WALMART BIG DATA PROJECT

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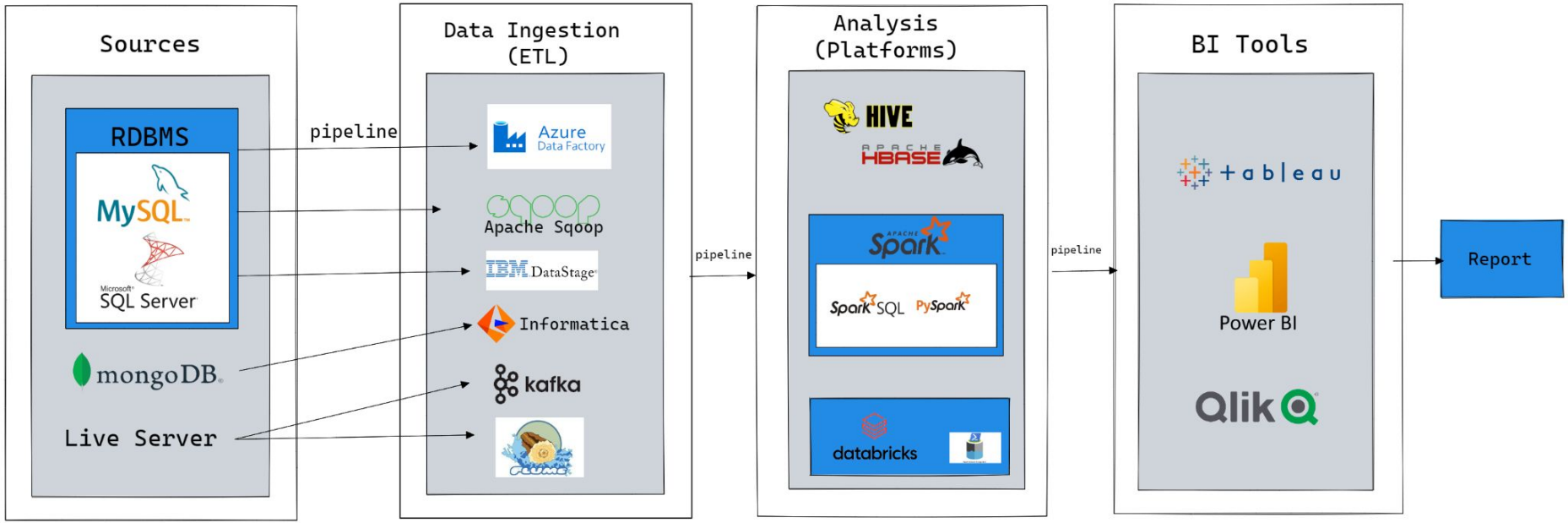
