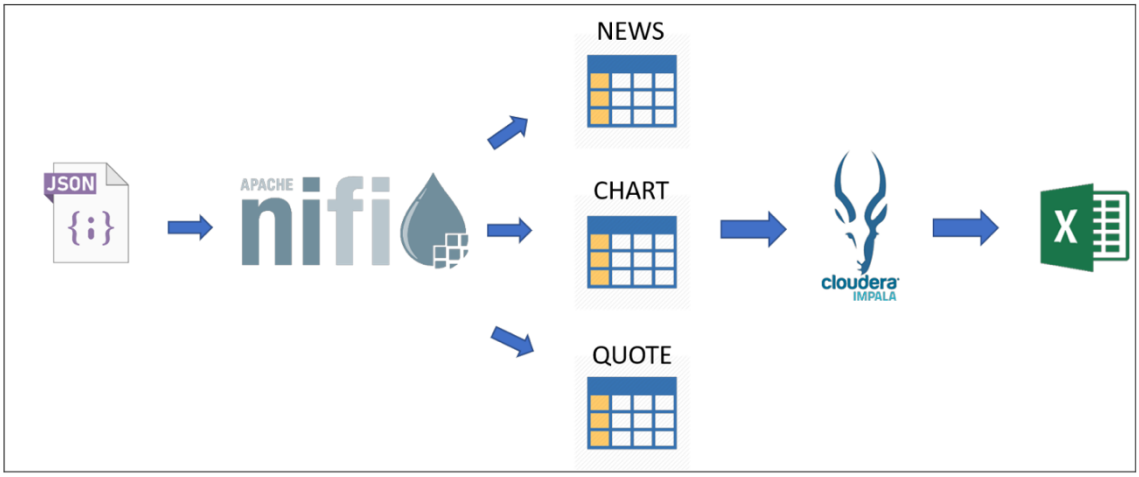
Assignment 2

Real-Time Financial Market Data Ingestion



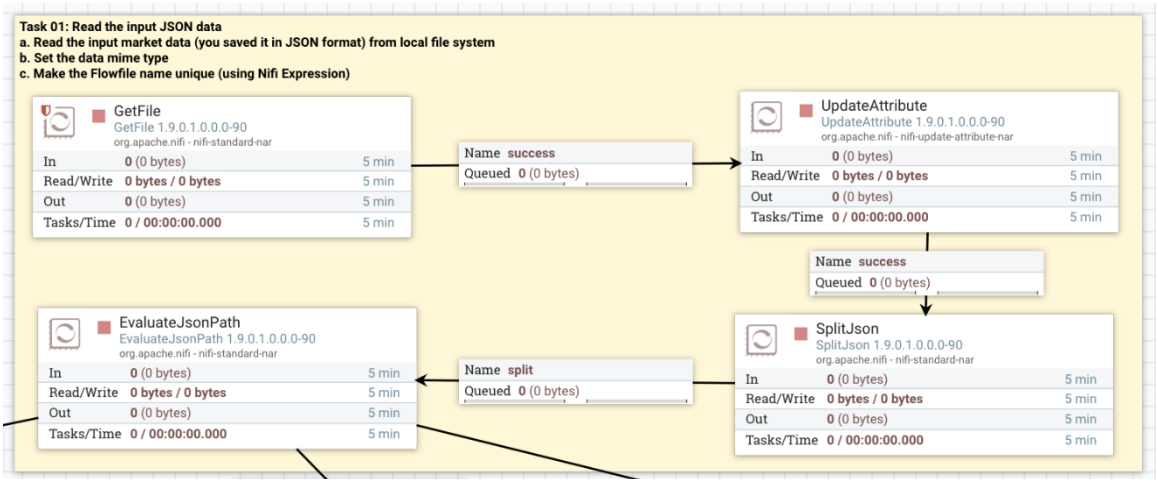
November 23, 2021

Team #5
Nazanin Hashemipoor
Sofienne Srihi
Nasim Afzali Chali
Marie-Noël Lepage
Benoit Tessier

In our team, all of us were working and participating. We all worked on code on our own and shared our progress with each other to solve issues and obtain a final working code. In parallel we produced and review the documentation to supplement the exercise.

TASK 01

Read the input JSON data



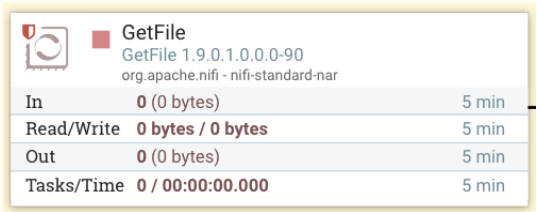
a. Read the input market data (you saved it in JSON format) from your local file system.

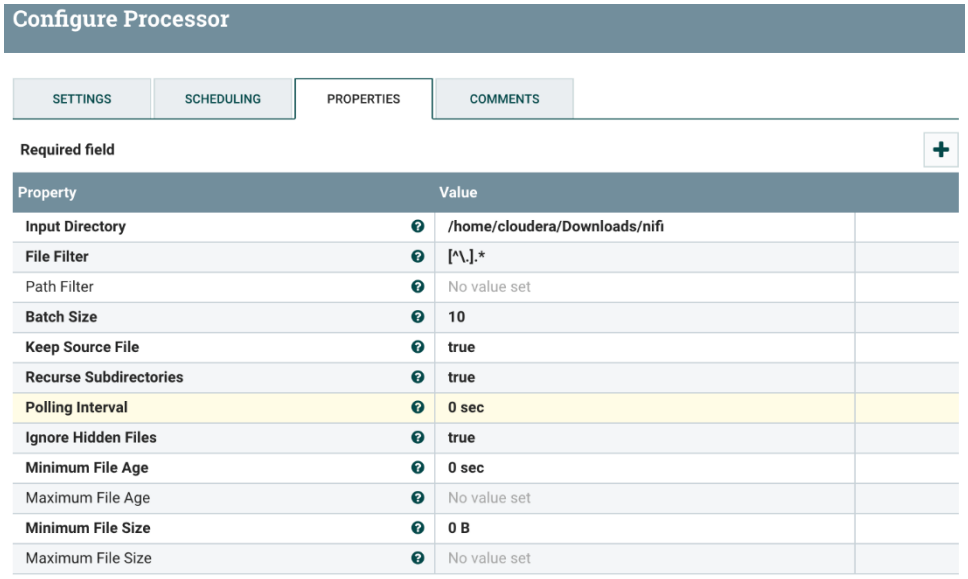
We downloaded our data from IEX Cloud Platform as mentioned on the assignment and we save it in Json format file, then we put it in HDFS to start working with it. The credit limitation allowed us to work with 3 months of data.

We put the file in our local system at this directory: /home/cloudera/Downloads/nifi

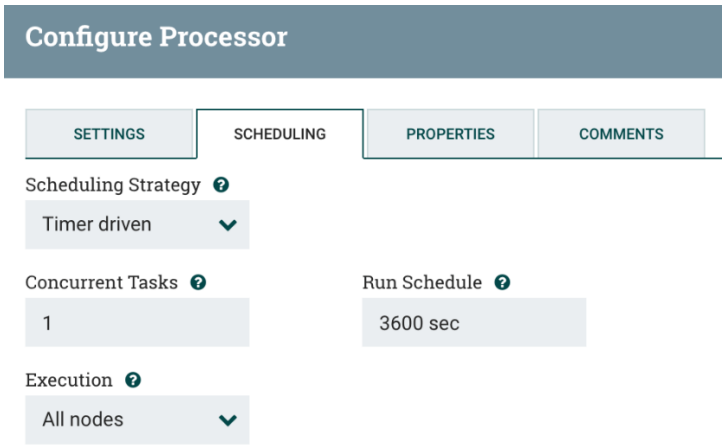
```
[cloudera@quickstart ~]$ cd Downloads
[cloudera@quickstart Downloads]$ cd nifi
[cloudera@quickstart nifi]$ ll
total 260
-rw------- 1 cloudera cloudera 262963 Nov 21 11:54 big_data_3m_100.json
[cloudera@quickstart nifi]$
```

Processor	Properties	
GetFile	Directory	/home/cloudera/Downloads/nifi
	Keep Source File	true





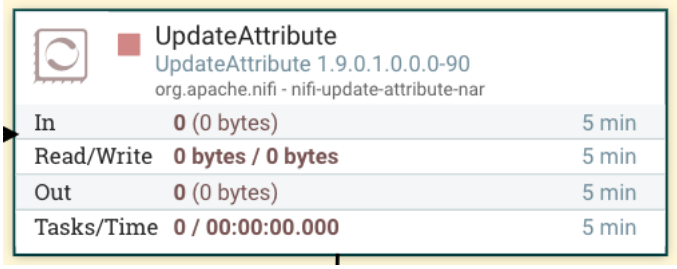
We use scheduling at this step to take the data each hour.
For all other step we put 0 sec to run the process in real time.

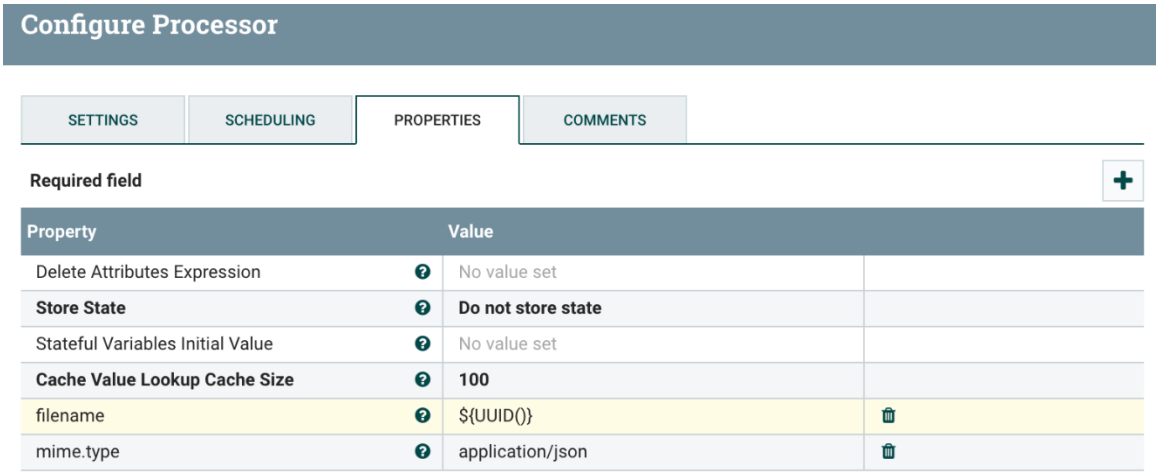


b. Set the data mime type
c. Make the Flowfile name unique (using Nifi Expression)

Link on success to:

Processor	Properties	
UpdateAttribute	Add these custom attributes	
	filename	${UUID()}
	mime.type	application/json

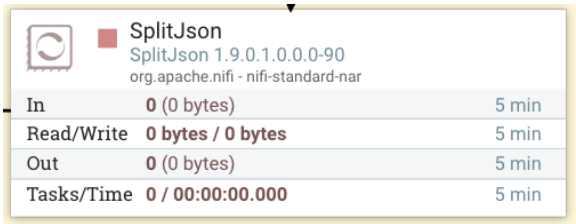




We used SplitJson and EvaluateJsonPath processor to create 3 attributes (companyName, symbol and Open). We will use them in the next tasks.

