Capstone Project 3

Creating a real Volume Profile for Cryptocurrencies

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Introduction

- **In this project, I will show you how I have created an instant and accurate volume profile for cryptocurrencies as a first step.**

- **The next step is to show that this is automatically written to a database.**

- **The last step is how I read it from the database and publish it on a small website.**

(All this is done on a Raspberry Pi 4 and works automatically.)

First Part

As you can see below, the volume on each exchange for each pair of bitcoin is different from each other.

#	Source	Pairs	Price	+2% Depth	-2% Depth	Volume	Volume %
1	Binance	BTC/USDT	$19,716.82	$27,401,988.19	$31,202,792.82	$5,578,782,315	18.50%
2	Binance	BTC/BUSD	$19,711.05	$8,470,423.50	$9,325,232.14	$2,374,968,702	7.88%
3	Coinbase Exchange	BTC/USD	$19,715.59	$13,352,616.28	$14,125,761.61	$485,807,471	1.61%
4	FTX	BTC/USD	$19,717.00	$20,466,670.11	$27,301,065.37	$371,539,041	1.23%
5	Gate.io	BTC/USDT	$19,715.80	$3,213,002.30	$5,014,586.02	$288,764,842	0.96%
6	Gate.io	BTC/USD	$19,713.60	$116,655.07	$124,736.07	$208,026,481	0.69%
7	Binance	BTC/USDC	$19,716.40	$2,630,556.92	$2,080,727.76	$170,529,981	0.57%
8	Binance.US	BTC/USD	$19,710.29	$11,395,536.22	$4,445,755.27	$168,242,100	0.56%
9	Binance	ETH/BTC	$19,722.91	$2,639,875.68	$3,352,926.57	$165,170,023	0.55%
10	Bitfinex	BTC/USD	$19,726.53	$12,985,119.66	$8,273,253.58	$136,634,900	0.45%
11	KuCoin	BTC/USDT	$19,716.35	$12,267,303.32	$8,193,957.83	$127,924,870	0.42%
12	Huobi Global	BTC/USDT	$19,715.40	$8,133,038.55	$12,117,266.83	$104,346,719	0.35%
13	Kraken	XBT/USD	$19,715.00	$24,645,863.56	$35,022,413.39	$72,310,844	0.24%
14	Bitfinex	BTC/GBP	$19,737.77	$14,765,295.07	$12,099,775.73	$65,213,258	0.22%

Libraries

I imported the ccxt library to pull price information from exchanges instantly.

Also imported, other required libraries for editing, analysis and visualization.

```
[2]
import ccxt, config, time, sys
import websocket, json
import pandas as pd
%matplotlib inline
import matplotlib
import matplotlib.pyplot as plt
from pandas.plotting import register_matplotlib_converters
import numpy as np
import datetime
import seaborn as sns
from sklearn.model_selection import train_test_split
from scipy import stats, signal
import plotly.express as px
import plotly.graph_objects as go
```

```
[3]
binance = ccxt.binance({
    'enableRateLimit': True,
    'apiKey': config.API_KEY,
    'secret': config.SECRET_KEY
})
```

```
[4]
coinbase = ccxt.coinbasepro({
    'enableRateLimit': True,
    'apiKey': 'x',
    'secret': 'x'
})
```

```
[60]
import psycopg2
from psycopg2.extensions import register_adapter, AsIs
psycopg2.extensions.register_adapter(np.int64, psycopg2._psycopg.AsIs)
```

Exchanges, Pairs and APIs

- I entered api keys for my accounts on 5 different exchanges.
- I pull the information of a total of 11 btc pairs from 5 different exchanges.
  (This can be increased depending on the request.)