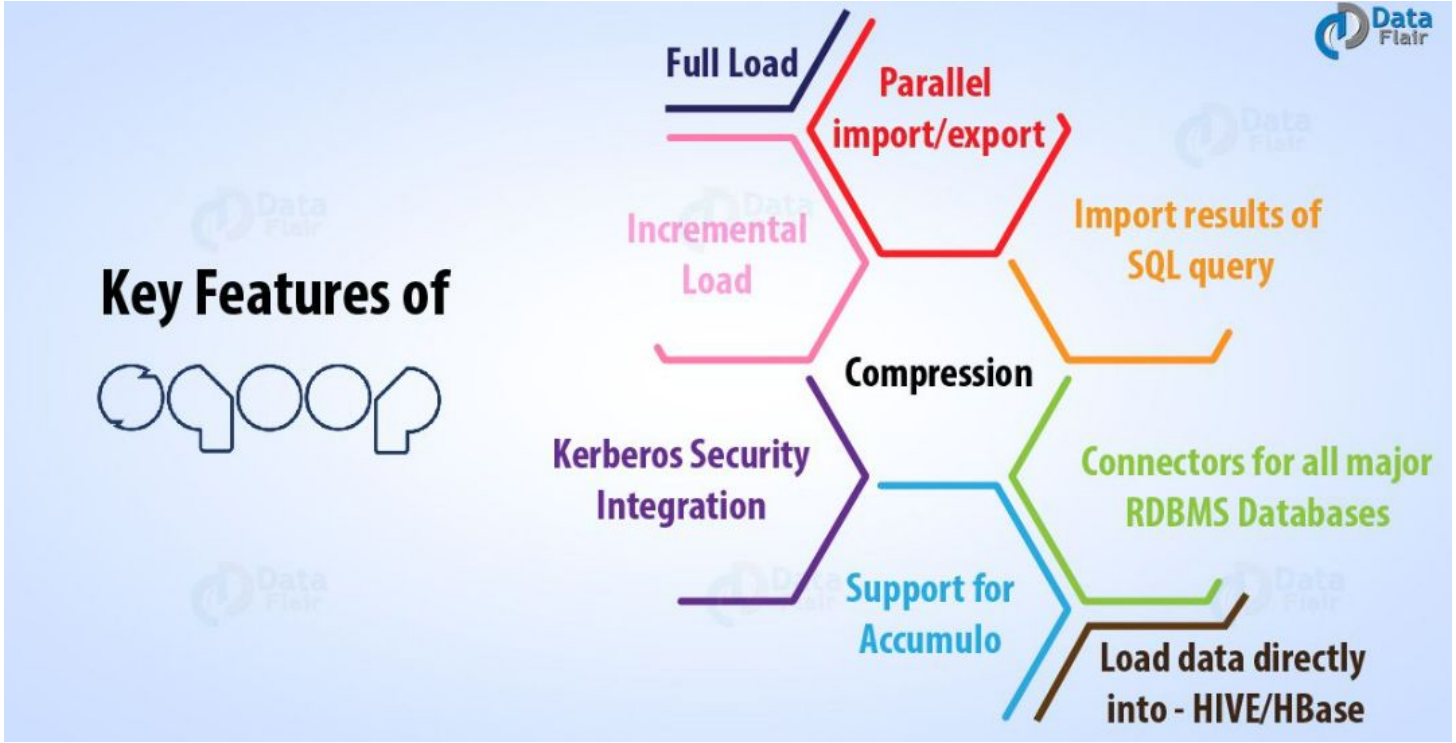
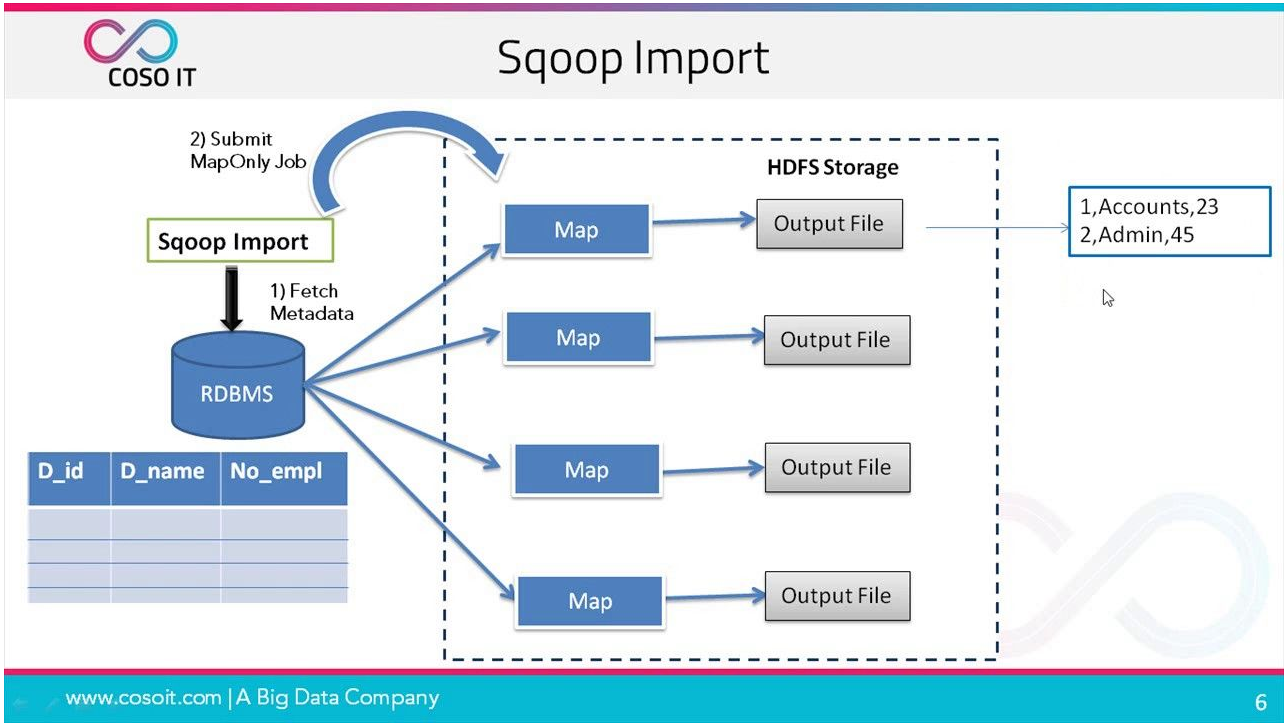
Big Data Architecture