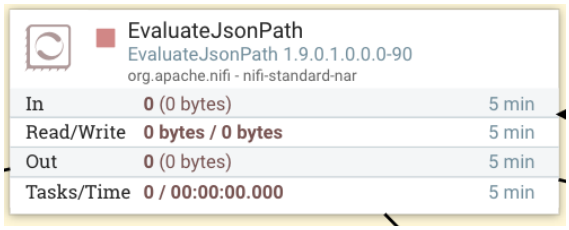
Link on success to:

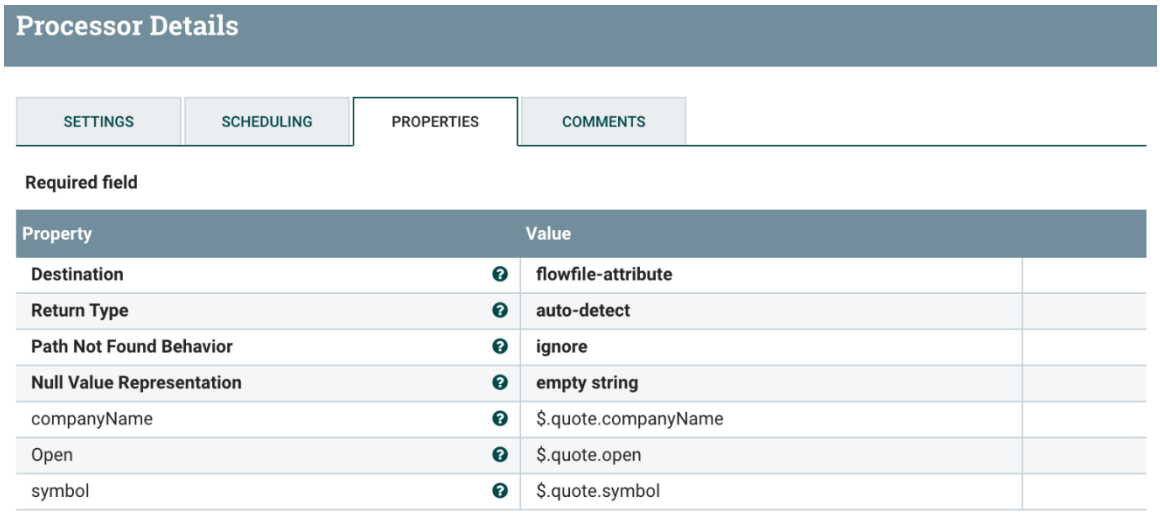
Processor	Properties	
SplitJson Relationships Failure success	JsonPath Expression	$.*



Link on split to:

Processor	Properties	
SplitJson Relationships Failure unmatched	Destination	Flowfile-attribute
	Null Value Representation	Empty string
	Add these custom attributes	
	companyName	$.quote.companyName
	symbol	$.quote.symbol
	Open	$.quote.open

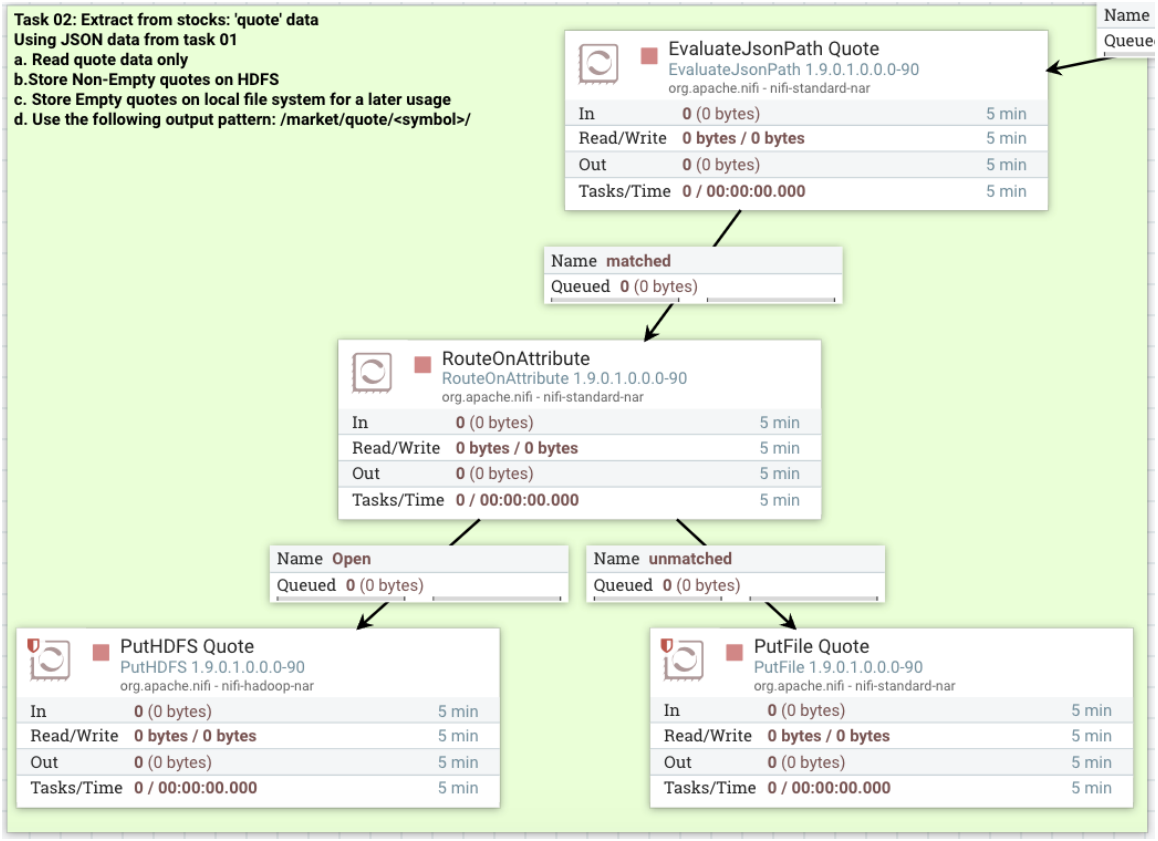




TASK 02

Extract from stocks: 'quote' data

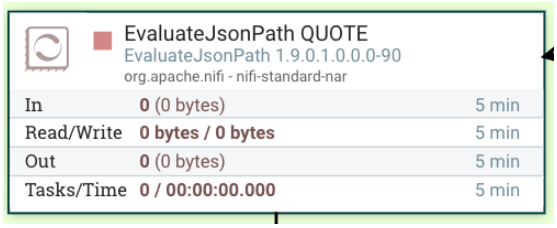
Using JSON data from task01

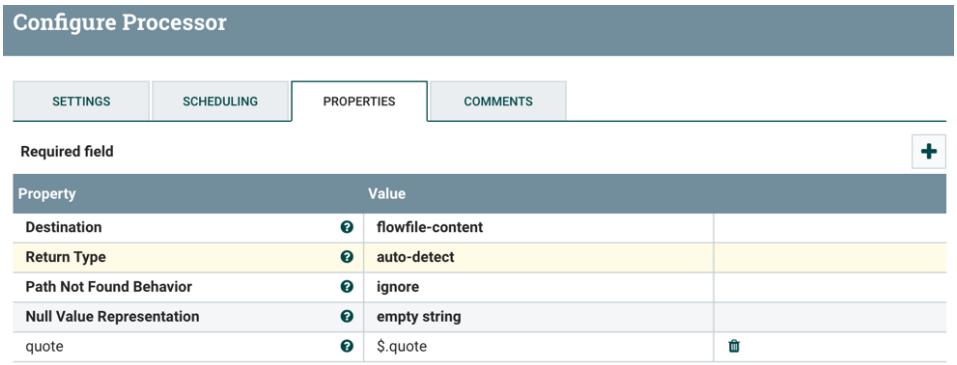


a. Read quote data only

Link on matched to:

Processor	Properties	
EvaluateJsonPath Relationships Failure unmatched	Destination	Flowfile-content
	Null Value Representation	Empty string
	Add this custom attribute	
	quote	$.quote



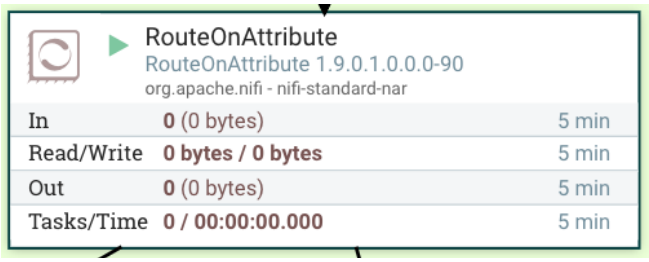


b. Store Non-Empty quotes on HDFS
c. Store Empty quotes on local system for a later usage
d. Use the following output pattern: /market/quote/<symbol>/

Hint: To check if a stocks quote is empty, check the value 'open' attribute.

Link on matched to:

Processor	Properties	
EvaluateJsonPath	Routing Strategy	Route to Property name
	Add this custom attribute	
	Open	$.{Open:isEmpty():not()}



Processor Details

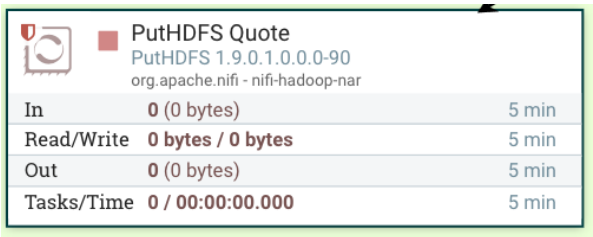
SETTINGS | SCHEDULING | PROPERTIES | COMMENTS

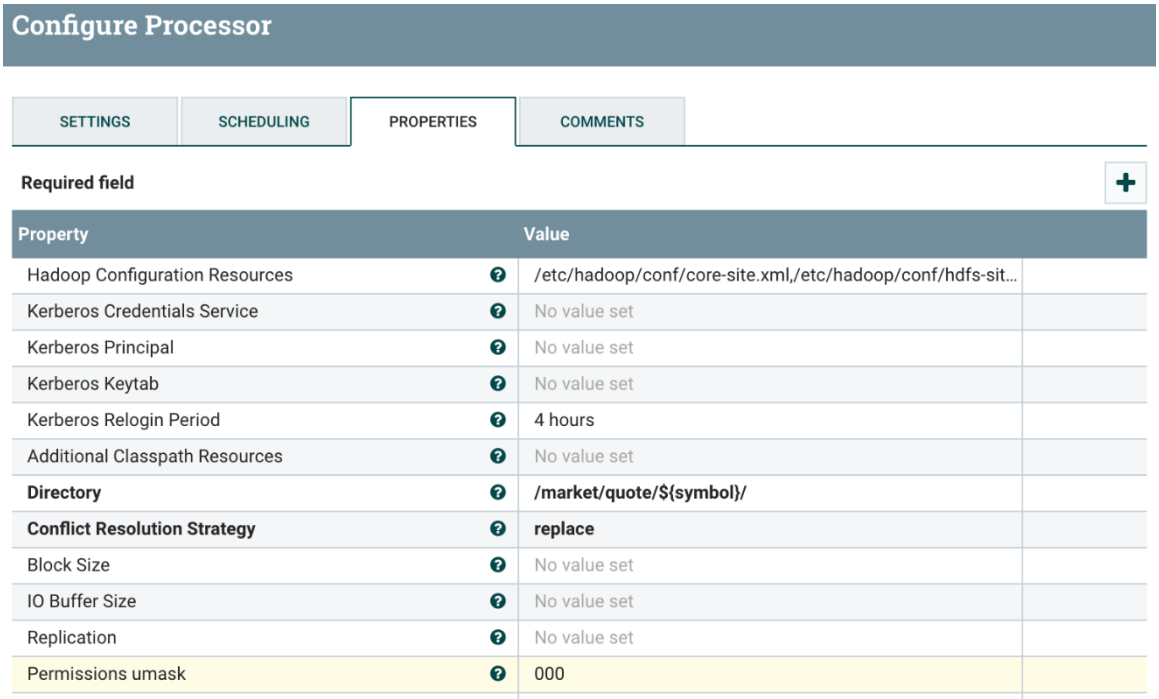
Required field

Property	Value
Routing Strategy	**Route to Property name**
Open	${Open:isEmpty():not()}

Link on Open / unmatched to:

Processor	Properties	
PutHDFS (open) Relationships Failure success	Hadoop Confiduration Ressources	/etc/hadoop/conf/core-site.xml,/etc/hadoop/conf/hdfs-site.xml
	Directory	/market/quote/${symbol}/
	Conflict Resolution Strategy	Replace
	Permissions unmask	000
PutFile (unmatched) Relationships Failure success	Directory	/home/cloudera/Downloads/market/quote/${symbol}/
	Conflict Resolution Strategy	replace
	Create missing directory	true
	Permissions	777



