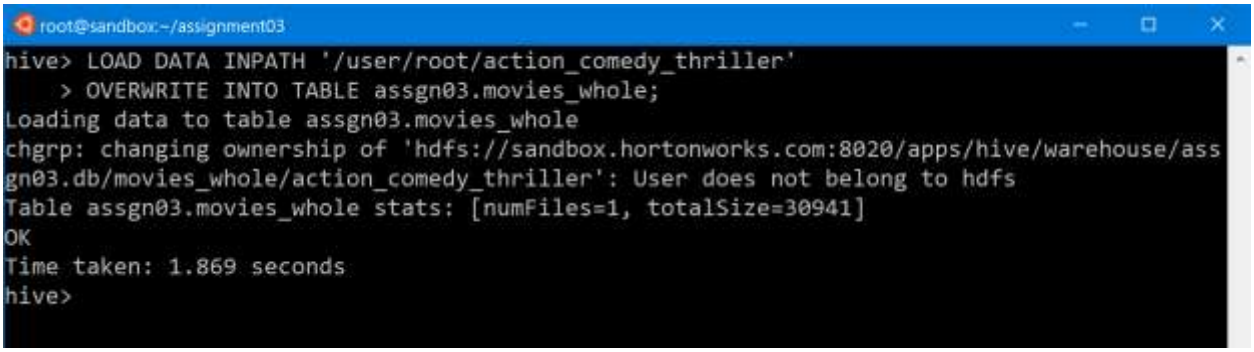
1.

```
CREATE DATABASE assgn03;
USE assgn03;
CREATE TABLE assgn03.movies_whole(
      movie_id INT,
      movie_name STRING,
      genre STRING
) ROW FORMAT DELIMITED
FIELDS TERMINATED BY '\t';
```



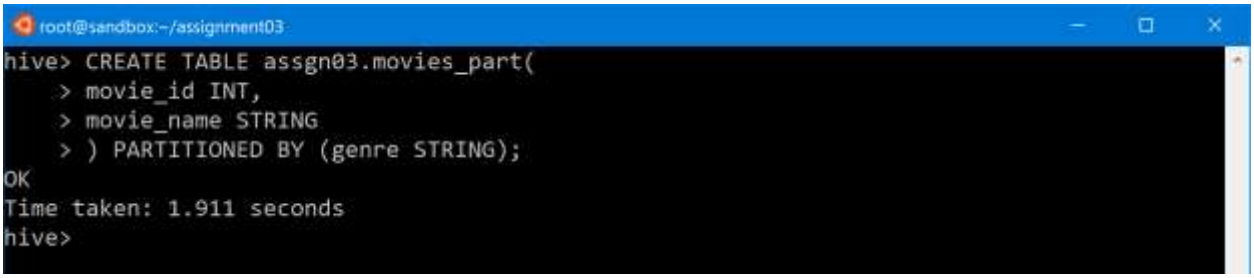
2.

```
LOAD DATA INPATH '/user/root/action_comedy_thriller'
OVERWRITE INTO TABLE assgn03.movies_whole;
```



3.

```
CREATE TABLE assgn03.movies_part(
      movie_id INT,
      movie_name STRING
) PARTITIONED BY (genre STRING);
```