Apache Sqoop Key Features

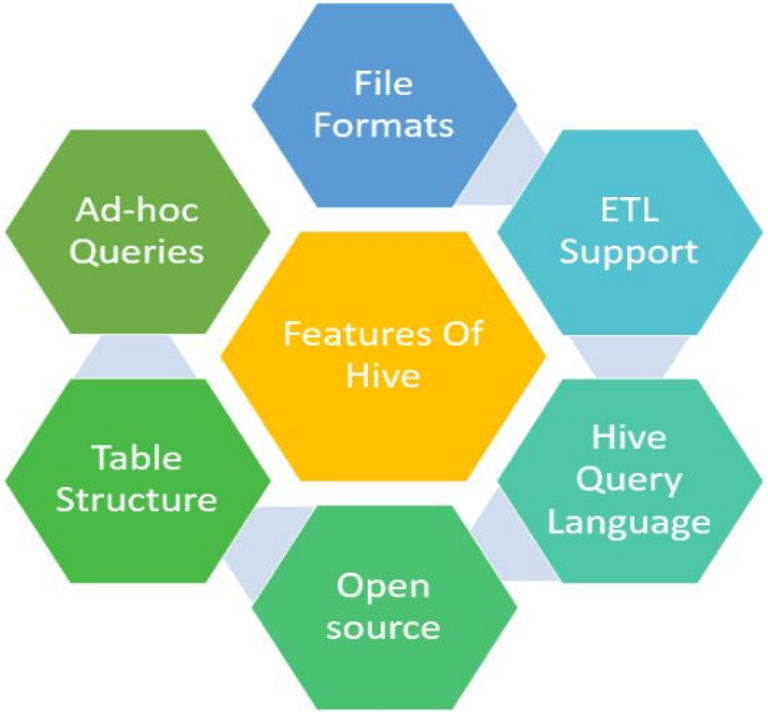


Apache Sqoop WorkFlow

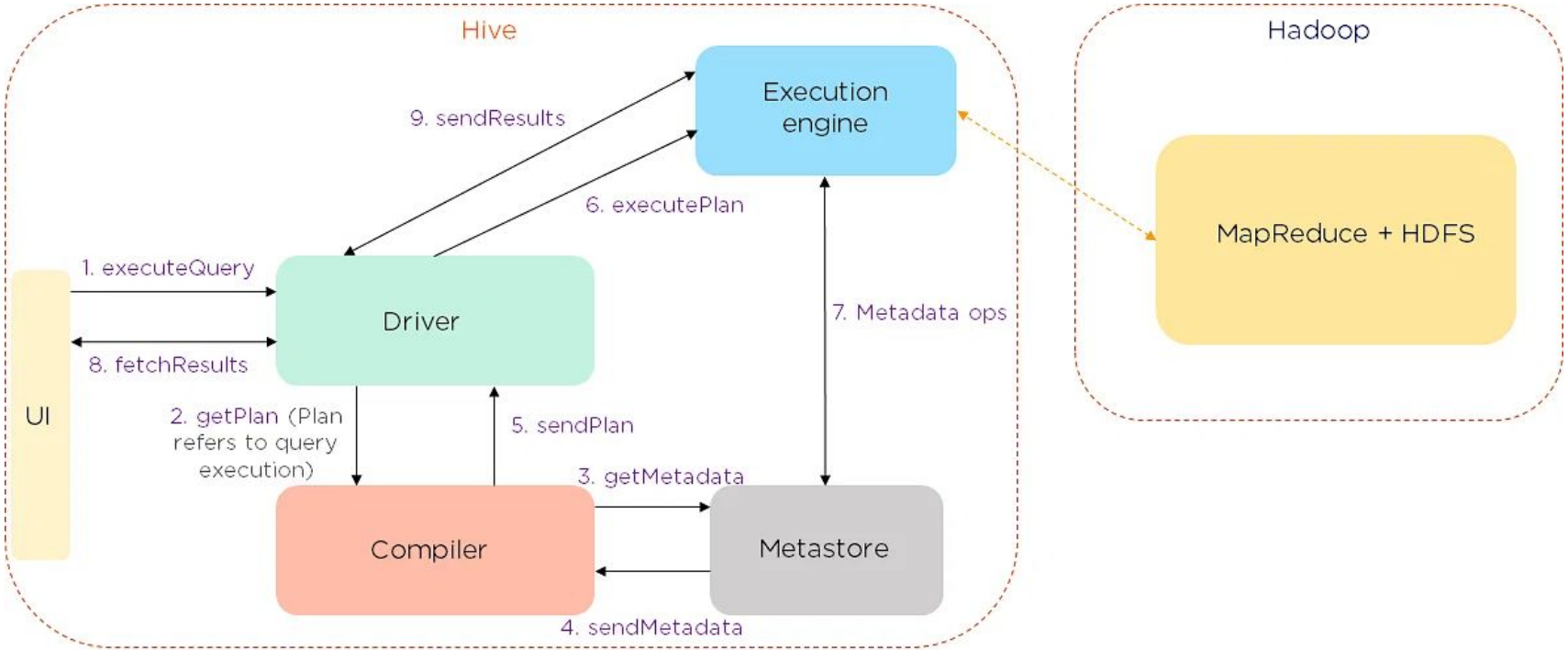


What is Hive?

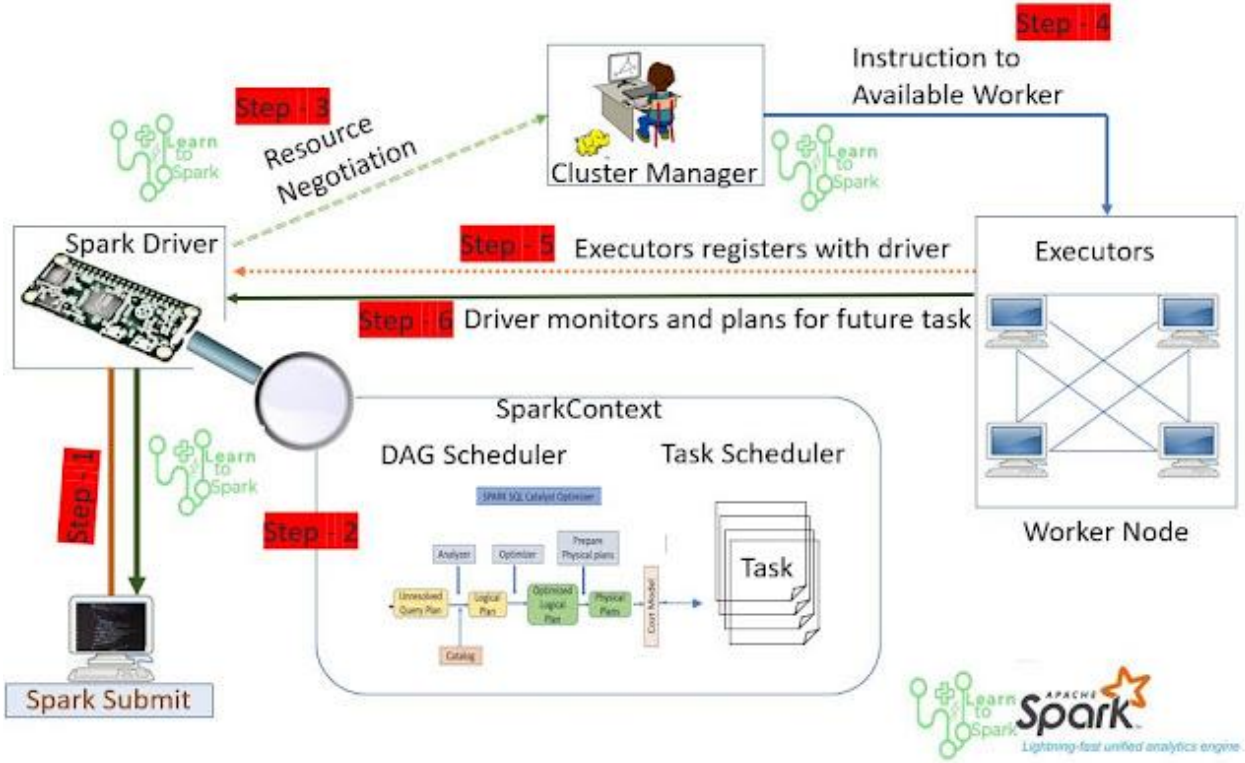
Apache Hive is often referred to as **Data Warehousing** infrastructure tool which is developed on the top of **Hadoop file distributed system**, used for processing and analysing large volume of **structured, semi-structured data** using **Hive Query Language (HQL)**