- Binance BTC USDT
- Binance BTC BUSD
- Binance BTC USDC
- Coinbase BTC USD
- Coinbase BTC USDT
- FTX BTC USD
- FTX BTC USDT
- Huobi BTC USDT
- Huobi BTC USDC
- Gate io BTC USDT
- Gate io BTC USD

Fetching Data

As you see, I pulled all price informations from each exchange/pair and creating DF for each one.

```
[8]
symbol = 'BTCUSDT'
timeframe = '1m'
limit = 300

[9]
bars = binance.fetch_ohlcv(symbol, timeframe=timeframe, limit=limit) # binance btcusdt
df = pd.DataFrame(bars, columns=['timestamp', 'open', 'high', 'low', 'close', 'volume'])
df['timestamp'] = pd.to_datetime(df['timestamp'], unit='ms')

[10]
symbol2 = 'BTCBUSD' # binance BTC BUSD

[11]
bars2 = binance.fetch_ohlcv(symbol2, timeframe=timeframe, limit=limit) # binance BTC BUSD
df2 = pd.DataFrame(bars2, columns=['timestamp', 'open', 'high', 'low', 'close', 'volume'])
df2['timestamp'] = pd.to_datetime(df2['timestamp'], unit='ms')

[12]
symbol3 = 'BTCUSDC' # binance BTC USDC

[13]
bars3 = binance.fetch_ohlcv(symbol3, timeframe=timeframe, limit=limit) # binance BTC BUSD
df3 = pd.DataFrame(bars3, columns=['timestamp', 'open', 'high', 'low', 'close', 'volume'])
df3['timestamp'] = pd.to_datetime(df3['timestamp'], unit='ms')

[14]
symbol4 = 'BTC/USD' # coinbase BTC USD

[15]
bars4 = coinbase.fetch_ohlcv(symbol4, timeframe=timeframe, limit=limit) # coinbase BTC USD
df4 = pd.DataFrame(bars4, columns=['timestamp', 'open', 'high', 'low', 'close', 'volume'])
df4['timestamp'] = pd.to_datetime(df4['timestamp'], unit='ms')

[16]
symbol5 = 'BTC/USDT' # coinbase BTC USDT
```

Data Preprocessing

On some exchanges the volume is given in currency, so I converted them to btc. Also converted timestamp, checked data, setting index and made other adjustments.

New DF with sum of all Volume Data

I created a new dataframe.

I have collected all volume data for the new dataframe.

(For other datas I used the data from binance exchange which has the highest volume.)

```
[36]
# create a new dataframe with timestamp high low close volume
df_fresh = pd.DataFrame(columns=['timestamp', 'open', 'high', 'low', 'close', 'volume'])
```

```
[37]
# volume = sum of volumes from all exchanges
df_fresh['volume'] = df['volume'] + df2['volume'] + df3['volume'] + df4['volume'] + df5['volume'] + df6['volume'] + df7['volume'] + df8['volume'] + df9['volume'] + df10['volume'] + df11['volume']
# other prices equal to binance btcusdt price
df_fresh['close'] = df['close']
df_fresh['open'] = df['open']
df_fresh['high'] = df['high']
df_fresh['low'] = df['low']
df_fresh['timestamp'] = df['timestamp']
```

Creating a DB and setting up variables

After making the necessary adjustments on the Raspberry Pi (I installed postgresql on the docker), I created the database and tables with python.

creating db

```
# conn = psycopg2.connect(
#    database="btcpi1m", user='x', password='x', host='192.168.1.65', port= '5432'
# )
# conn.autocommit = True
# cursor = conn.cursor()
# sql = '''CREATE DATABASE btcpi5m''';
# cursor.execute(sql)
# print("Database created successfully!")
# conn.close()
```

[68]

setting up db variables

```
# conn = psycopg2.connect(
#     database="btc1min", user='x', password='x', host='192.168.1.65', port= '5432'
# )
# conn.autocommit = True
# cur = conn.cursor()
# cur.execute('''CREATE TABLE prices
#               (
#                Timestamp TIMESTAMP WITHOUT TIME ZONE NOT NULL,
#                Open FLOAT NOT NULL,
#                High FLOAT NOT NULL,
#                Low FLOAT NOT NULL,
#                Close FLOAT NOT NULL,
#                Volume BIGINT NOT NULL
#                );''')

# print("Table created successfully")
# conn.close()
```