4.

```
LOAD DATA INPATH '/user/root/action'
INTO TABLE assgn03.movies_part
PARTITION(genre='action');
LOAD DATA INPATH '/user/root/comedy'
INTO TABLE assgn03.movies_part
PARTITION(genre='comedy');
LOAD DATA INPATH '/user/root/thriller'
INTO TABLE assgn03.movies_part
PARTITION(genre='thriller');
```

```
hive> LOAD DATA INPATH '/user/root/action'
    > INTO TABLE assgn03.movies_part
    > PARTITION(genre='action');
Loading data to table assgn03.movies_part partition (genre=action)
chgrp: changing ownership of 'hdfs://sandbox.hortonworks.com:8020/apps/hive/warehouse/ass
gn03.db/movies_part/genre=action/action': User does not belong to hdfs
Partition assgn03.movies_part{genre=action} stats: [numFiles=1, numRows=0, totalSize=4702
, rawDataSize=0]
OK
Time taken: 5.886 seconds
hive> LOAD DATA INPATH '/user/root/comedy'
    > INTO TABLE assgn03.movies_part
    > PARTITION(genre='comedy');
Loading data to table assgn03.movies_part partition (genre=comedy)
chgrp: changing ownership of 'hdfs://sandbox.hortonworks.com:8020/apps/hive/warehouse/ass
gn03.db/movies_part/genre=comedy/comedy': User does not belong to hdfs
Partition assgn03.movies_part{genre=comedy} stats: [numFiles=1, numRows=0, totalSize=1318
7, rawDataSize=0]
OK
Time taken: 5.161 seconds
hive> LOAD DATA INPATH '/user/root/thriller'
    > INTO TABLE assgn03.movies_part
    > PARTITION(genre='thriller');
Loading data to table assgn03.movies_part partition (genre=thriller)
chgrp: changing ownership of 'hdfs://sandbox.hortonworks.com:8020/apps/hive/warehouse/ass
gn03.db/movies_part/genre=thriller/thriller': User does not belong to hdfs
Partition assgn03.movies_part{genre=thriller} stats: [numFiles=1, numRows=0, totalSize=63
97, rawDataSize=0]
OK
Time taken: 5.789 seconds
hive>
```

5.

```
DESCRIBE assgn03.movies_part;
SHOW PARTITIONS assgn03.movies_part;
```

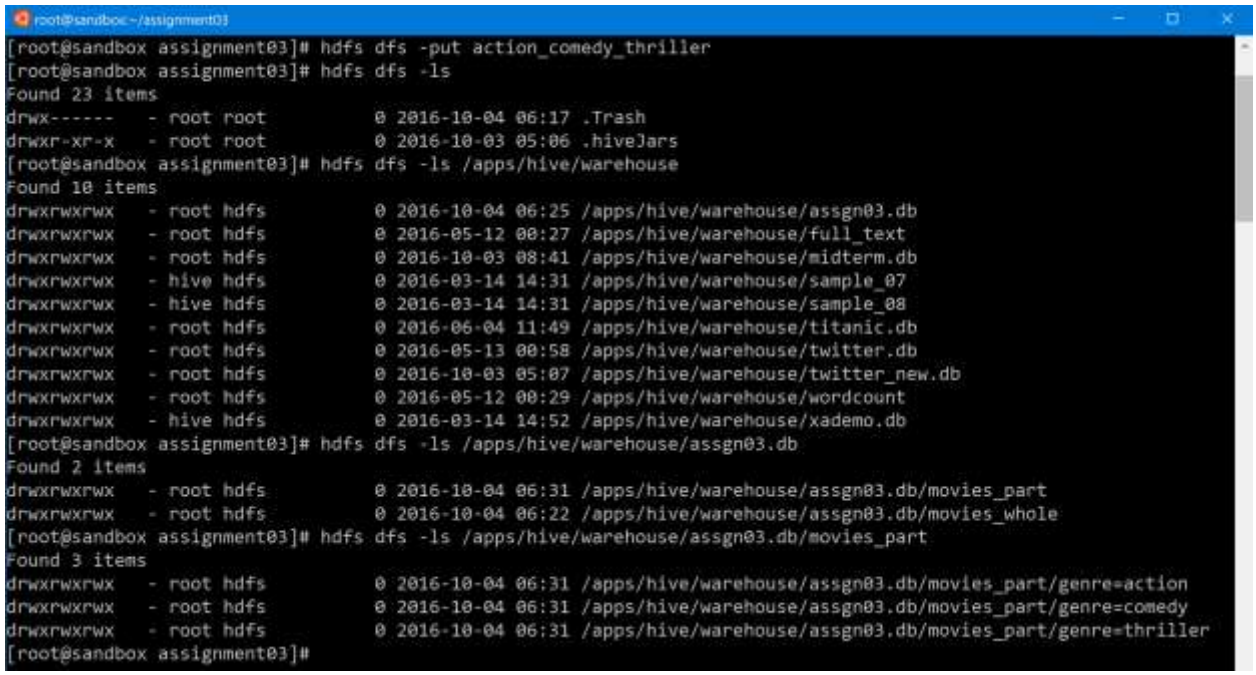
```
hive> DESCRIBE assgn03.movies_part;
OK
movie_id                int
movie_name              string
genre                   string

# Partition Information
# col_name              data_type               comment

genre                   string
Time taken: 0.635 seconds, Fetched: 8 row(s)
hive> SHOW PARTITIONS assgn03.movies_part;
OK
genre=action
genre=comedy
genre=thriller
Time taken: 1.125 seconds, Fetched: 3 row(s)
hive>
```