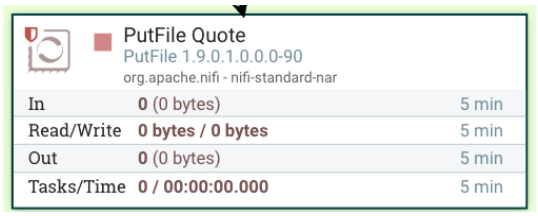


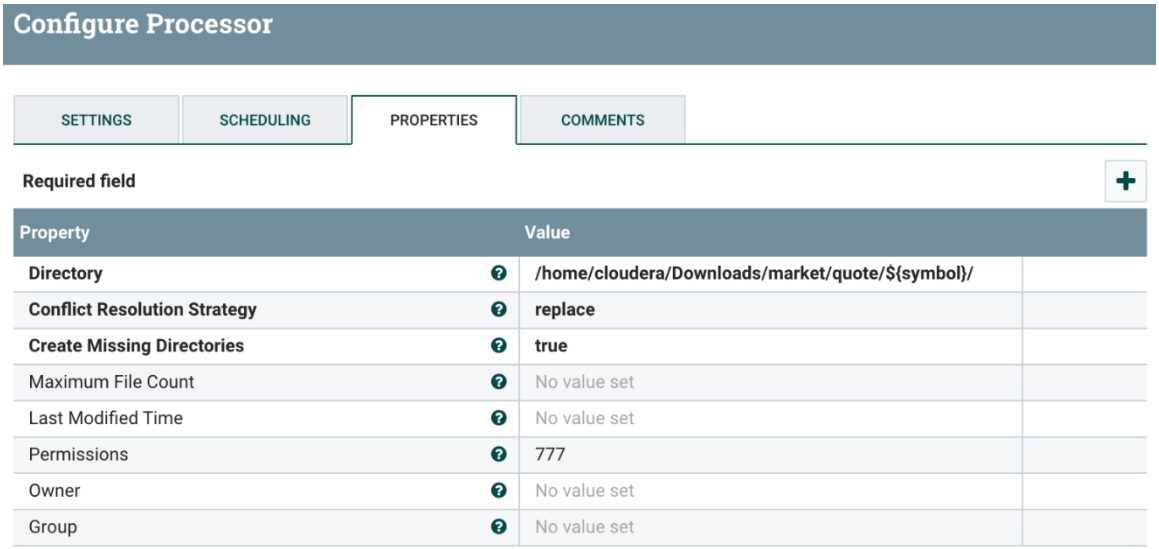
For the PutHDFS, we see the open is not empty for the result quote:

```
"oddLotDelayedPrice" : 160.58,
"oddLotDelayedPriceTime" : 1637355599827,
"open" : 157.87,
"openTime" : 1637332202707,
"openSource" : "official",
"peRatio" : 14.3,
"previousClose" : 157.87,
```

Two files and directory are created (for AAPL and MSFT) in HDFS on directory:

```
# Check the directory recursively
hdfs dfs -ls -R -h /market

drwxrwxrwx   - root supergroup          0 2021-11-22 06:07 /market/quote
drwxrwxrwx   - root supergroup          0 2021-11-22 06:07 /market/quote/AAPL
-rw-rw-rw-   1 root supergroup      1.3 K 2021-11-22 06:07 /market/quote/AAPL/c963fbad-eff0-411a-b16e-01b34804b224
drwxrwxrwx   - root supergroup          0 2021-11-22 06:07 /market/quote/MSFT
-rw-rw-rw-   1 root supergroup      1.3 K 2021-11-22 06:07 /market/quote/MSFT/c963fbad-eff0-411a-b16e-01b34804b224
```





For the PutFile, we see the open is null for the result quote:

```
37    "latestUpdate" : 1562616178268,
38    "latestVolume" : 0,
39    "low" : null,
40    "lowSource" : null,
41    "lowTime" : null,
42    "marketCap" : 0,
43    "oddLotDelayedPrice" : null,
44    "oddLotDelayedPriceTime" : null,
45    "open" : null,
46    "openTime" : null,
```

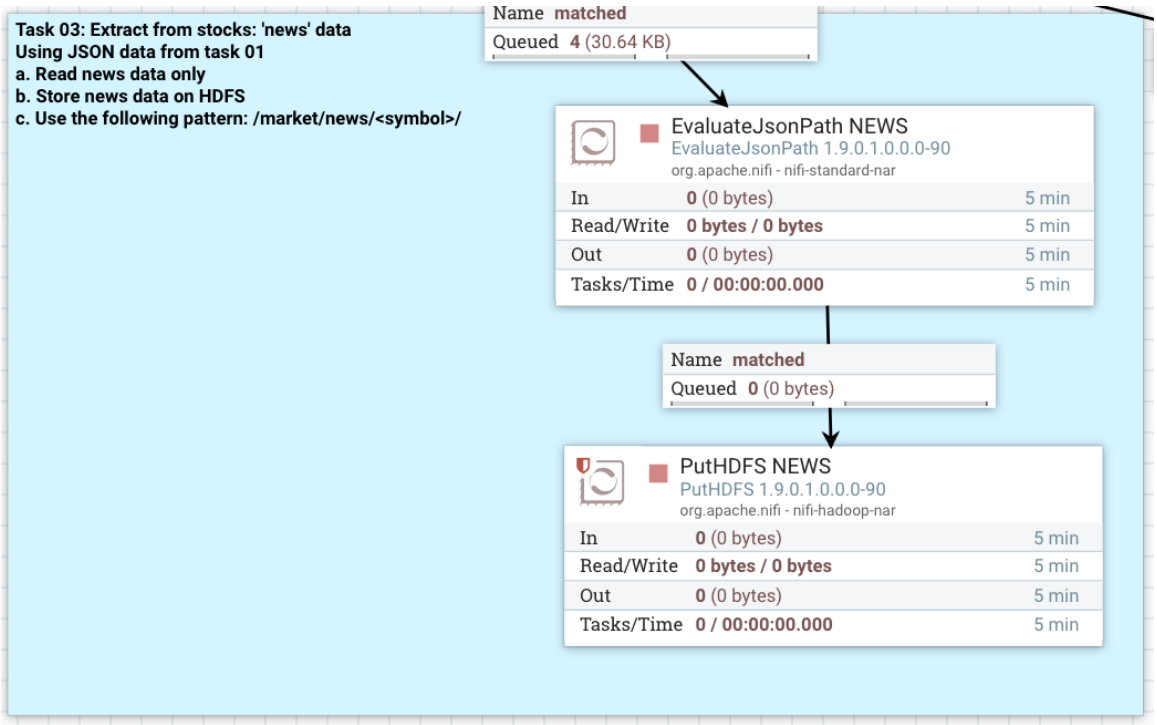
Two files and directory are created (for CLDR and RHT) in our local system:

```
[cloudera@quickstart ~]$ cd Downloads
[cloudera@quickstart Downloads]$ ll -R market
market:
total 4
drwxr-xr-x 4 root root 4096 Nov 22 06:00 quote

market/quote:
total 8
drwxr-xr-x 2 root root 4096 Nov 22 06:00 CLDR
drwxr-xr-x 2 root root 4096 Nov 22 06:00 RHT

market/quote/CLDR:
total 4
-rwxrwxrwx 1 root root 1296 Nov 22 06:00 c963fbad-eff0-411a-b16e-01b34804b224

market/quote/RHT:
total 4
-rwxrwxrwx 1 root root 1157 Nov 22 06:00 c963fbad-eff0-411a-b16e-01b34804b224
[cloudera@quickstart Downloads]$
```

TASK 03

Extract from stocks: 'news' data

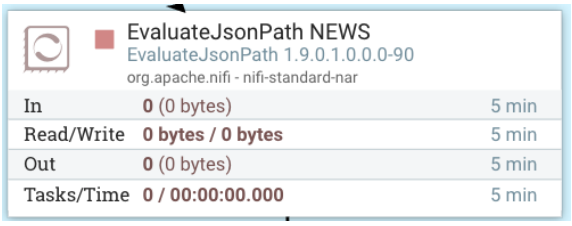
Using JSON data from task01

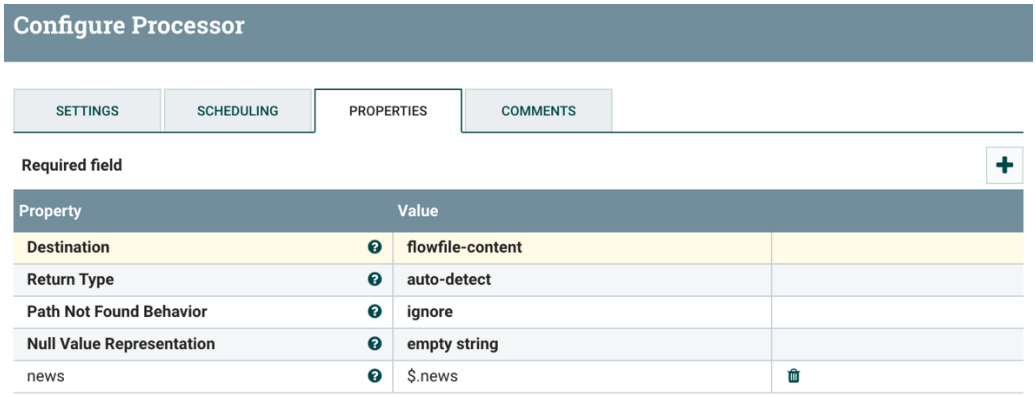


a. Read news data only

Link on matched to:

Processor	Properties	
EvaluateJsonPath Relationships Failure unmatched	Destination	Flowfile-content
	Null Value Representation	Empty string
	Add this custom attribute	
	news	$.news





b. Store news data on HDFS

c. Use the following pattern: /market/news/<symbol>/

Link on matched to:

Processor	Properties	
PutHDFS Relationships Failure success	Hadoop Confiduration Ressources	/etc/hadoop/conf/core-site.xml,/etc/hadoop/conf/hdfs-site.xml
	Directory	/market/news/${symbol}/
	Conflict Resolution Strategy	replace
	Permissions unmask	000

Configure Processor

SETTINGS | SCHEDULING | PROPERTIES | COMMENTS

Required field

Property	Value
Hadoop Configuration Resources	/etc/hadoop/conf/core-site.xml,/etc/hadoop/conf/hdfs-sit...
Kerberos Credentials Service	No value set
Kerberos Principal	No value set
Kerberos Keytab	No value set
Kerberos Relogin Period	4 hours
Additional Classpath Resources	No value set
Directory	**/market/news/${symbol}/**
Conflict Resolution Strategy	**replace**
Block Size	No value set
IO Buffer Size	No value set
Replication	No value set
Permissions umask	000

We see on HDFS four files and directory are created for the result news:

- For stock RHT, we don't have news data into the JSON.

```
# Check the directory recursively
hdfs dfs -ls -R -h /market
```

```
drwxrwxrwx   - root supergroup          0 2021-11-22 06:15 /market/news
drwxrwxrwx   - root supergroup          0 2021-11-22 06:15 /market/news/AAPL
-rw-rw-rw-   1 root supergroup     74.1 K 2021-11-22 06:15 /market/news/AAPL/92233b5d-8ef5-4640-9c5b-b6c862ff4c3c
drwxrwxrwx   - root supergroup          0 2021-11-22 06:15 /market/news/CLDR
-rw-rw-rw-   1 root supergroup     19.1 K 2021-11-22 06:15 /market/news/CLDR/92233b5d-8ef5-4640-9c5b-b6c862ff4c3c
drwxrwxrwx   - root supergroup          0 2021-11-22 06:15 /market/news/MSFT
-rw-rw-rw-   1 root supergroup     80.2 K 2021-11-22 06:15 /market/news/MSFT/92233b5d-8ef5-4640-9c5b-b6c862ff4c3c
drwxrwxrwx   - root supergroup          0 2021-11-22 06:15 /market/news/RHT
-rw-rw-rw-   1 root supergroup          2 2021-11-22 06:15 /market/news/RHT/92233b5d-8ef5-4640-9c5b-b6c862ff4c3c
```


```
[ {
  "datetime" : 1637449582000,
  "headline" : "Heres where to meet New Yorks young(ish) crypto millionaires",
  "source" : "New York Post",
  "url" : "https://cloud.iexapis.com/v1/news/article/3fmFVcNrNhSFNBhtYgPc2kSuZTLSNG04olEVHxEWVBPp",
  "summary" : "Young cryptocurrency millionaires -- and those who want to learn more about their hot assets -- converge weekly in the Big Apple.",
  "related" : "AAPL",
  "image" : "https://cloud.iexapis.com/v1/news/image/3fmFVcNrNhSFNBhtYgPc2kSuZTLSNG04olEVHxEWVBPp",
  "lang" : "en",
  "hasPaywall" : false
}, {
  "datetime" : 1637448933000,
  "headline" : "Apple affirms employees right to speak about working conditions, in a win for #AppleToo movement",
  "source" : "Techtelegraph",
  "url" : "https://cloud.iexapis.com/v1/news/article/151hayiSGYjgrMCHWJ0TEDV5QXwWWztKattjKbfBIKuI",
  "summary" : "Apple is deeply committed to providing employees with a workplace where they feel safe, respected, and inspired to do their best work
  "related" : "AAPL",
  "image" : "https://cloud.iexapis.com/v1/news/image/151hayiSGYjgrMCHWJ0TEDV5QXwWWztKattjKbfBIKuI",
  "lang" : "en",
  "hasPaywall" : false
```