[69]

Name	State / Filter	Quick Actions	Stack	Image
btcpostgres	running		-	postgres

Data insertion

I insert the data into postgresql, then delete duplicates.

```
# PSYCOPG2 adapter data insertion
conn = psycopg2.connect(
    database="btc1min", user='x', password='x', host='192.168.1.65', port= '5432'
)
conn.autocommit = True
cur = conn.cursor()
query = """INSERT INTO prices (Timestamp, Open, High, Low, Close, Volume)
            VALUES (%s, %s, %s, %s, %s, %s)"""
cur = conn.cursor()
cur.executemany(query, records)
conn.close()
print("Data insert successfully!")
```

[70]

```
Data insert successfully!
```

```
# delete duplicates from postgresql table
conn = psycopg2.connect(
    database="btc1min", user='x', password='x', host='192.168.1.65', port= '5432'
)
conn.autocommit = True
cur = conn.cursor()
cur.execute('''delete from prices
    where exists (select 1
                  from prices t2
                  where t2.Timestamp = prices.Timestamp and
                        t2.ctid < prices.ctid
                 );''')
conn.close()
print("Duplicates deleted successfully!")
```

[71]

```
Duplicates deleted successfully!
```

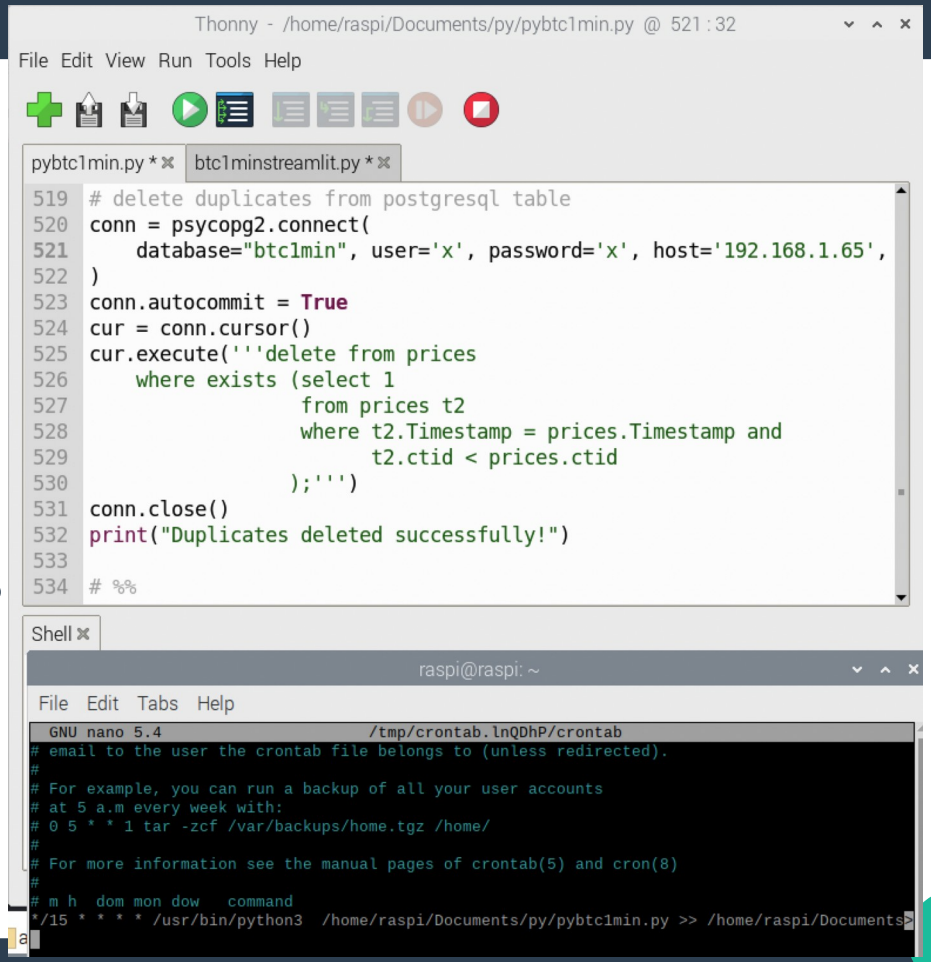
```
# read data from postgres database and convert to dataframe
conn = psycopg2.connect(
    database="btc1min", user='x', password='x', host='192.168.1.65', port= '5432'
)
conn.autocommit = True
cur = conn.cursor()
cur.execute("SELECT * FROM prices")
rows = cur.fetchall()
df_fresh = pd.DataFrame(rows)
df_fresh.columns = [x[0] for x in cur.description]
print("Data read successfully!")
```