6.

```
hdfs dfs -ls /apps/hive/warehouse/
hdfs dfs -ls /apps/hive/warehouse/assgn03.db
hdfs dfs -ls /apps/hive/warehouse/assgn03.db/movies_part/
```



```
[root@sandbox assignment03]# hdfs dfs -put action_comedy_thriller
[root@sandbox assignment03]# hdfs dfs -ls
Found 23 items
drwx------   - root root          0 2016-10-04 06:17 .Trash
drwxr-xr-x   - root root          0 2016-10-03 05:06 .hiveJars
[root@sandbox assignment03]# hdfs dfs -ls /apps/hive/warehouse
Found 10 items
drwxrwxrwx   - root hdfs          0 2016-10-04 06:25 /apps/hive/warehouse/assgn03.db
drwxrwxrwx   - root hdfs          0 2016-05-12 00:27 /apps/hive/warehouse/full_text
drwxrwxrwx   - root hdfs          0 2016-10-03 08:41 /apps/hive/warehouse/midterm.db
drwxrwxrwx   - hive hdfs          0 2016-03-14 14:31 /apps/hive/warehouse/sample_07
drwxrwxrwx   - hive hdfs          0 2016-03-14 14:31 /apps/hive/warehouse/sample_08
drwxrwxrwx   - root hdfs          0 2016-06-04 11:49 /apps/hive/warehouse/titanic.db
drwxrwxrwx   - root hdfs          0 2016-05-13 00:58 /apps/hive/warehouse/twitter.db
drwxrwxrwx   - root hdfs          0 2016-10-03 05:07 /apps/hive/warehouse/twitter_new.db
drwxrwxrwx   - root hdfs          0 2016-05-12 00:29 /apps/hive/warehouse/wordcount
drwxrwxrwx   - hive hdfs          0 2016-03-14 14:52 /apps/hive/warehouse/xademo.db
[root@sandbox assignment03]# hdfs dfs -ls /apps/hive/warehouse/assgn03.db
Found 2 items
drwxrwxrwx   - root hdfs          0 2016-10-04 06:31 /apps/hive/warehouse/assgn03.db/movies_part
drwxrwxrwx   - root hdfs          0 2016-10-04 06:22 /apps/hive/warehouse/assgn03.db/movies_whole
[root@sandbox assignment03]# hdfs dfs -ls /apps/hive/warehouse/assgn03.db/movies_part
Found 3 items
drwxrwxrwx   - root hdfs          0 2016-10-04 06:31 /apps/hive/warehouse/assgn03.db/movies_part/genre=action
drwxrwxrwx   - root hdfs          0 2016-10-04 06:31 /apps/hive/warehouse/assgn03.db/movies_part/genre=comedy
drwxrwxrwx   - root hdfs          0 2016-10-04 06:31 /apps/hive/warehouse/assgn03.db/movies_part/genre=thriller
[root@sandbox assignment03]#
```

Instead of keeping the default structure of one data file inside the table directory, the partitioning created three directories for the partitioned table (movies_part) with the following structure: one directory per partition value, named [FIELD]=[PARTITION_VALUE].