Hive Architecture



Apache Spark Job Execution



Apache Spark Key Features

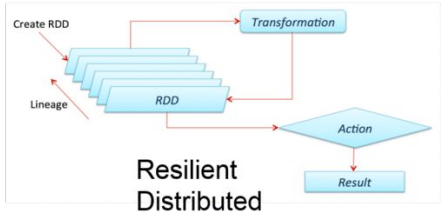
Spark SQL Pipeline

Data Source API

DataFrame API

Named Columns

Interpreter & Optimizer



Resilient Distributed Dataset

Spark SQL Service

Scenario 01: Print out first 5 columns

```
In [22]: first5Column = spark.sql("select Date, Open, High, Low, Close from walmart_stock")
```

```
In [23]: first5Column.show(4)
```

```
+-------------------+------------------+---------+---------+------------------+
|               Date|              Open|     High|      Low|             Close|
+-------------------+------------------+---------+---------+------------------+
|2012-01-03 00:00:00|         59.970001|61.060001|59.869999|         60.330002|
|2012-01-04 00:00:00|60.209998999999996|60.349998|59.470001|59.709998999999996|
|2012-01-05 00:00:00|         59.349998|59.619999|58.369999|         59.419998|
|2012-01-06 00:00:00|         59.419998|59.450001|58.869999|              59.0|
+-------------------+------------------+---------+---------+------------------+
only showing top 4 rows
```

Scenario 02: Describe function, formatted to two decimal place

```
describeDF = walmart_df.describe()
```

```
from pyspark.sql.functions import *
describeDF = describeDF.select(
  col("summary"),
  format_number(col("Open").cast("double"), 2).alias("Open"),
  format_number(col("High").cast("double"), 2).alias("High"),
  format_number(col("Low").cast("double"), 2).alias("Low"),
  format_number(col("Close").cast("double"), 2).alias("Close"),
  format_number(col("Volume").cast("double"), 2).alias("Volume"),
  format_number(col("Adj Close").cast("double"), 2).alias("Adj Close")
)
describeDF.show()
```

```
13 describeDF.show()
```

```
+-------+--------+--------+--------+--------+-------------+---------+
|summary|    Open|    High|     Low|   Close|       Volume|Adj Close|
+-------+--------+--------+--------+--------+-------------+---------+
|  count|1,258.00|1,258.00|1,258.00|1,258.00|     1,258.00| 1,258.00|
|   mean|   72.36|   72.84|   71.92|   72.39| 8,222,093.48|    67.24|
| stddev|    6.77|    6.77|    6.74|    6.76| 4,519,780.84|     6.72|
|    min|   56.39|   57.06|   56.30|   56.42| 2,094,900.00|    50.36|
|    max|   90.80|   90.97|   89.25|   90.47|80,898,100.00|    84.91|
+-------+--------+--------+--------+--------+-------------+---------+
```