[104]

```
Data read successfully!
```

Crontab

I converted the jupyter (using vs code) work I did for the first part into a .py script and entered the necessary crontab information for the Raspberry to do this process every 15 minutes. (Data insertion, followed by deleting duplicates.)



Reading data from postgresql

At the very beginning of this section, I prepared the other file, imported the streamlit library and made the necessary adjustments for DF.

pybtc1min.py | btc1minstreamlit.py *

```
35 conn.autocommit = True
36 cur = conn.cursor()
37 cur.execute("SELECT * FROM prices")
38 rows = cur.fetchall()
39 df_fresh = pd.DataFrame(rows)
40 df_fresh.columns = [x[0] for x in cur.description]
41 #print("Data read successfully!")
42
43 # make a copy of df_fresh with timestamp as index
44 daily = df_fresh.copy()
45 daily.set_index('timestamp', inplace=True)
46 #daily.shape
47 # change index name to Date
48 daily.index.name = 'Date'
49 # set Date as datetimeindex
50 #daily.index = pd.to_datetime(daily.index)
51
52 # convert Date to datetime format and set as index
53 df_fresh.set_index('timestamp', inplace=True)
54 #df_fresh.tail()
55
56 # reset index df_fresh
57 df_fresh.reset_index(inplace=True)
58 #df_fresh.tail()
59
60 # sort by timestamp
61 df_fresh.sort_values(by=['timestamp'], inplace=True, ascending=True)
62
```

Sidebar

I created time periods and put them in the sidebar.

```
64  # put radio button in sidebar
65  st.sidebar.markdown('---')
66  st.sidebar.markdown('## Select a time period')
67  period = st.sidebar.radio('Select a time period', ('Last 1h', 'Last 2h', 'L
68  if period == 'Last 1h':
69      # use last 60 rows of df_fresh
70      df_fresh = df_fresh.tail(60)
71  elif period == 'Last 2h':
72      # use last 120 rows of df_fresh
73      df_fresh = df_fresh.tail(120)
74  elif period == 'Last 4h':
75      # use last 240 rows of df_fresh
76      df_fresh = df_fresh.tail(240)
77  elif period == 'Last 12h':
78      # use last 720 rows of df_fresh
79      df_fresh = df_fresh.tail(720)
80  else:
81      # use all rows of df_fresh
82      df_fresh = df_fresh
```

Seaborn

I created a close, volume chart with Seaborn scatterplot.