7. **Query Times**

Query	movies_part time (s)	movies_whole time (s)	Diff (s)	Diff (%)
a	5.469	1.228	4.241	345.3
b	14.486	7.157	7.329	102.4
c	9.558	6.535	3.023	46.2
d	11.101	6.737	4.364	64.7
e	6.037	6.619	-0.582	-8%

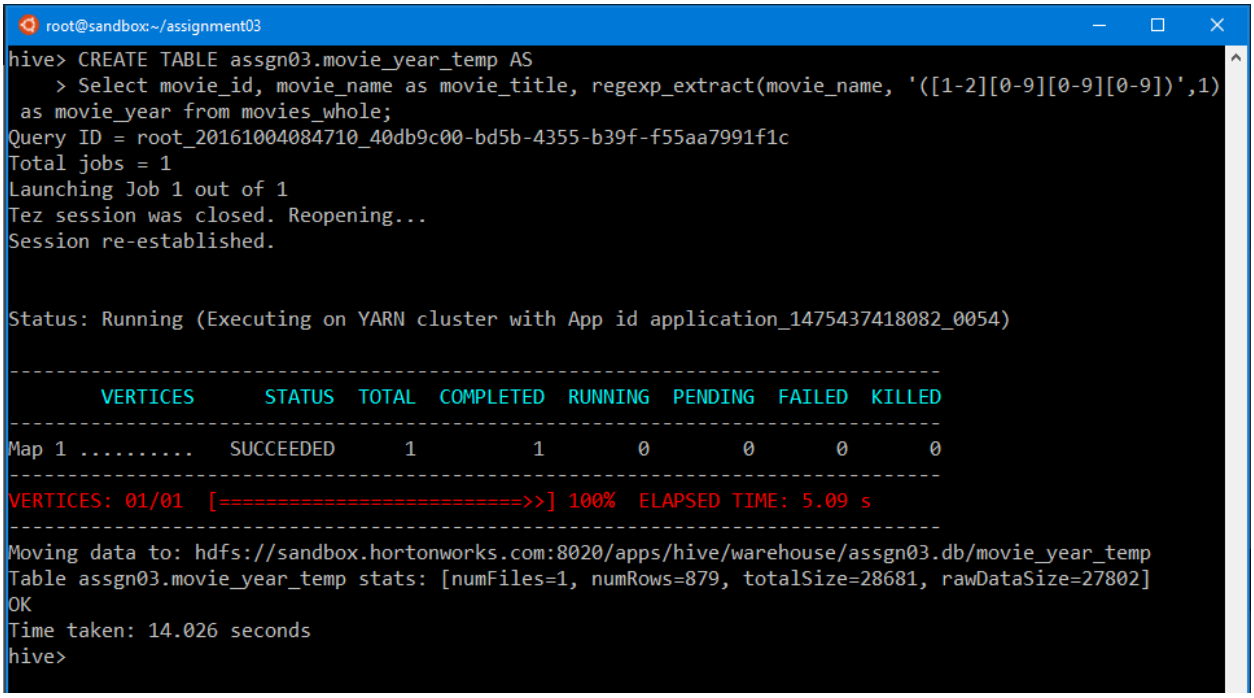
a. Select * from *table* limit 20;
b. Select count(*) from *table* where genre='Action';
c. Select count(*) from *table*;
d. Select t.year, count(*) as count from (Select regexp_extract(movie_name, '([1-2][0-9][0-9][0-9])',1) as year from *table*) t group by year order by count desc limit 5;
e. Select t.year, count(*) as count from (Select regexp_extract(movie_name, '([1-2][0-9][0-9][0-9])',1) as year from *table* where genre='Thriller') t group by year order by count desc limit 5;

7.1- Intuitively queries should run faster on the partitioned version of the table **movies_part**.

7.2- Four out of all the five queries ran faster in the non-partitioned **movies_whole** table. Run times difference vary from 345% faster in the best case to 8% slower in the worst case.