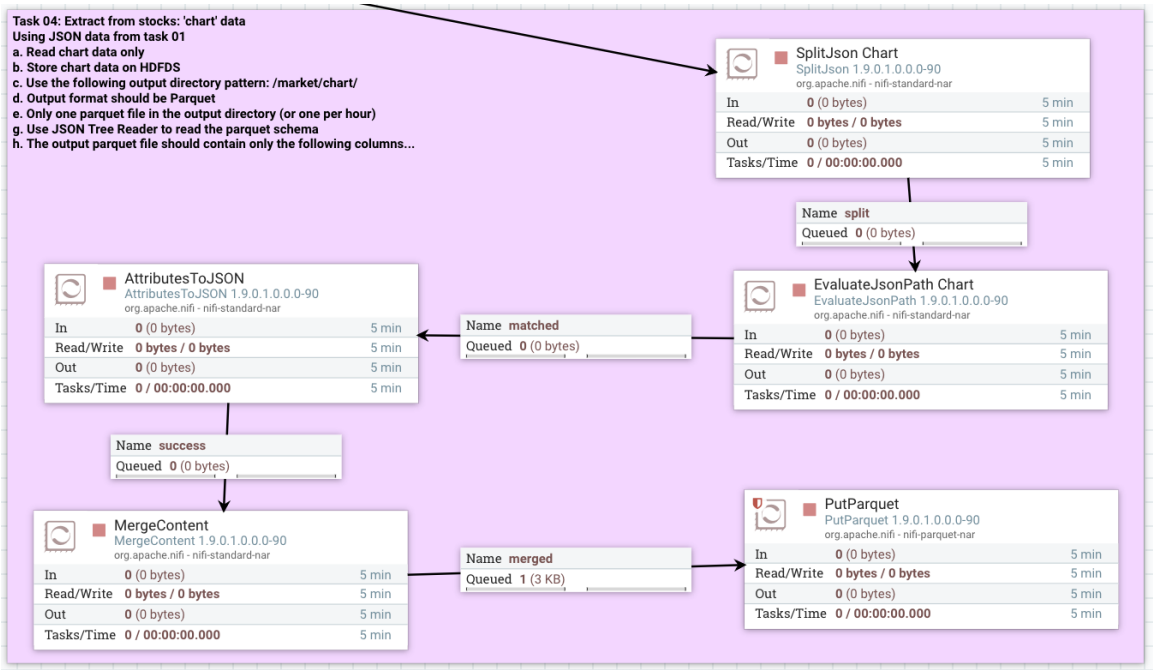
TASK 04

Extract from stocks: 'chart' data

Using JSON data from task01

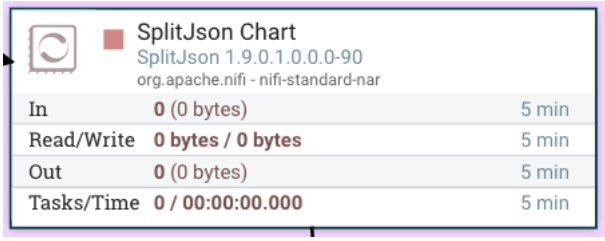
a) **Read chart data only**
b) **Store chart data on HDFS**
c) **Use the following output directory pattern: /market/chart/**
d) **Output format should be Parquet**
e) **Parquet file should be compressed using SNAPPY compression**
f) **Only one parquet file in the output directory (or one per hour)**
g) **Use JSON Tree Reader to read the parquet schema**
h) **The output parquet file should contain only the following columns:**

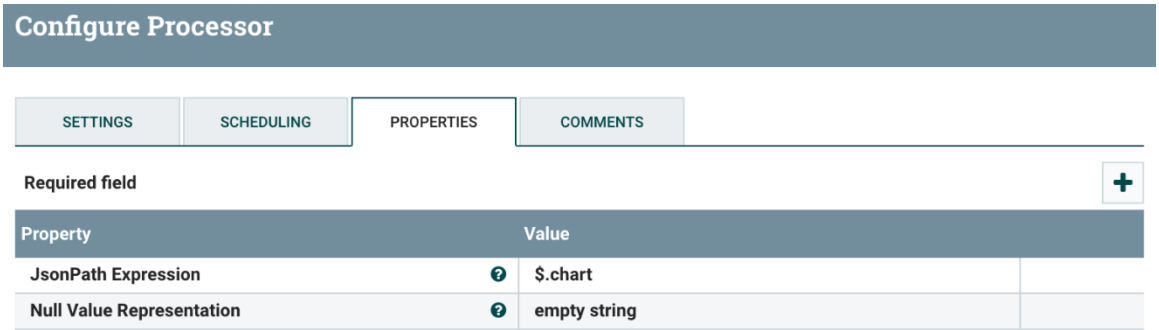
Source: quote		Source: chart					
symbol	companyName	date	open	close	high	low	volume
string	string	string	double	double	double	double	long



Link on matched to:

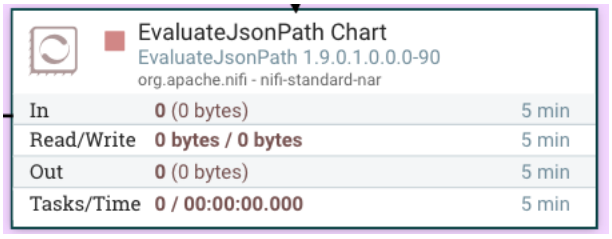
Processor	Properties	
SplitJson Relationships Failure original	JsonPath Expression	$.chart
	Null Value Representation	Empty string





Link on split to:

Processor	Properties	
EvaluateJsonPath Relationships Failure unmatched	Destination	Flowfile-attribute
	Null Value Representation	Empty string
	Add these custom attributes	
	close	$.close
	date	$.date
	high	$.high
	low	$.low
	open	$.open
	volume	$.volume



Configure Processor

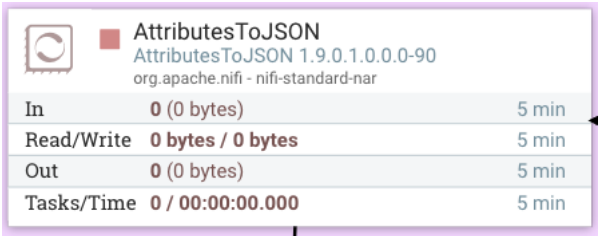
SETTINGS | SCHEDULING | PROPERTIES | COMMENTS

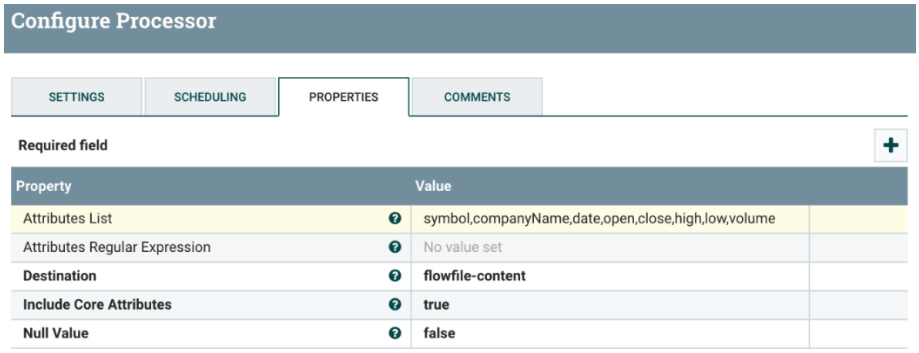
Required field

Property	Value
Destination	**flowfile-attribute**
Return Type	**auto-detect**
Path Not Found Behavior	**ignore**
Null Value Representation	**empty string**
close	$.close
date	$.date
high	$.high
low	$.low
open	$.open
volume	$.volume

Link on matched to:

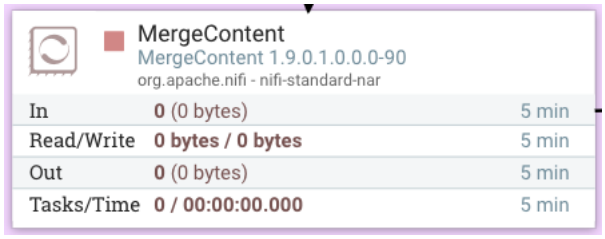
Processor	**Properties**	
AttributeToJson Relationships Failure	Attributes List	Symbol,companyName,date,open,close, high,low,volume
	Destination	Flowfile-content

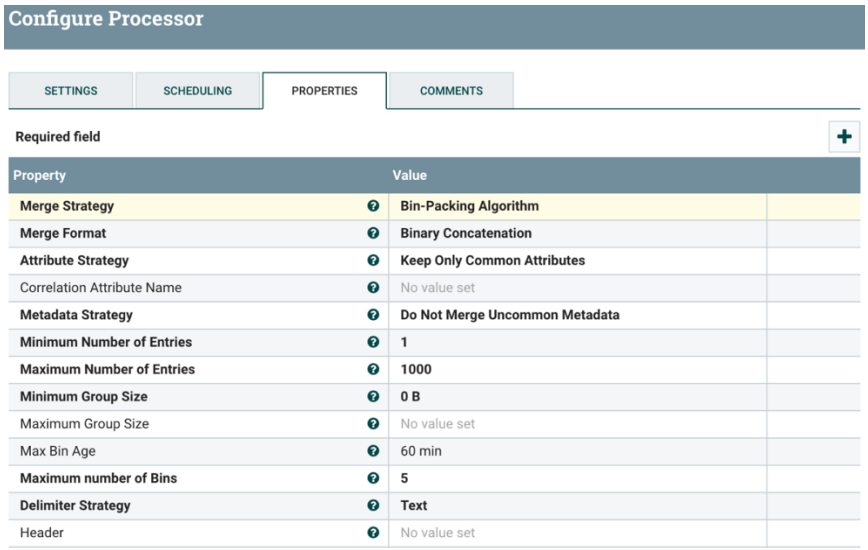




Link on success to:

Processor	Properties	
MergeContent Relationships Failure original	Merge Strategy	Bin-Packing Algorithm
	Merge Format	Binary Concatenation
	Attribute Strategy	Keep Only Common Attributes
	Metadata Strategy	Do not merge uncommon metadata
	Max Bin Age	60 min
	Delimiter Strategy	Text
	Demarcator	Shift + enter