pybtc1min.py | btc1minstreamlit.py *

```
100  # scatter plot of Close and Volume with seaborn
101  plt.figure(figsize=(16,12), dpi=200)
102  sns.scatterplot(x='timestamp', y='close', data=df_fresh, size='volume', size
103  # add close as a line plot with seaborn
104  sns.lineplot(x='timestamp', y='close', data=df_fresh, color='white', alpha=(
105  a = round((df_fresh['close'].max() + 200.0), -2)
106  b = round((df_fresh['close'].min() - 200.0), -2)
107  plt.yticks(np.arange(b, a, 100))
108  # show y axis at right
109  plt.gca().yaxis.tick_right()
110
111  # round a and b to nearest 100
112  # x axis ticks and labels with matplotlib
113  plt.xticks(rotation=45)
114  plt.gca().xaxis.set_major_locator(matdates.DayLocator(interval=1))
115  plt.gca().xaxis.set_major_formatter(matdates.DateFormatter('%Y-%m-%d-%H:%M'
116  plt.gca().xaxis.set_minor_locator(matdates.HourLocator(interval=1))
117  plt.gca().xaxis.set_minor_formatter(matdates.DateFormatter('%H:%M'))
118  plt.xlim(df_fresh['timestamp'].min(), (df_fresh['timestamp'].max() + pd.Time
119  # add grid for x axis
120  plt.grid(axis='x', which='major', color='white', alpha=0.3)
121  plt.grid(axis='x', which='minor', color='white', alpha=0.1)
122
123  #plt.ylim(b, a)
124  plt.savefig('btc1min.png')
125  st.title('BTC 1 Minute Chart')
126  st.image('btc1min.png')
```

