Visualize Top 5 Technology Stocks

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ABSTRACT
The rise of cloud computing has opened multiple opportunities on how data generation can be achieved by using cloud services such as Amazon AWS, Microsoft Azure and others and the combine it with the data visualization tools such as Tableau and Power BI can efficiently read data from these cloud services. To better understand how this operation works, I have built a data visualization dashboard that has multiple graphs/charts which showcase the properties of top five technology stocks such as Volume, Open, Close, High, Low. In addition, show the grow of stocks for two days.

KEYWORDS: AWS LAMBDA, MYSQL, TABLEAU

1 INTRODUCTION
The work follows the growing tradition of using cloud computing resources to better visualize the data through using data visualization tools. To achieve data retrieval, I used multiple services in Amazon AWS to retrieve data, process it either in a chunk or individual record to a running data server then use Tableau Public to create dashboard to which is available here: dashboard. It shows visual analytics of the top five technology stocks: GOOGL, AAPL, FB, AMZN, MSFT.

2 AWS LAMBDA
The AWS Lambda function has a fundamental role in reading data from Yahoo Finance which provides multiple details about a stock. I have created two functions which are written in Python and are responsibly to do different tasks. One function reads historical data from the last five years about the top five technology stocks by using yfinance library which provides data like Volume, Open price, Close price, High price, Low price, and Date for each day. For each data record, it exports the data to MySQL server running on AWS by using the connection string and has the credentials to authenticate and export it to MySQL by using insert query as shown in image [1].

Figure 1: Lambda function that reads records from last five years and saves the record to the database.

Another function runs every 30 minutes starting from 9:30 am ET to 4:00 pm ET for two days and the function reads stock prices at each time along with the timestamps and it exports to same MySQL server by using insert query. To trigger the function every minute, I had to setup trigger rule event in Amazon Eventbridge which provides easy to trigger AWS Lambda function. To trigger function, I had to provide cron expression as shown in the image [2].

Figure 2: Lambda function that reads stock price the moment it is triggered and saves it to the database

3 MYSQL SERVER
To store stock records generated by AWS Lambda, I had to utilize MySQL server since it provides a fast and easy to connect solution. Plus, it can hold thousands of records without causing extra pay and Tableau provides easy access to MySQL server. To host records from the two Lambda functions, I created two tables for each function since the import data stream from the functions have different number

of columns plus the data types, so the table schemas are different.

ID	Ticker	S Date	Open P	High P	Low P	Close P	Volume
1	GOOGL	11/23/2016	789.520	789.520	772.650	779.230	1,313,000.00
2	GOOGL	11/25/2016	782.610	782.920	778.190	780.230	6,135,000.00
3	GOOGL	11/28/2016	778.350	799.740	778.100	785.790	2,575,400.00
4	GOOGL	11/29/2016	788.380	796.440	785.340	789.440	1,562,000.00
5	GOOGL	11/30/2016	789.100	791.510	773.150	775.880	2,279,100.00
6	GOOGL	12/1/2016	778.550	778.600	753.360	764.330	2,867,100.00
7	GOOGL	12/2/2016	761.900	770.500	759.000	764.460	1,718,800.00
8	GOOGL	12/5/2016	770.000	780.000	766.970	778.220	1,688,500.00
9	GOOGL	12/6/2016	780.190	785.280	773.320	776.180	1,734,100.00
10	GOOGL	12/7/2016	779.950	792.000	773.530	791.470	2,029,400.00
11	GOOGL	12/8/2016	792.950	799.000	787.910	795.170	1,612,500.00
12	GOOGL	12/9/2016	799.300	809.950	798.050	809.450	1,904,500.00
13	GOOGL	12/12/2016	804.820	811.350	804.530	807.900	1,628,600.00
14	GOOGL	12/13/2016	812.390	824.300	811.940	815.340	2,128,200.00
15	GOOGL	12/14/2016	815.920	824.260	812.780	817.890	1,799,700.00

Figure 3: Snapshot of the table which contains stock records from last five years

ID	Ticker	Datetime	Current P
16	GOOGL	11/23/2021 8:30:20 AM	2,926.04
17	AAPL	11/23/2021 8:30:21 AM	161.20
18	FB	11/23/2021 8:30:21 AM	340.28
19	AMZN	11/23/2021 8:30:22 AM	3,584.06
20	MSFT	11/23/2021 8:30:22 AM	336.73
21	GOOGL	11/23/2021 9:00:19 AM	2,923.89
22	AAPL	11/23/2021 9:00:20 AM	160.78
23	FB	11/23/2021 9:00:20 AM	340.65
24	AMZN	11/23/2021 9:00:21 AM	3,590.76
25	MSFT	11/23/2021 9:00:22 AM	338.92
26	GOOGL	11/23/2021 9:30:19 AM	2,894.93
27	AAPL	11/23/2021 9:30:20 AM	159.73
28	FB	11/23/2021 9:30:20 AM	336.69
29	AMZN	11/23/2021 9:30:21 AM	3,561.99

Figure 4: Snapshot of the table which contains stock records for 11/23/2021 – 11/24/2021

4 TABLEAU

Tableau Desktop provides excellent data visualization tools and can create graphs/charts from a live database server (it can connect to multiple servers) or extract data from the database server. For this project, I extracted data by connecting to MySQL server which creates local data files for each table in the server. Then using data files, I was able to create individual graphs/charts that were put together in a dashboard so it is not only easier to navigate but also, the users can see the cause and effect on multiple graph/charts by playing with the filter options. I was able to publish this dashboard via Tableau Public to make this data visualization public.

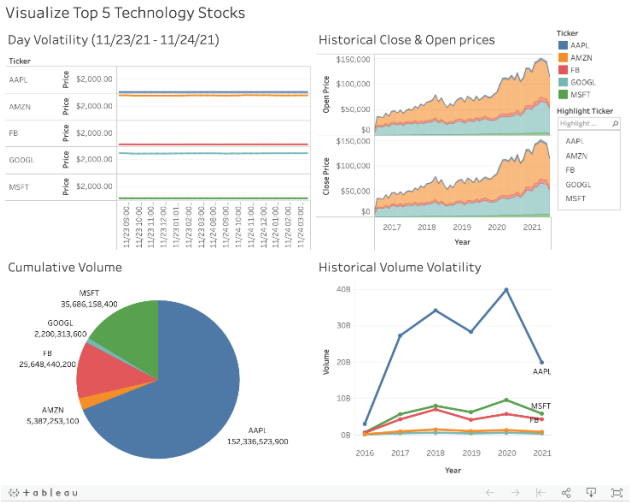

Figure 5: Dashboard layout which has different charts

5 CONCLUSIONS

Combining Cloud Computing services with data analytics tools can create transform modern day analytics and this data visualization is an example of how it can easily be achieved and can be scaled efficiently. This visualization is used a simple, but I am planning to extend this into real-time data visualization where users can see the current stock prices and additional details and integrating additional features like DynamoDB, Amazon Redshift to not only increase the capacity but increase the performance dramatically.

REFERENCES

[1] C. O'Dwyer, "AWS Lambda with RDS using pymysql," 11 09 2018. [Online]. Available: https://levelup.gitconnected.com/aws-lambda-with-rds-using-pymysql-23ad3cde46c8.

[2] M. Noten, "Using Amazon EventBridge with AWS Lambda.," [Online]. Available: https://medium.com/nbtl/using-amazon-eventbridge-with-aws-lambda-52fa40b7964e.

Note to TAs – The original project has been revised and approved by the professor. Please see the revised proposal on Campus post #597.