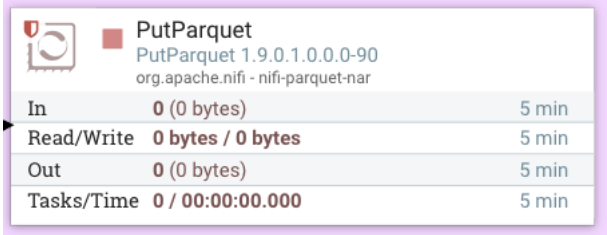


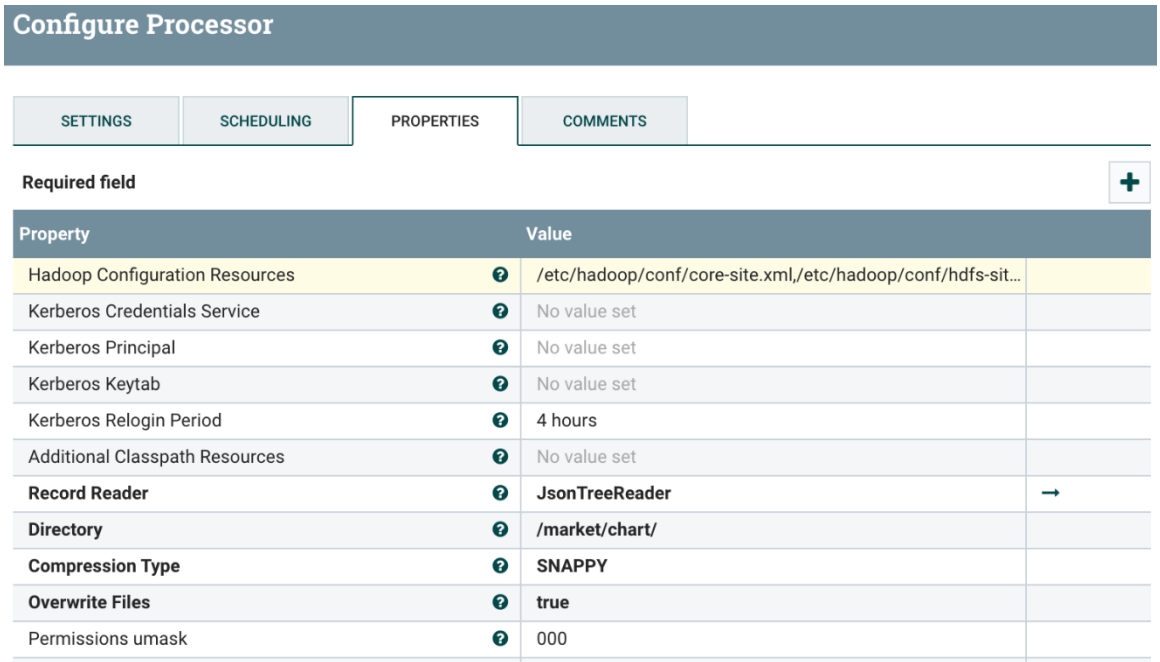


Footer	No value set	
Demarcator		
Compression Level	1	
Keep Path	**false**	
Tar Modified Time	${file.lastModifiedTime}	

Link on merged to:

Processor	Properties	
PutParquet Relationships Failure Retry success	Hadoop Configuration Resources	/etc/hadoop/conf/core-site.xml,/etc/hadoop/conf/hdfs-site.xml
	Record Reader	Json TreeReader
	Directory	/market/chart
	Compression Type	SNAPPY
	Overwrite Files	true
	Permissions unmask	000

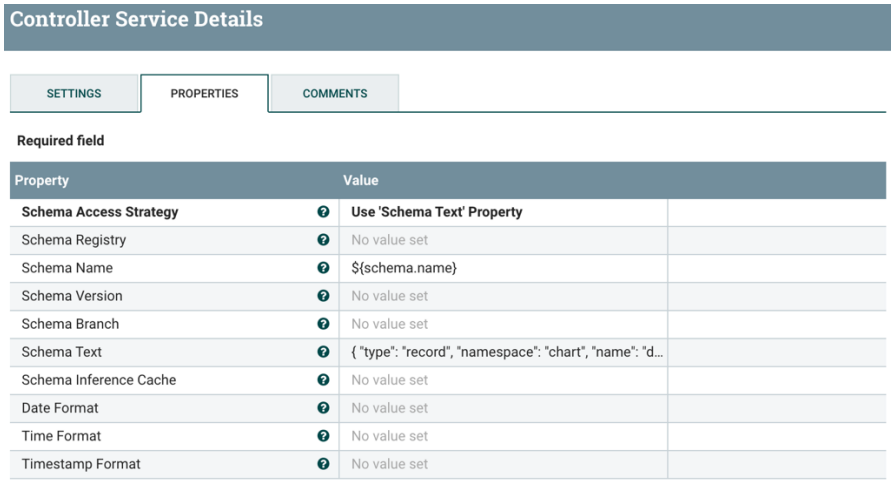




For the Record Reader (JsonTreeReader):

View Configuration:

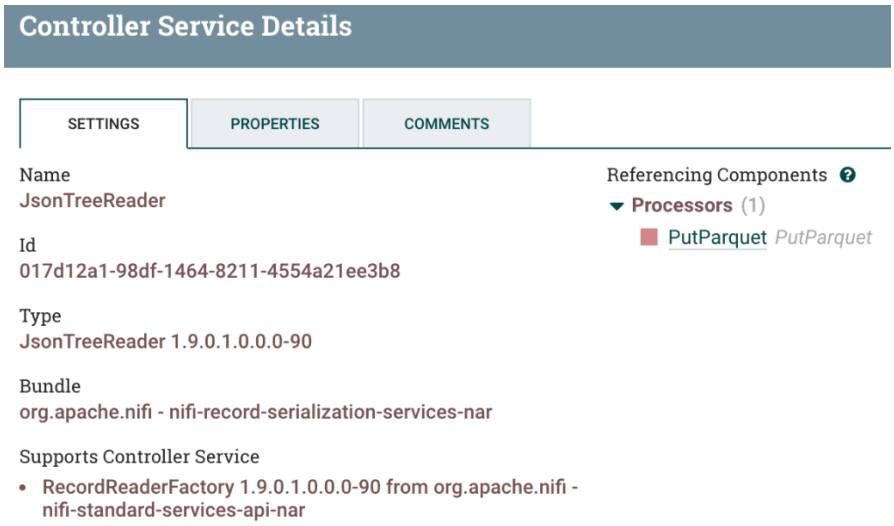
Property	Value
Schema Access Strategy	Use 'Schema Text' Property
Schema Text	See below the view of schema text



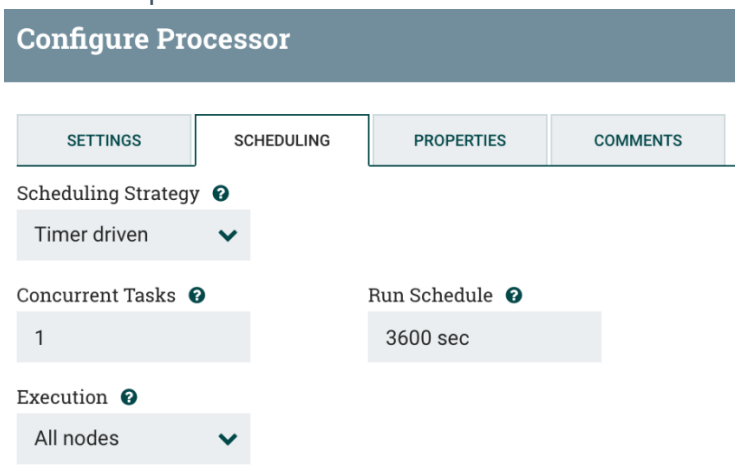
Schema text:

```
{
    "type": "record",
    "namespace": "chart",
    "name": "data",
    "fields": [
   { "name": "symbol", "type": "string" },
   { "name": "compagnyName", "type": "string" },
   { "name": "date", "type": "string" },
   { "name": "open", "type": "double" },
   { "name": "close", "type": "double" },
   { "name": "high", "type": "double" },
   { "name": "low", "type": "double" },
   { "name": "volume", "type": "long" }
    ]
}
```

We need to enable the processors after these steps.



For this step we run schedule for one hour.



We see on HDFS one file and directory is created for the result chart:

- For stock RHT, we don't have chart data into the JSON.

```
# Check the directory recursively
hdfs dfs -ls -R -h /market

drwxrwxrwx   - root supergroup          0 2021-11-22 06:24 /market/chart
-rw-rw-rw-   1 root supergroup      6.9 K 2021-11-22 06:24 /market/chart/64981d19-6511-4c3b-b5c2-dec1ba087923
```


```
{"date":"2021-08-26","volume":"48597195","symbol":"AAPL","high":"149.12","low":"147.51","companyName":"Apple Inc","close":"147.54","open":"148.35"}
{"date":"2021-08-25","volume":"58991297","symbol":"AAPL","high":"150.32","low":"147.8","companyName":"Apple Inc","close":"148.36","open":"149.81"}
{"date":"2021-08-24","volume":"48606428","symbol":"AAPL","high":"150.86","low":"149.15","companyName":"Apple Inc","close":"149.62","open":"149.45"}
{"date":"2021-08-23","volume":"60131810","symbol":"AAPL","high":"150.19","low":"147.89","companyName":"Apple Inc","close":"149.71","open":"148.31"}
{"date":"2021-11-19","volume":"21963403","symbol":"MSFT","high":"345.1","low":"342.2","companyName":"Microsoft Corporation","close":"343.11","open":"342.64"}
{"date":"2021-11-18","volume":"22463533","symbol":"MSFT","high":"342.45","low":"337.12","companyName":"Microsoft Corporation","close":"341.27","open":"338.18"}
{"date":"2021-11-17","volume":"19053380","symbol":"MSFT","high":"342.19","low":"338","companyName":"Microsoft Corporation","close":"339.12","open":"338.94"}
```

TASK 05

Create a new Impala user-managed table named market that satisfies the following criteria:

o The table schema should match stock 'chart' parquet schema

Check the directory recursively

%sh
hdfs dfs -ls -R -h /market

The parquet file is created in /market/chat:

```
drwxrwxrwx   - root supergroup          0 2021-11-22 06:24 /market/chart
-rw-rw-rw-   1 root supergroup      6.9 K 2021-11-22 06:24 /market/chart/64981d19-6511-4c3b-b5c2-dec1ba087923
drwxrwxrwx   - root supergroup          0 2021-11-22 06:15 /market/news
drwxrwxrwx   - root supergroup          0 2021-11-22 06:15 /market/news/AAPL
-rw-rw-rw-   1 root supergroup     74.1 K 2021-11-22 06:15 /market/news/AAPL/92233b5d-8ef5-4640-9c5b-b6c862ff4c3c
drwxrwxrwx   - root supergroup          0 2021-11-22 06:15 /market/news/CLDR
-rw-rw-rw-   1 root supergroup     19.1 K 2021-11-22 06:15 /market/news/CLDR/92233b5d-8ef5-4640-9c5b-b6c862ff4c3c
drwxrwxrwx   - root supergroup          0 2021-11-22 06:15 /market/news/MSFT
-rw-rw-rw-   1 root supergroup     80.2 K 2021-11-22 06:15 /market/news/MSFT/92233b5d-8ef5-4640-9c5b-b6c862ff4c3c
drwxrwxrwx   - root supergroup          0 2021-11-22 06:15 /market/news/RHT
-rw-rw-rw-   1 root supergroup          2 2021-11-22 06:15 /market/news/RHT/92233b5d-8ef5-4640-9c5b-b6c862ff4c3c
drwxrwxrwx   - root supergroup          0 2021-11-22 06:07 /market/quote
drwxrwxrwx   - root supergroup          0 2021-11-22 06:07 /market/quote/AAPL
-rw-rw-rw-   1 root supergroup      1.3 K 2021-11-22 06:07 /market/quote/AAPL/c963fbad-eff0-411a-b16e-01b34804b224
drwxrwxrwx   - root supergroup          0 2021-11-22 06:07 /market/quote/MSFT
-rw-rw-rw-   1 root supergroup      1.3 K 2021-11-22 06:07 /market/quote/MSFT/c963fbad-eff0-411a-b16e-01b34804b224
```

Create a database stock

%impala
create database stock

Use the database stock

%impala
use stock

Create a parquet schema with the file

%sh
hdfs dfs -get /market/chart/03f4aba6-348a-4307-a1a6-ef1e90b997a8 /home/cloudera/Downloads/market.parquet

Create an avro schema with the file

parquet-tools schema -d /home/cloudera/Downloads/market.parquet > /home/cloudera/Downloads/market.parquet.avsc

Create a directory /market/schema on HDFS to put the schema

%sh
hdfs dfs -mkdir /market/schema

Put the schema in the directory on HDFS

%sh
hdfs dfs -put /home/cloudera/Downloads/market. /market/schema*

Check of the schema is on the HDFS directory

%sh
hdfs dfs -ls -h /market/schema

```
Found 2 items
-rw-r--r--   1 root supergroup      6.9 K 2021-11-22 06:51 /market/schema/market.parquet
-rw-r--r--   1 root supergroup      1.9 K 2021-11-22 06:51 /market/schema/market.parquet.avsc
```

Read the avro parquet (more reading)