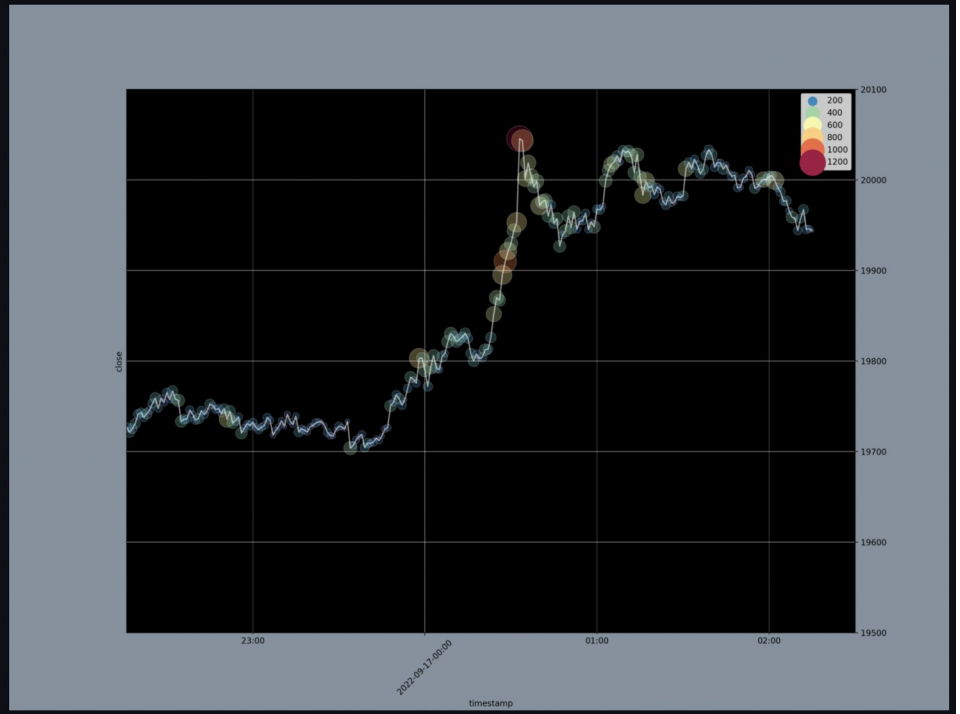
Seaborn, scatter chart

Select a time period

Select a time period

- ○ Last 1h
- ○ Last 2h
- ◉ Last 4h
- ○ Last 12h
- ○ ALL

BTC 1 Minute Chart



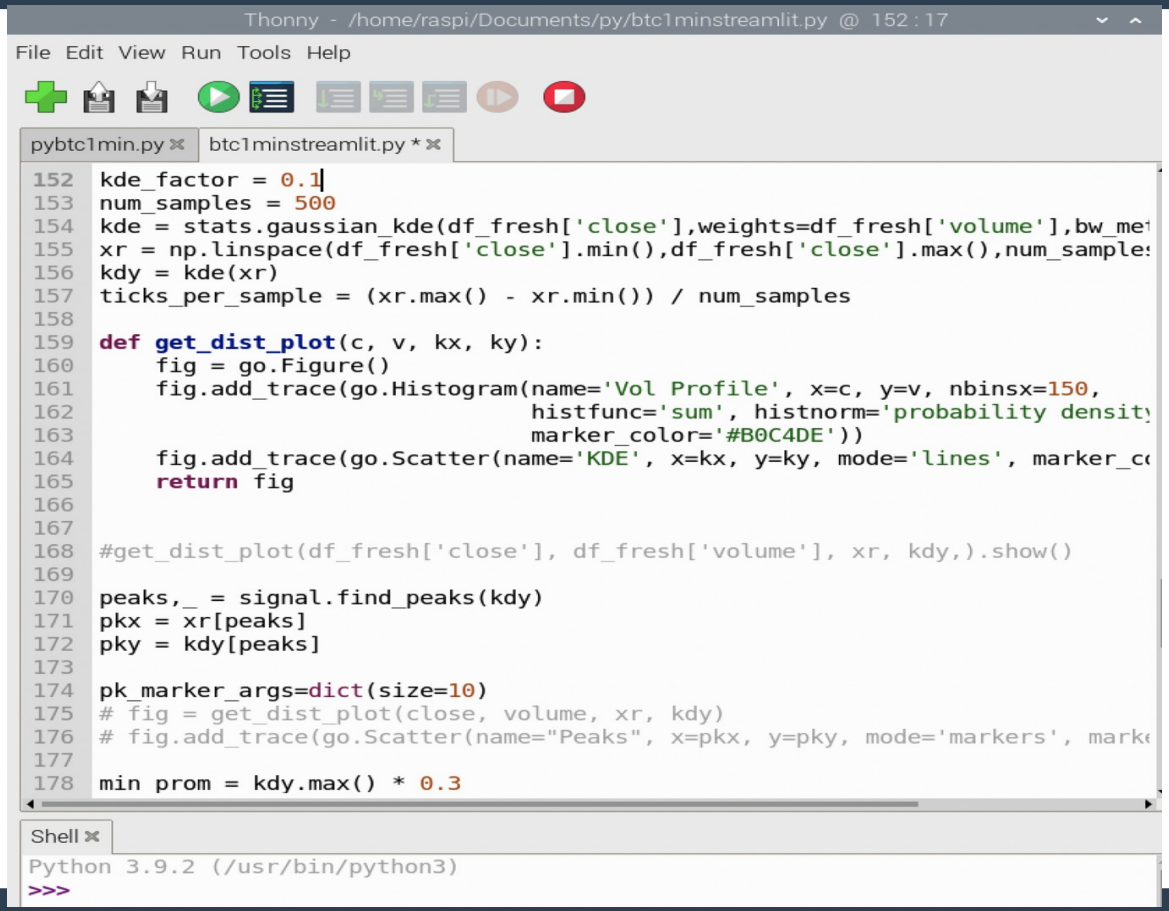
First Timestamp: 2022-09-16 22:16:00 (UTC)

Last Timestamp: 2022-09-17 02:15:00 (UTC)