Scenario 03: Create a new dataframe with a column called HighToLow Ratio that is the ratio of the High Price versus Low Price of stock traded for a day

```
# Now we have the desired Output we can store it in a new dataframe

walmart_stock_updated = spark.sql('''SELECT Date, round(Open, 2) as Open, round(High, 2) as High,
                                     round(Low, 2) as Low, round(Close,2) as Close, Volume,
                                     round(`Adj Close`,2) as `Adj Close`,
                                     round(High/Low, 3) as `HighToLowRatio` FROM walmart_data ''')
```

```
+-------------------+-----+-----+-----+-----+--------+---------+--------------+
|               Date| Open| High|  Low|Close|  Volume|Adj Close|HighToLowRatio|
+-------------------+-----+-----+-----+-----+--------+---------+--------------+
|2012-01-03 00:00:00|59.97|61.06|59.87|60.33|12668800|    52.62|          1.02|
|2012-01-04 00:00:00|60.21|60.35|59.47|59.71| 9593300|    52.08|         1.015|
|2012-01-05 00:00:00|59.35|59.62|58.37|59.42|12768200|    51.83|         1.021|
|2012-01-06 00:00:00|59.42|59.45|58.87| 59.0| 8069400|    51.46|          1.01|
|2012-01-09 00:00:00|59.03|59.55|58.92|59.18| 6679300|    51.62|         1.011|
|2012-01-10 00:00:00|59.43|59.71|58.98|59.04| 6907300|    51.49|         1.012|
|2012-01-11 00:00:00|59.06|59.53|59.04| 59.4| 6365600|    51.81|         1.008|
|2012-01-12 00:00:00|59.79| 60.0| 59.4| 59.5| 7236400|     51.9|          1.01|
|2012-01-13 00:00:00|59.18|59.61|59.01|59.54| 7729300|    51.93|          1.01|
|2012-01-17 00:00:00|59.87|60.11|59.52|59.85| 8500000|     52.2|          1.01|
|2012-01-18 00:00:00|59.79|60.03|59.65|60.01| 5911400|    52.34|         1.006|
|2012-01-19 00:00:00|59.93|60.73|59.75|60.61| 9234600|    52.86|         1.016|
|2012-01-20 00:00:00|60.75|61.25|60.67|61.01|10378800|    53.21|          1.01|
|2012-01-23 00:00:00|60.81|60.98|60.51|60.91| 7134100|    53.13|         1.008|
|2012-01-24 00:00:00|60.75| 62.0|60.75|61.39| 7362800|    53.54|         1.021|
|2012-01-25 00:00:00|61.18|61.61|61.04|61.47| 5915800|    53.61|         1.009|
|2012-01-26 00:00:00| 61.8|61.84|60.77|60.97| 7436200|    53.18|         1.018|
|2012-01-27 00:00:00|60.86|61.12|60.54|60.71| 6287300|    52.95|          1.01|
|2012-01-30 00:00:00|60.47|61.32|60.35| 61.3| 7636900|    53.47|         1.016|
|2012-01-31 00:00:00|61.53|61.57|60.58|61.36| 9761500|    53.52|         1.016|
+-------------------+-----+-----+-----+-----+--------+---------+--------------+
only showing top 20 rows
```

Scenario 04: What day had the Peak High in Price?

```
spark.sql("SELECT Date, High FROM walmart_data WHERE HIGH = (SELECT MAX(High) FROM walmart_data) ").show()
```

```
+-------------------+---------+
|               Date|     High|
+-------------------+---------+
|2015-01-13 00:00:00|90.970001|
+-------------------+---------+
```

Scenario 05: What is the mean of the Close column?

In [25]:
```
closing_price_mean = spark.sql('SELECT ROUND(AVG(Close),3) AS closing_mean FROM walmart_stock')
```

In [26]:
```
closing_price_mean.show()
```

```
+------------+
|closing_mean|
+------------+
|      72.388|
+------------+
```

Scenario 10: What is the average Close for each Calendar Month?

```
In [14]: monthly_avg_closing = spark.sql('''SELECT MONTH(Date) AS month, ROUND(AVG(Close),3)
                                    AS closing_mean FROM walmart_stock GROUP BY MONTH(Date) ORDER BY month''')
```

```
In [15]: monthly_avg_closing.show()
```

```
+-----+------------+
|month|closing_mean|
+-----+------------+
|    1|      71.448|
|    2|      71.307|
|    3|      71.778|
|    4|      72.974|
|    5|       72.31|
|    6|      72.495|
|    7|       74.44|
|    8|       73.03|
|    9|      72.184|
|   10|      71.579|
|   11|      72.111|
|   12|      72.848|
+-----+------------+
```

Scenario 11: What is the Pearson correlation between High and Volume?

```
In [23]: from pyspark.sql.functions import corr
```