%sh
hdfs dfs -cat /market/schema/market.parquet.avsc | head -n 15

```
message chart.data {
  required binary symbol (UTF8);
  required binary companyName (UTF8);
  required binary date (UTF8);
  required double open;
  required double close;
  required double high;
  required double low;
  required int64 volume;
}

creator: parquet-mr version 1.10.0 (build 031a6654009e3b82020012a18434c582bd74c73a)
extra: writer.model.name = avro
extra: parquet.avro.schema = {"type":"record","name":"data","namespace":"chart","fields":[{"name":"symbol","type":"string"},{"name":"companyName","type":"string"},{"name":"date","type":"strin
g"},{"name":"open","type":"double"},{"name":"close","type":"double"},{"name":"high","type":"double"},{"name":"low","type":"double"},{"name":"volume","type":"long"}]}
```

Create Impala user-managed table

%impala
create external table market
like PARQUET '/market/schema/market.parquet'
stored as parquet
location '/market/chart/'
TBLPROPERTIES ("parquet.compression"="SNAPPY");

o Report the rows count and the size for this table

Compute stats of the table

%impala
compute stats market;

Show stats of the table

%impala
show table stats market;

#Rows	#Files	Size
161	1	6.92KB

Row Count	Table Size
161	6.92KB

TASK 06

Use Impala to run the following analysis on the market table

Q1. Show the first 5 line of the table.

```
%impala
select * from market limit 5;
```

symbol	companyname	date	open	close	high	low	volume
AAPL	Apple Inc	2021-11-19	157.65	160.55	161.02	156.5328	117305597
AAPL	Apple Inc	2021-11-18	153.71	157.87	158.67	153.05	137827673
AAPL	Apple Inc	2021-11-17	150.995	153.49	155	150.99	88807000
AAPL	Apple Inc	2021-11-16	149.94	151	151.488	149.34	59256210
AAPL	Apple Inc	2021-11-15	150.37	150	151.88	149.43	59222803

Q2. Find the count of charts per stock symbol.

```
%impala
select symbol, count(*) as count
from market
group by symbol
```

symbol	count
AAPL	64
MSFT	64
CLDR	33

Q3. Find max and min per stock symbol for the following columns: open, high, low, volume

```
%impala
select symbol, min(open) as min_open, max(open) as max_open,
        min(high) as min_high, max(high) as max_high,
        min(low) as min_low, max(low) as max_low,
        min(volume) as min_volume, max(volume) as max_volume
from market
group by symbol
```

symbol	min_open	max_open	min_high	max_high	min_low	max_low	min_volume	max_volume
AAPL	139.47	157.65	141.4	161.02	138.27	156.5328	40999950	140893235
MSFT	282.1217	342.64	286.77	345.1	280.25	342.2	14751610	52588690
CLDR	15.9	15.98	15.91	16	15.81	15.98	1006851	15203961

Note: The RHT stock is empty for the chart in the JSON.

TASK 07

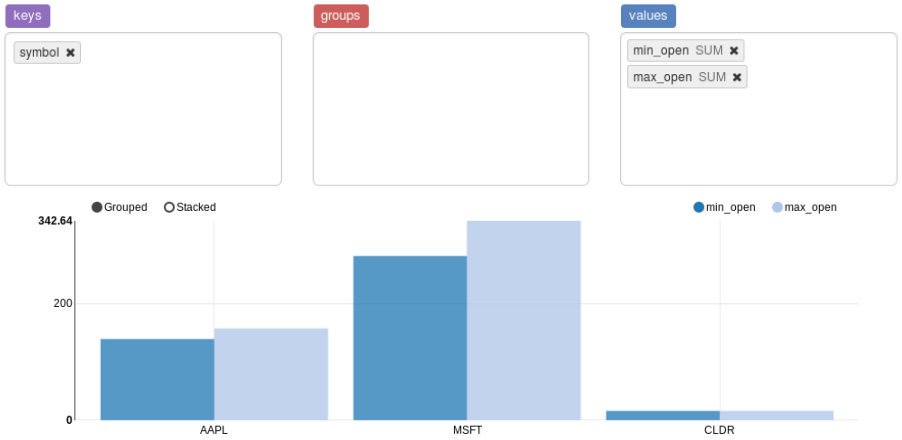
For task 7, we used two different methods. The first one consists of using the Impala built-in visualization tools. The second one consists of creating an Impala view. Both methods are presented below.

Method 1

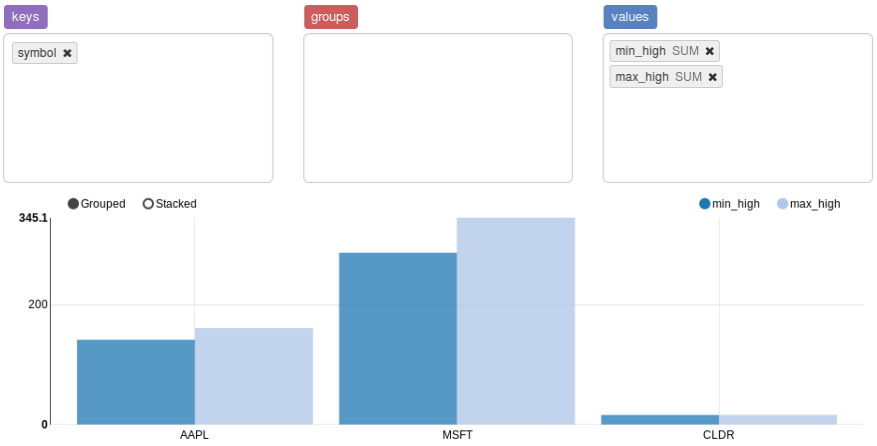
a) Create an Impala view that report max and min per stock symbol for the following columns: open, high, low, volume.

```
%impala
select symbol, min(open) as min_open,  max(open) as max_open,
    min(high) as min_high,  max(high) as max_high,
    min(low) as min_low,  max(low) as max_low,
    min(volume) as min_volume,  max(volume) as max_volume
from market
group by symbol
```

1) Open

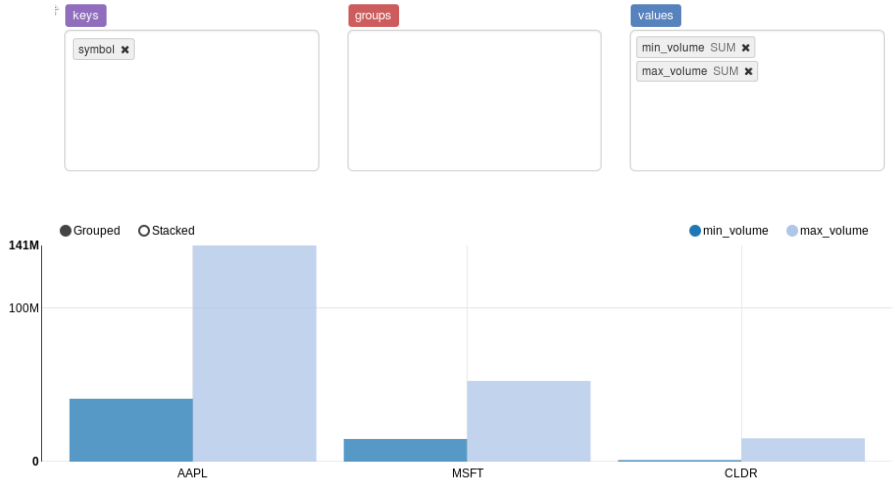


2) High



3) Low

4) Volume

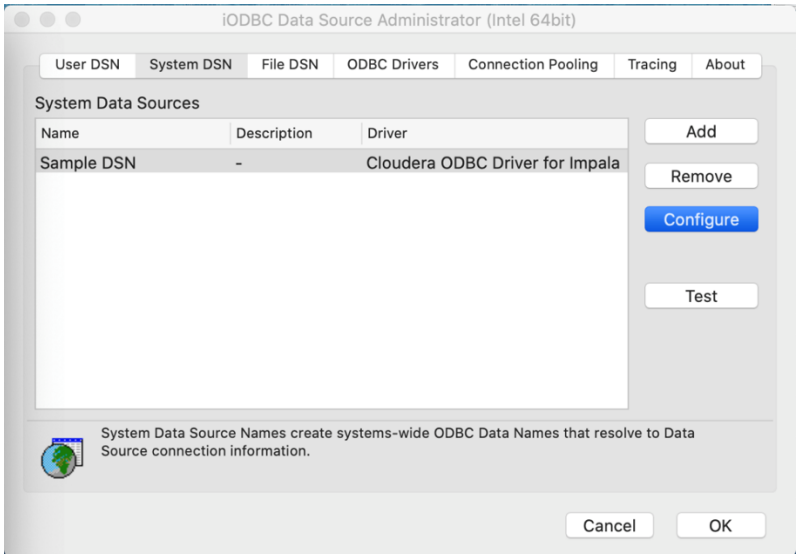


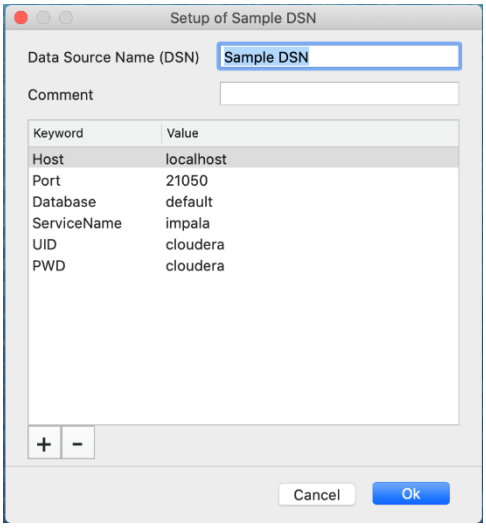
b) Use an ODBC connection to read this view and import data into MS Excel or any external visualization tool you might have on your system.

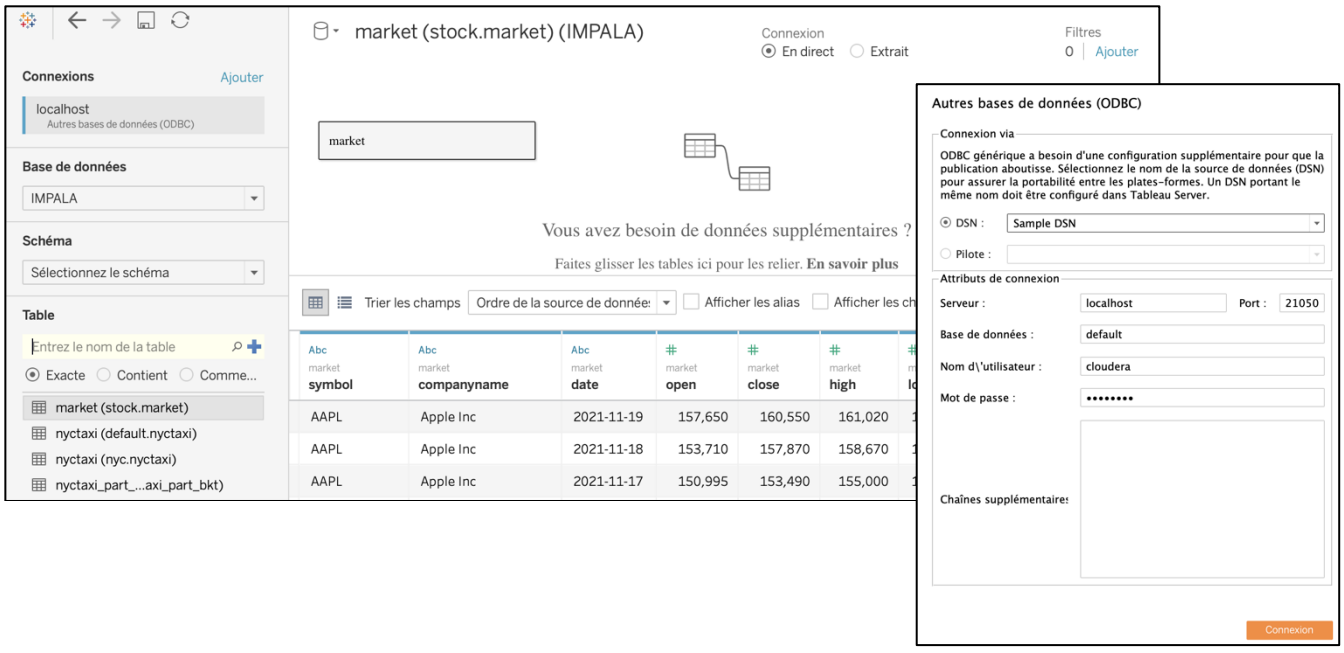
We used two different external visualization tools, Tableau and MS Excel.