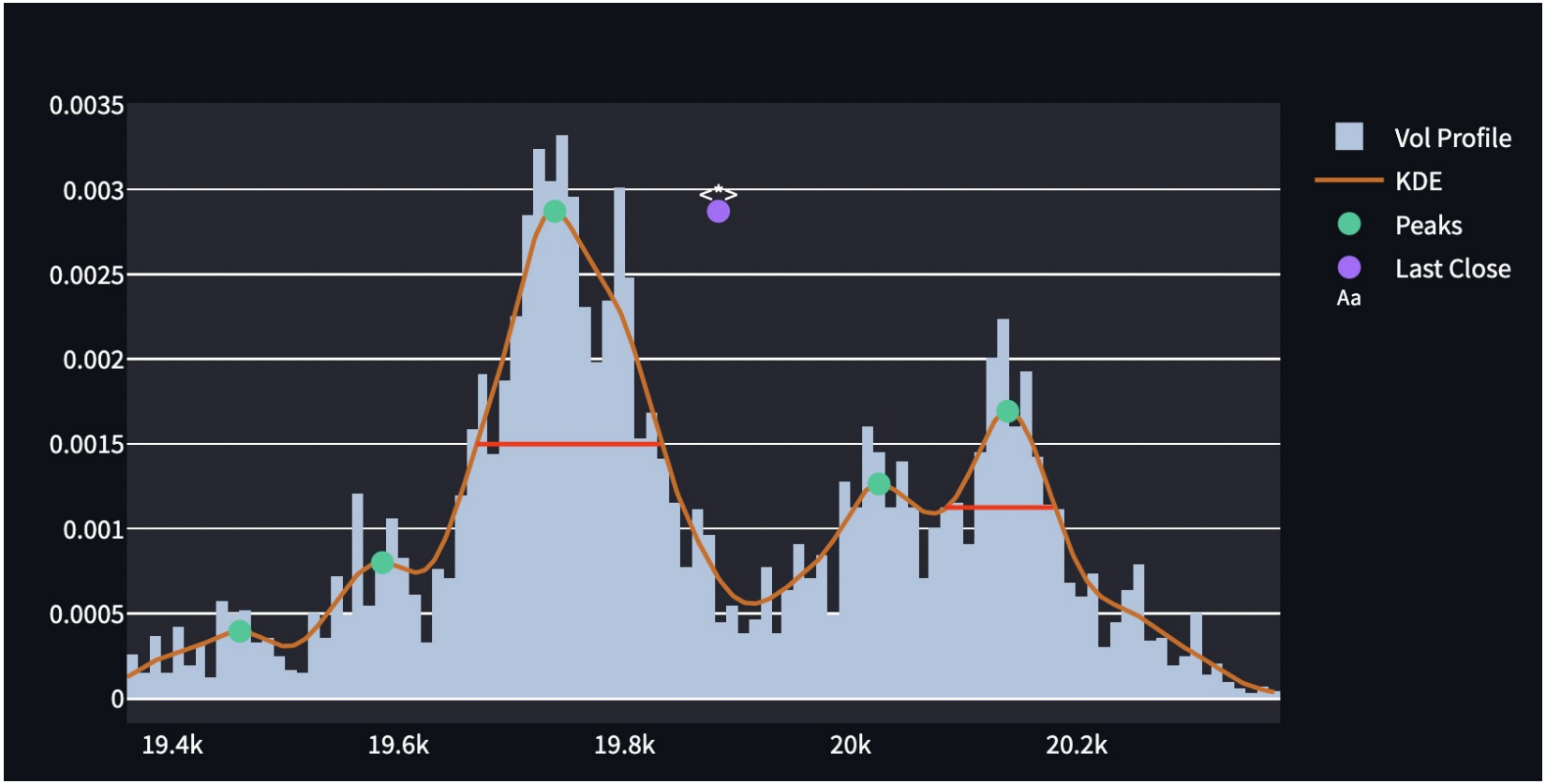
Volume Profile

Volume profile,

some of coding part.