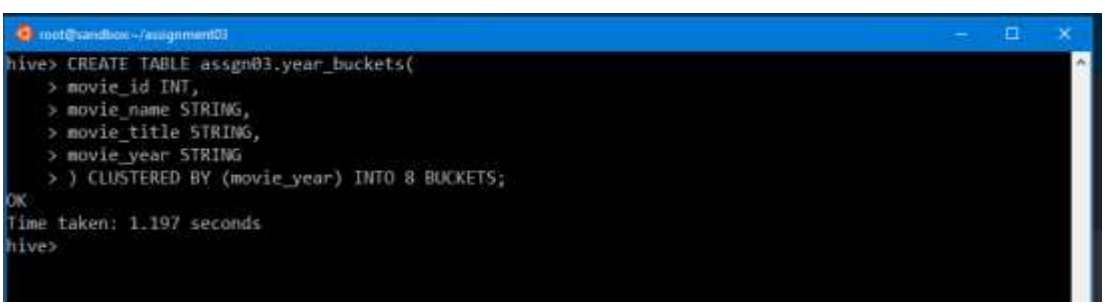
8.

```
CREATE TABLE assgn03.movie_year_temp AS
Select movie_id, movie_name as movie_title,
regexp_extract(movie_name, '([1-2][0-9][0-9][0-9])',1) as
movie_year from movies_whole;
```



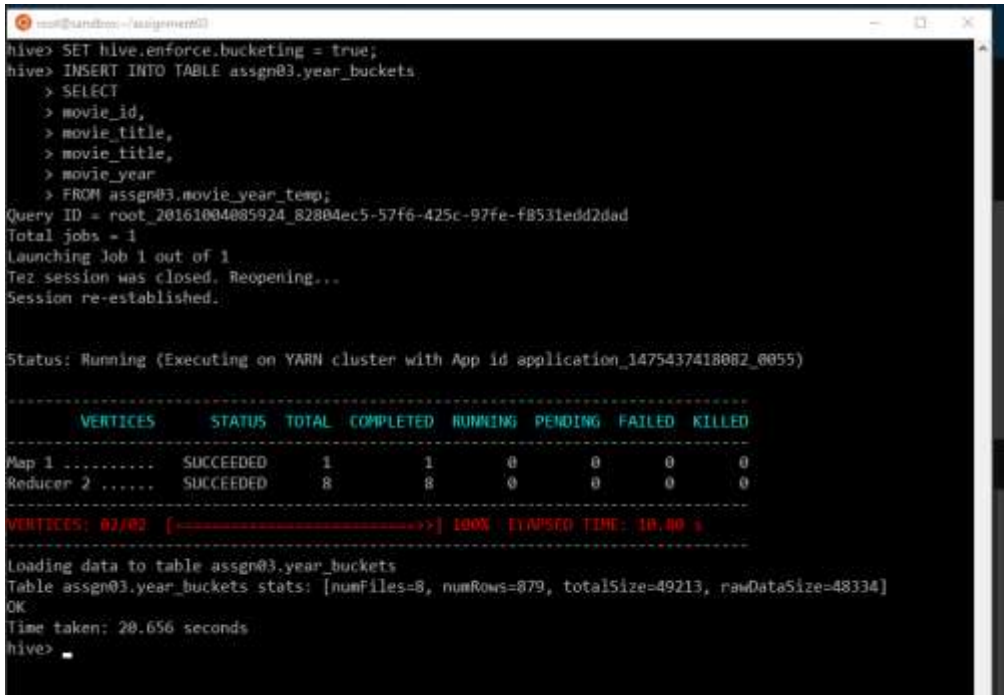
9.

```
CREATE TABLE assgn03.year_buckets(
      movie_id INT,
      movie_name STRING,
      movie_title STRING,
      movie_year STRING
) CLUSTERED BY (movie_year) INTO 8 BUCKETS;
```



10.

```
SET hive.enforce.bucketing = true;
INSERT INTO TABLE assgn03.year_buckets
      SELECT
            movie_id,
            movie_title,
            movie_title,
            movie_year
      FROM assgn03.movie_year_temp;
```