1) Tableau

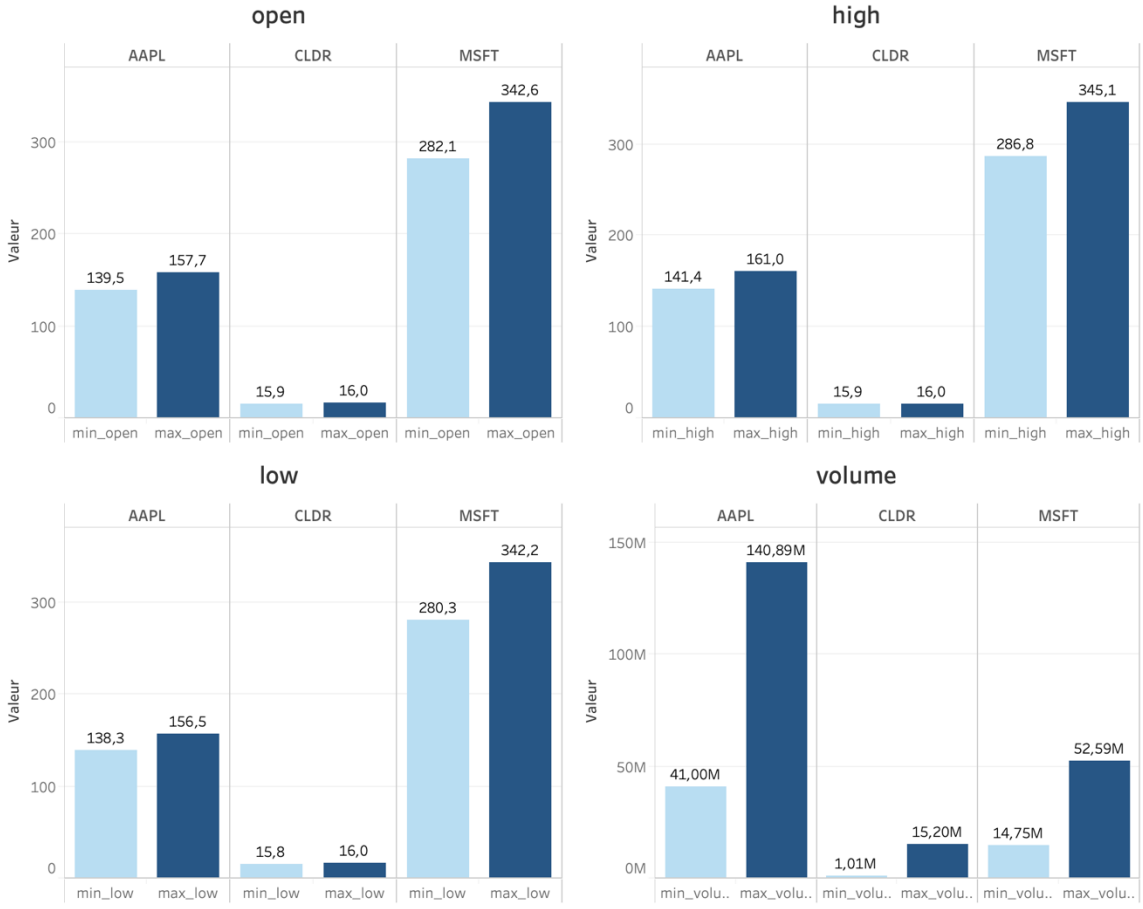
ODBC connection





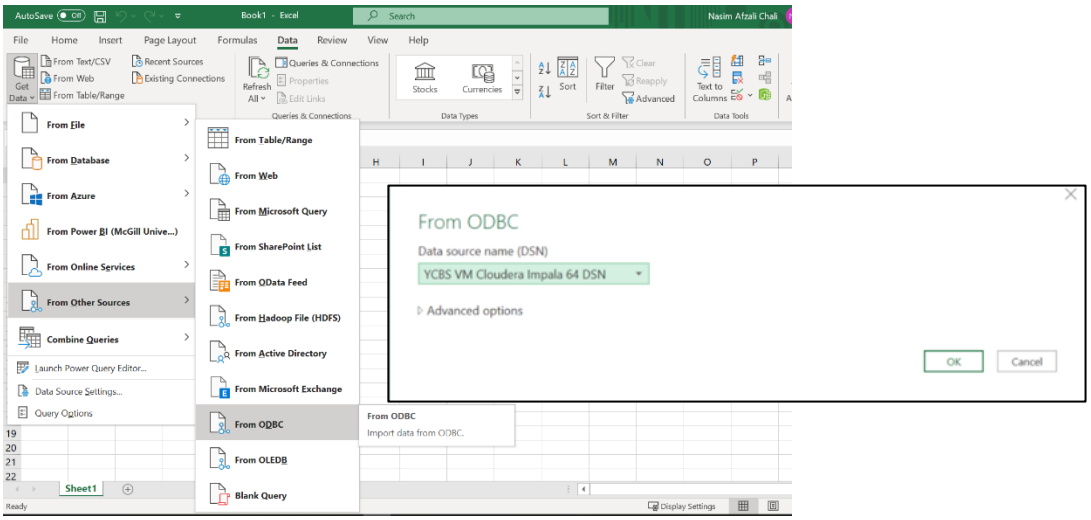


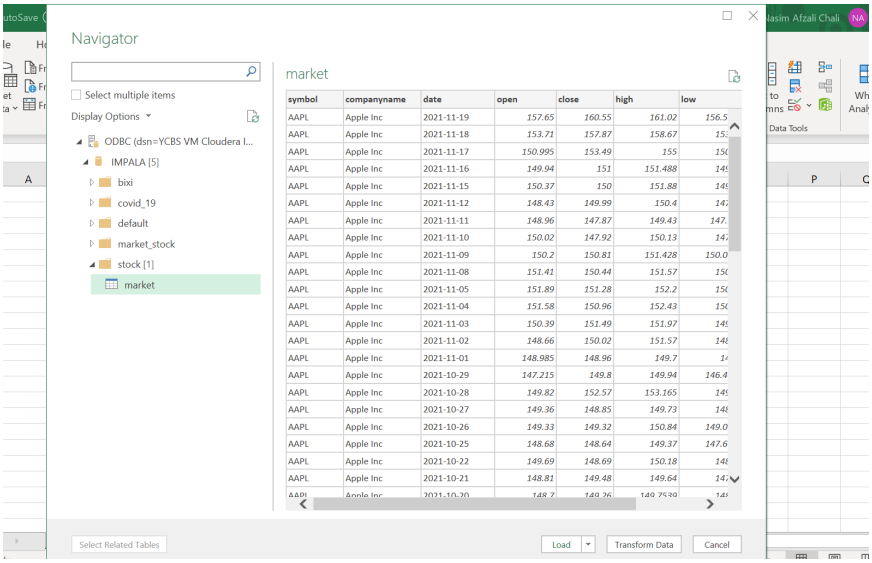
Charts

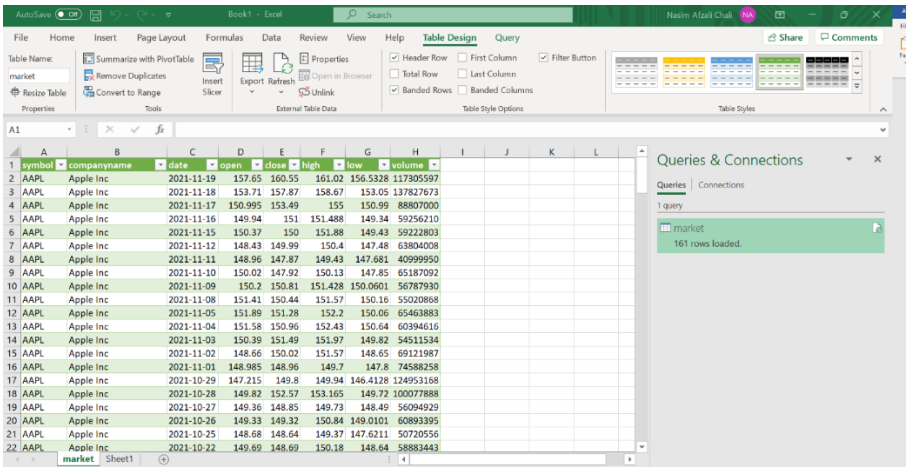


2) MS Excel

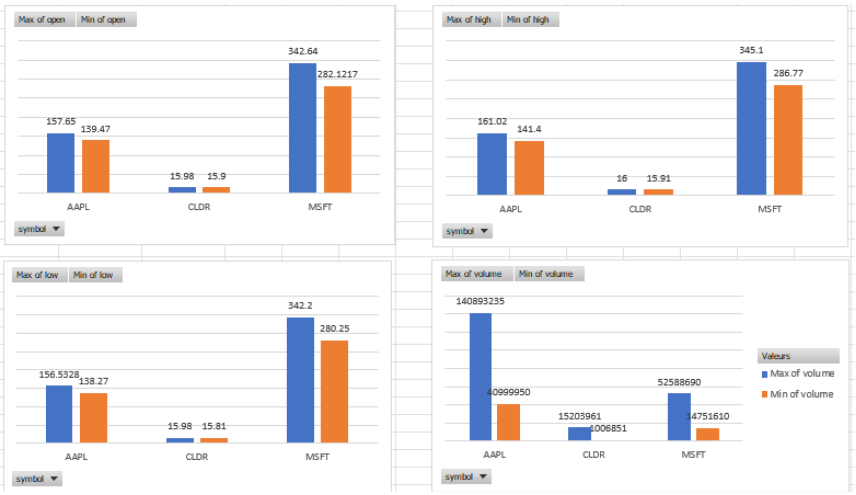
ODBC connection




Navigator
market
Select multiple items
Display Options
ODBC (dsn=YCBS VM Cloudera I...
IMPALA [5]
bixi
covid_19
default
market_stock
stock [1]
market
Select Related Tables
Load
Transform Data
Cancel


Queries & Connections
market
161 rows loaded.

Charts


Max of open
Min of open
342.64
282.1217
157.65
139.47
15.98
15.9
AAPL
CLDR
MSFT
symbol
Max of high
Min of high
345.1
286.77
161.02
141.4
16
15.91
Max of low
Min of low
342.2
280.25
156.5328
138.27
15.98
15.81
Max of volume
Min of volume
140893235
40999950
15203961
1006851
52588690
14751610
Valeurs

Method 2

a) Create an Impala view that report max and min per stock symbol for the following columns: open, high, low, volume.

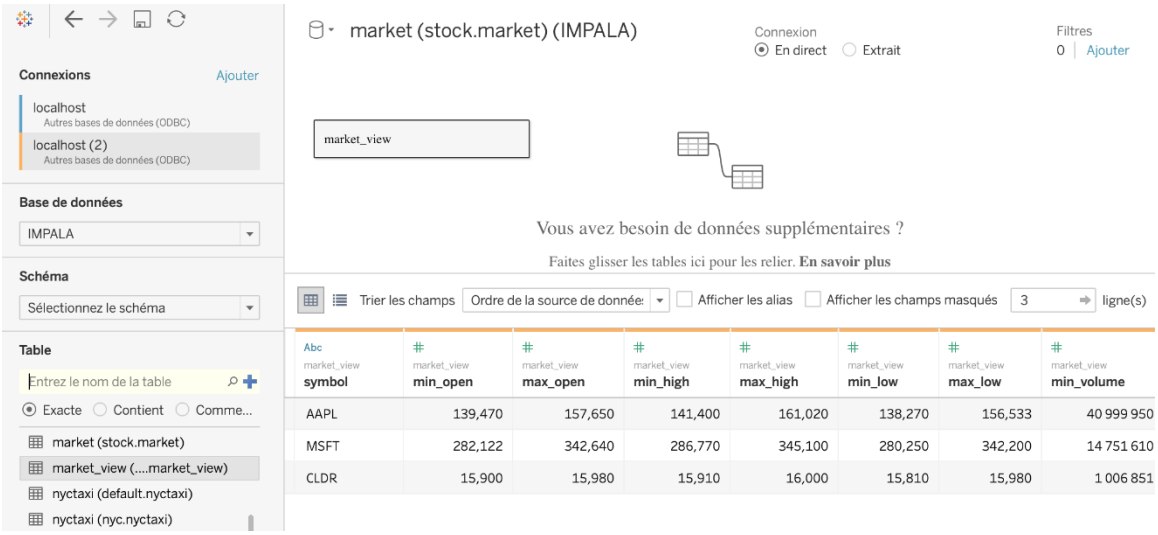
```
%impala
create view market_view as
select `symbol`,min(open) as min_open, max(open) as max_open,
        min(high) as min_high, max(high) as max_high,
        min(low) as min_low, max(low) as max_low,
        min(volume) as min_volume, max(volume) as max_volume
from market
group by `symbol`
```

b) Use an ODBC connection to read this view and import data into MS Excel or any external visualization tool you might have on your system.