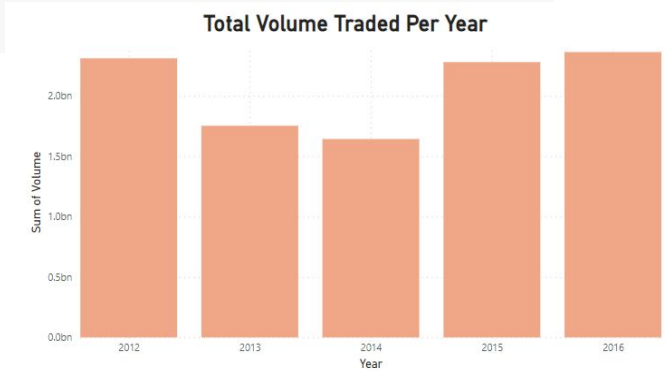
```
In [25]: df.select(corr("High", "Volume").alias('Pearson Correlation')).show()
```

```
+-------------------+
|Pearson Correlation|
+-------------------+
|-0.3384326061737161|
+-------------------+
```

Scenario 06: What is the max and min of the Volume column?

```
data_rdd=sc.textFile("walmart_stock.csv")

headers = data_rdd.first()

rdd = data_rdd.filter(lambda line:line!=headers)

max_volume = rdd.map(lambda line:float(line.split(",")[5])).max()

min_volume = rdd.map(lambda line:float(line.split(",")[5])).min()

df_max_min=sc.parallelize([Row(max_volume,min_volume)]).toDF(["max_volume","min_volume"])

df_max_min.createOrReplaceTempView("min_max_volume")

df_max_min.show()
```

```
+----------+----------+
|max_volume|min_volume|
+----------+----------+
| 8.08981E7| 2094900.0|
+----------+----------+
```



Scenario 07: How many days was the Close lower than 60 dollars?

```
headers = data_rdd.first()

rdd = data_rdd.filter(lambda line:line!=headers)

cnt=rdd.filter(lambda line: float(line.split(",")[4])<60.00).count()

df_cnt=sc.parallelize([Row(cnt)]).toDF(["close_lower_than_60"])

df_cnt.createOrReplaceTempView("close_lower_than_60")

df_cnt.show()
```

```
+-------------------+
|close_lower_than_60|
+-------------------+
|                 81|
+-------------------+
```

Scenario 08: What percentage of the time was the High greater than 80 dollars?

```
hive> create table walmart_stock(Date string,Open double,high double,Low double,close double,
volume int,Adj_close double)row format delimited fields terminated by ',' tblproperties("skip
.header.line.count"="1");
```

```
hive> select round((count(high_date)/count(date))*100,2) as ratio from(select *,if(high>80,1,
null) as high_date from walmart_stock)a;
```

```
mysql> select * from high_80perc;
+-------------+
| perecentage |
+-------------+
|        9.14 |
+-------------+
1 row in set (0.00 sec)
```

Scenario 09: What is the max High per year?

```
hive> create table walmart_stock(Date string,Open double,high double,Low double,close double,
volume int,Adj_close double)row format delimited fields terminated by ',' tblproperties("skip
.header.line.count"="1");
```

```
hive> select year(date),max(high) from walmart_stock group by year(date);
```

```
mysql> select * from max_high_year;
+------+----------+
| date | max_high |
+------+----------+
| 2012 |     77.6 |
| 2016 |    75.19 |
| 2013 |    81.37 |
| 2014 |    88.09 |
| 2015 |    90.97 |
+------+----------+
5 rows in set (0.01 sec)
```

E-Commerce
Big Data Analysis

UNDERSTANDING THE E-Commerce DATA:

- Dataset has **duplicate values.**
- Data in **timestamp** column is *not formatted as per the default format*, so we will format that as well
- For quantity column we have counters instead of the exact value.
  For example, if a customer had bought 2 quantities of the same product we have that data in two rows, in the first row the quantity is 1 and in the second row the quantity is 2. So we will only take the row with the total quantity.