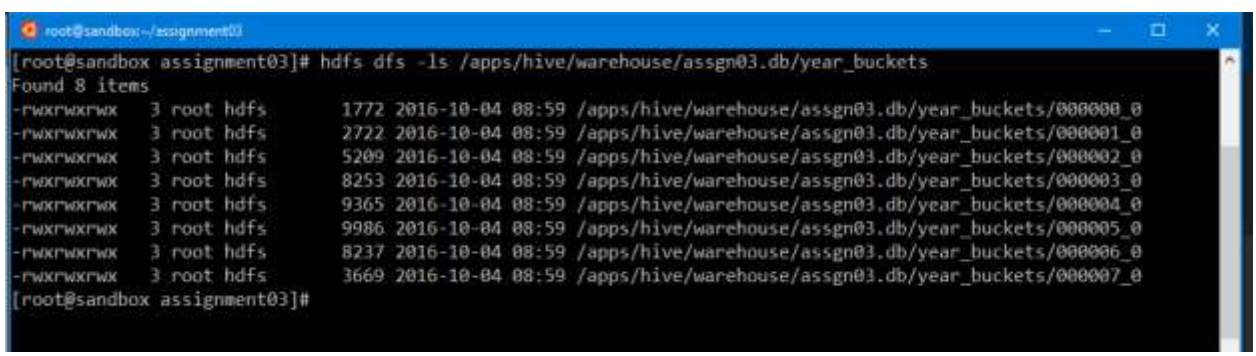
```
hive> SET hive.enforce.bucketing = true;
hive> INSERT INTO TABLE assgn03.year_buckets
    > SELECT
    > movie_id,
    > movie_title,
    > movie_title,
    > movie_year
    > FROM assgn03.movie_year_temp;
Query ID = root_20161004085924_82804ec5-57f6-425c-97fe-f8531edd2dad
Total jobs = 1
Launching Job 1 out of 1
Tez session was closed. Reopening...
Session re-established.


Status: Running (Executing on YARN cluster with App id application_1475437418082_0055)

--------------------------------------------------------------------------------
        VERTICES      STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
--------------------------------------------------------------------------------
Map 1 ..........   SUCCEEDED      1          1        0        0       0       0
Reducer 2 ......   SUCCEEDED      8          8        0        0       0       0
--------------------------------------------------------------------------------
VERTICES: 02/02  [==========================>>] 100%  ELAPSED TIME: 10.00 s
--------------------------------------------------------------------------------
Loading data to table assgn03.year_buckets
Table assgn03.year_buckets stats: [numFiles=8, numRows=879, totalSize=49213, rawDataSize=48334]
OK
Time taken: 20.656 seconds
hive>
```

11.

```
hdfs dfs -ls /apps/hive/warehouse/assgn03.db/year_buckets
```



```
[root@sandbox assignment03]# hdfs dfs -ls /apps/hive/warehouse/assgn03.db/year_buckets
Found 8 items
-rwxrwxrwx   3 root hdfs       1772 2016-10-04 08:59 /apps/hive/warehouse/assgn03.db/year_buckets/000000_0
-rwxrwxrwx   3 root hdfs       2722 2016-10-04 08:59 /apps/hive/warehouse/assgn03.db/year_buckets/000001_0
-rwxrwxrwx   3 root hdfs       5209 2016-10-04 08:59 /apps/hive/warehouse/assgn03.db/year_buckets/000002_0
-rwxrwxrwx   3 root hdfs       8253 2016-10-04 08:59 /apps/hive/warehouse/assgn03.db/year_buckets/000003_0
-rwxrwxrwx   3 root hdfs       9365 2016-10-04 08:59 /apps/hive/warehouse/assgn03.db/year_buckets/000004_0
-rwxrwxrwx   3 root hdfs       9986 2016-10-04 08:59 /apps/hive/warehouse/assgn03.db/year_buckets/000005_0
-rwxrwxrwx   3 root hdfs       8237 2016-10-04 08:59 /apps/hive/warehouse/assgn03.db/year_buckets/000006_0
-rwxrwxrwx   3 root hdfs       3669 2016-10-04 08:59 /apps/hive/warehouse/assgn03.db/year_buckets/000007_0
[root@sandbox assignment03]#
```

The partitioned table looks like a series of sequentially numbered files inside the table directory.

12.

```
SELECT
      explode(histogram_numeric(INT(movie_year), 5))
FROM movie_year_temp;
```