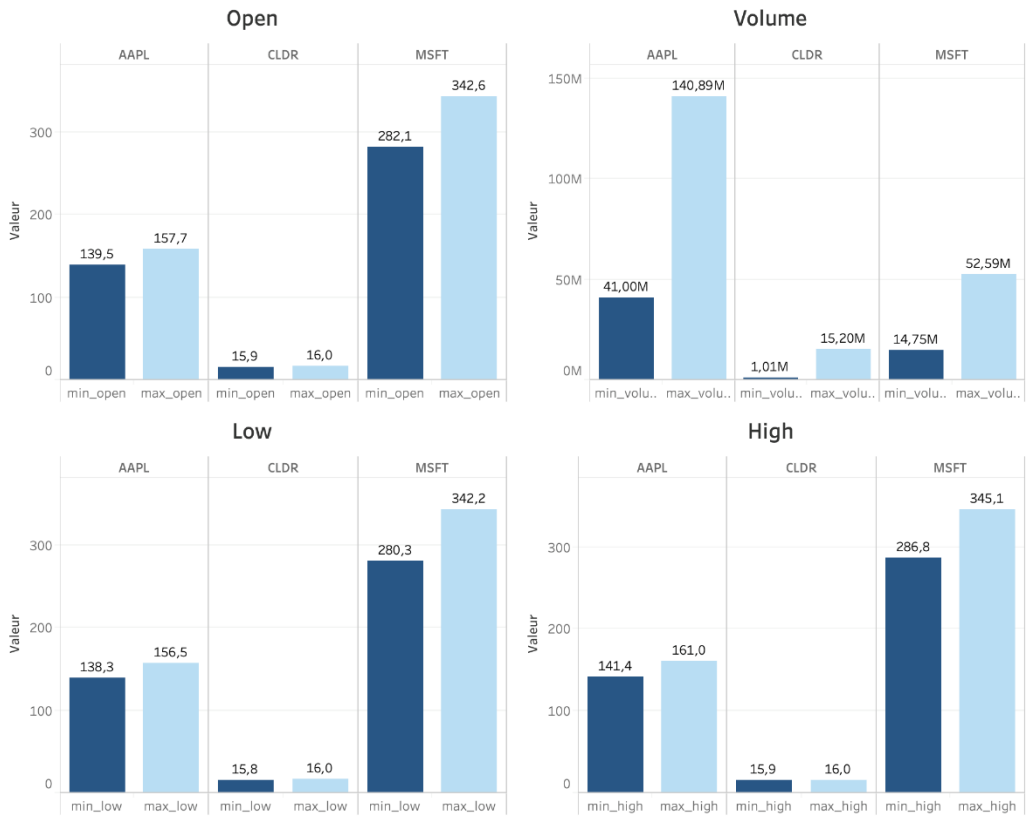
We used two different external visualization tools, Tableau and MS Excel.

1) Tableau

ODBC connection

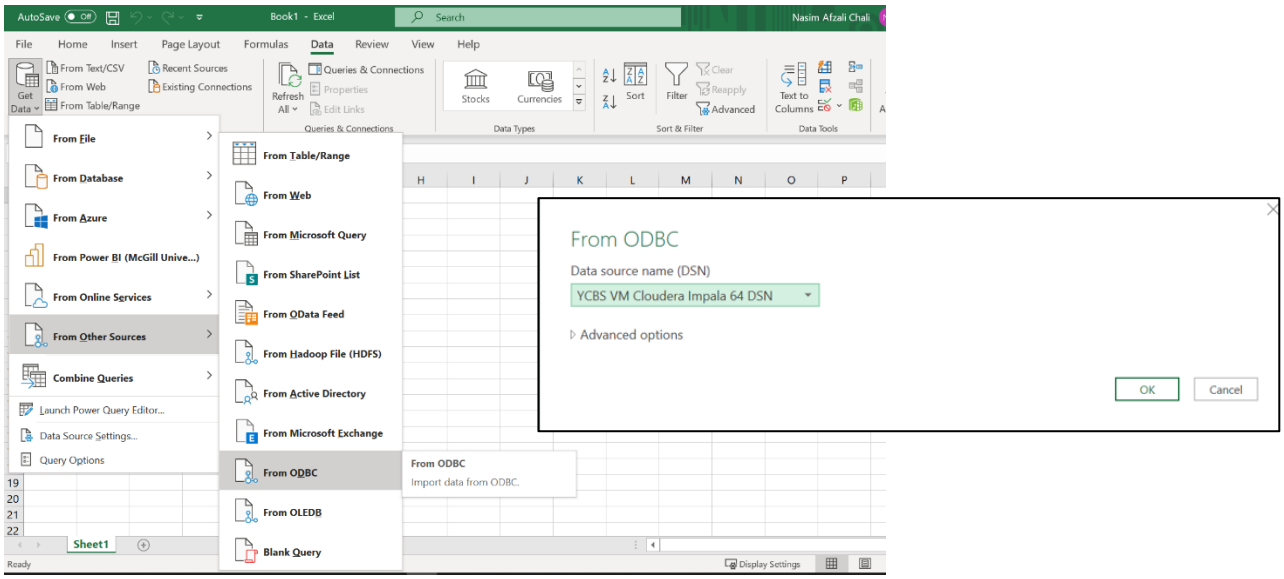


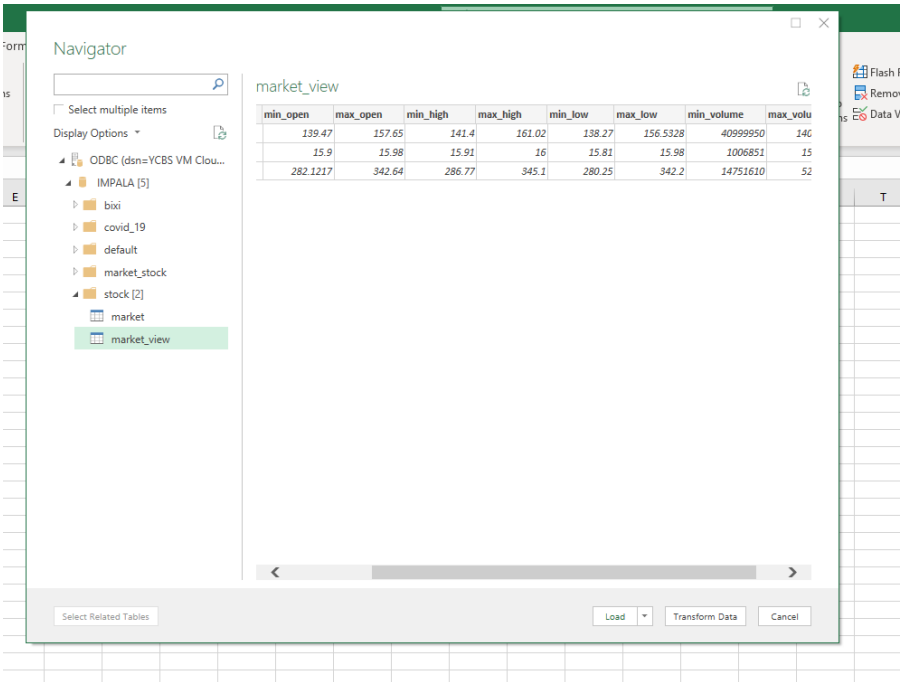
Charts



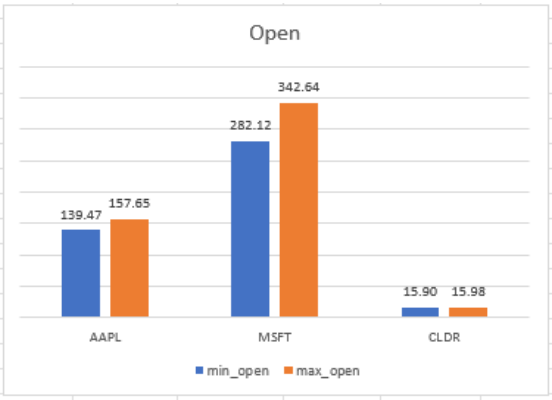
2) MS Excel

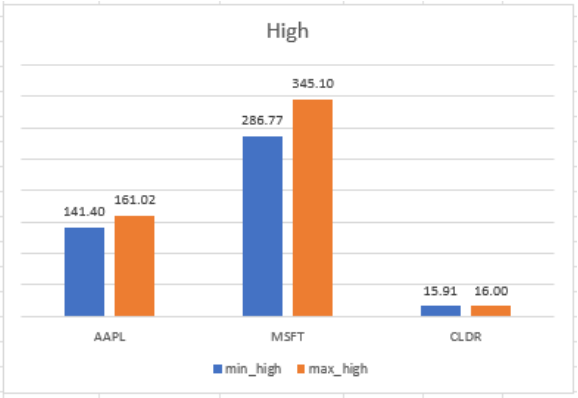
ODBC connection

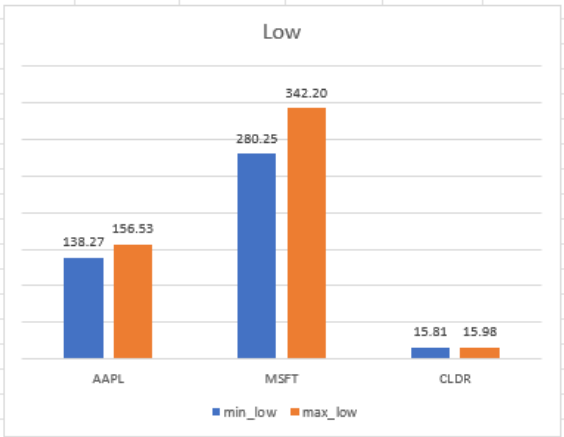


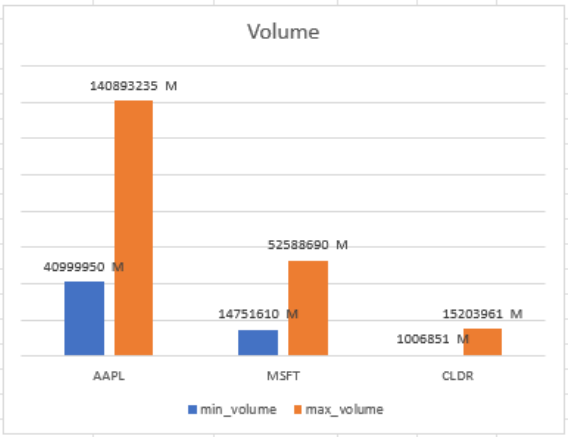

Navigator
Select multiple items
Display Options
ODBC (dsn=YCBS VM Clou...
IMPALA [5]
bixi
covid_19
default
market_stock
stock [2]
market
market_view
market_view
min_open max_open min_high max_high min_low max_low min_volume max_volu
139.47 157.65 141.4 161.02 138.27 156.5328 40999950 140
15.9 15.98 15.91 16 15.81 15.98 1006851 15
282.1217 342.64 286.77 345.1 280.25 342.2 14751610 52
Select Related Tables
Load
Transform Data
Cancel

Charts


Open
342.64
282.12
139.47
157.65
15.90
15.98
AAPL
MSFT
CLDR
min_open
max_open


High
345.10
286.77
141.40
161.02
15.91
16.00
AAPL
MSFT
CLDR
min_high
max_high


Low
342.20
280.25
138.27
156.53
15.81
15.98
AAPL
MSFT
CLDR
min_low
max_low


Volume
140893235 M
40999950 M
52588690 M
14751610 M
15203961 M
1006851 M
AAPL
MSFT
CLDR
min_volume
max_volume