Hive Queries

User Story 01. The monthly trend of sales:

```
hive> insert overwrite table monthly_sales select year(timestamp) as years, month(timestamp) as months,
sum(payment) as sales from cecom where ostatus not in ('canceled', 'unavailable') group by year(timestamp),
month(timestamp) order by months, years;
```

User Story 04: Which hour has more no. of sales?

```
hive> insert overwrite table hourly_most_sales select hours, sales from (select hour(timestamp) as hours,
sum(quantity) as sales, rank() over(order by sum(quantity) desc) AS `max_sales` from cecom group by
hour(timestamp)) t where max_sales = 1;
```

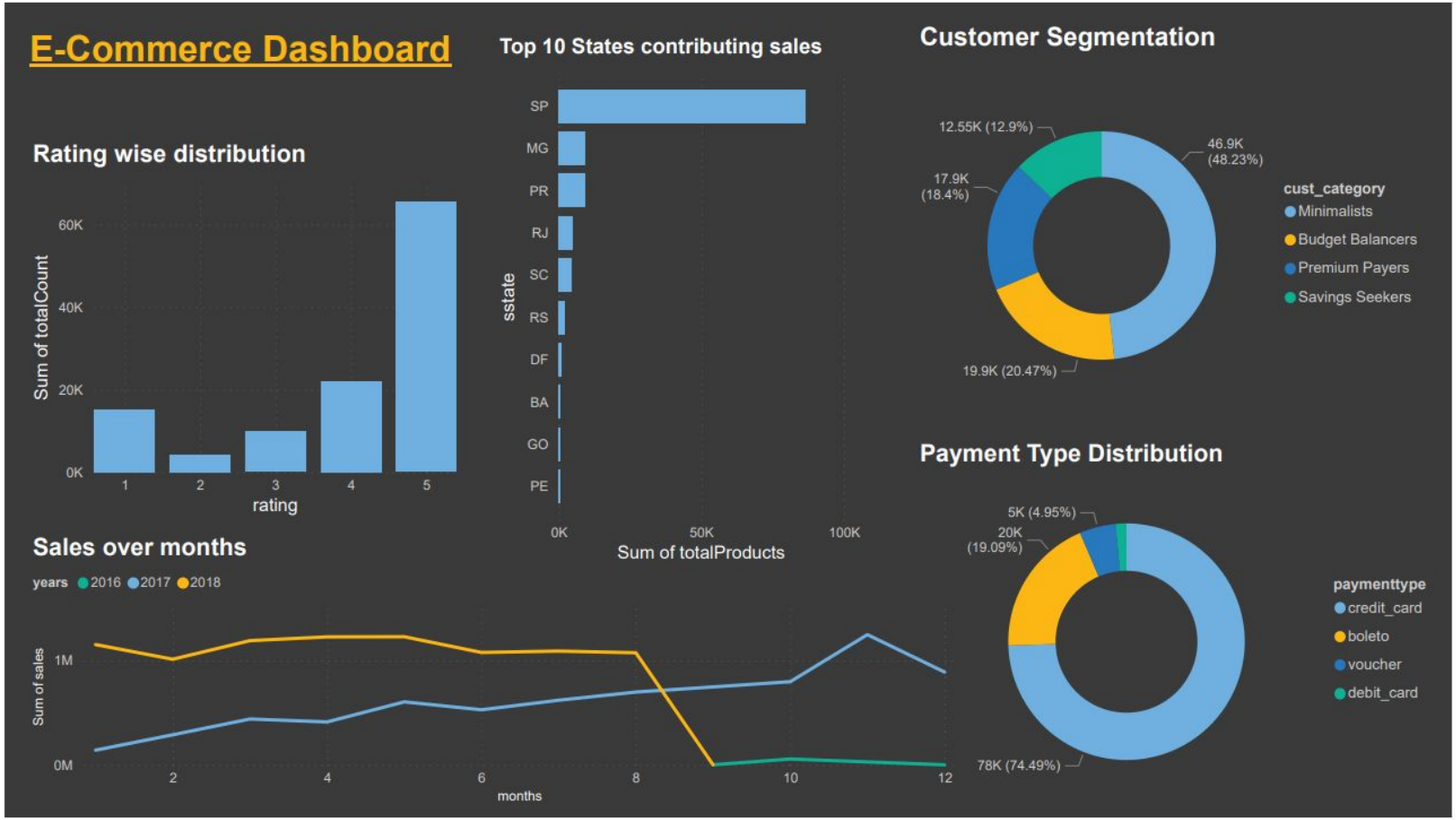
User Story 03. What are the most commonly used payment types?

```
hive> insert overwrite table common_paymenttype select paymenttype, count(oid) as tcount from cecom group by
paymenttype order by tcount desc;
```

User Story 04: Count of Orders With each No. of Payment Installments

```
hive> insert overwrite table installment_count  select installments, count(oid) as tcount from cecom group by
installments;
```

E-Commerce Dashboard



THANK YOU