Volume Profile



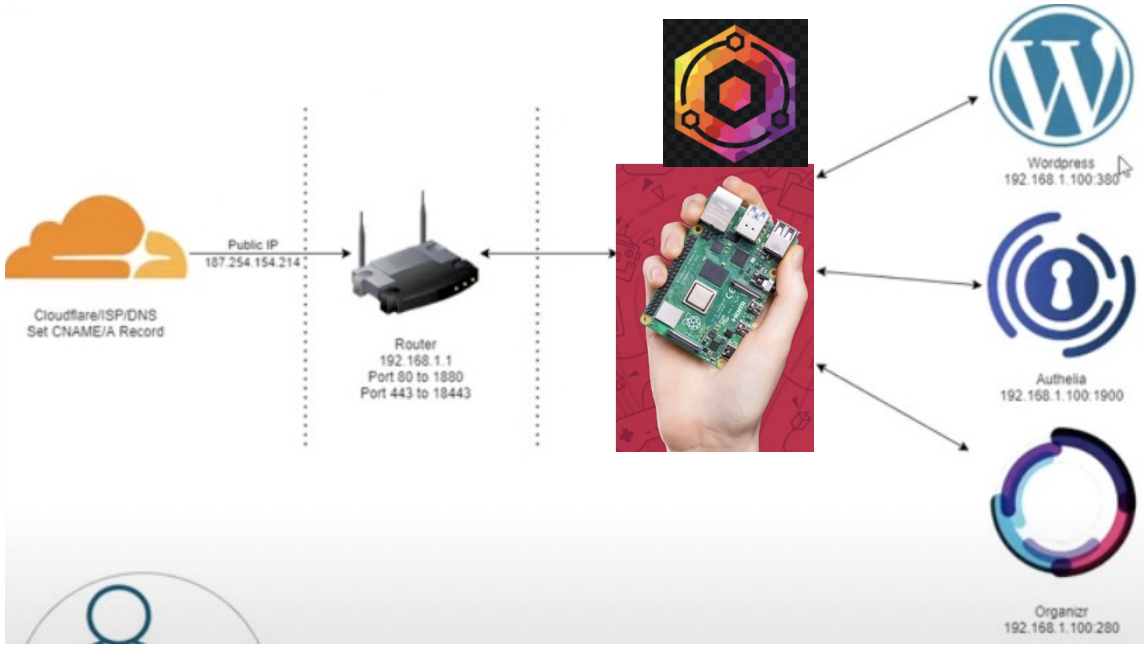
Volume Profile

- There are several strategies volume profile and auction market theory (like mean reversion strategy etc.)
- Pretty much information about in the books and web. I don't want to elaborate further here as this is not our subject.

Self hosting from Raspberry Pi 4

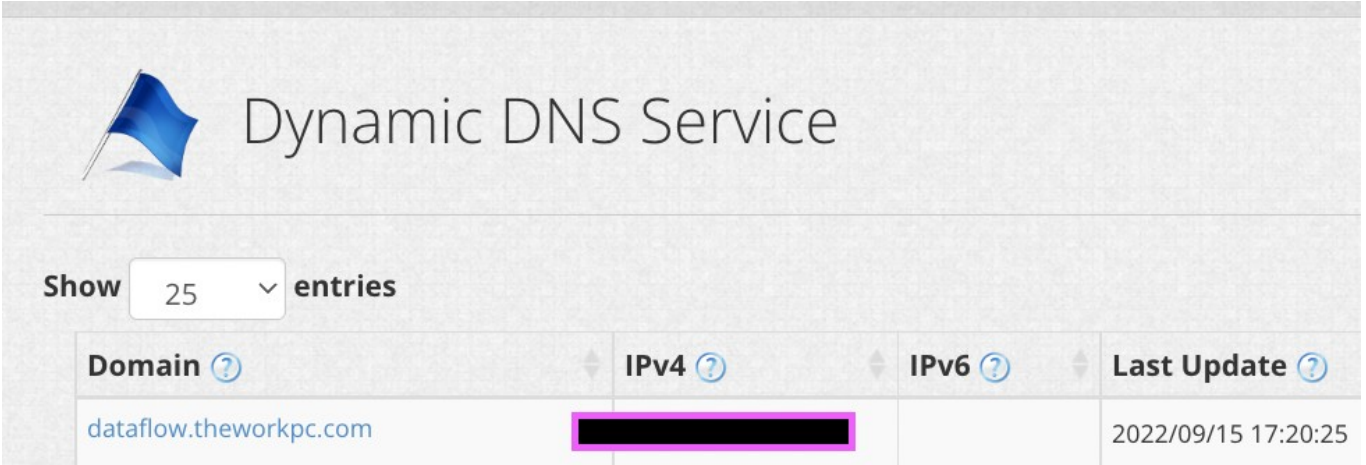
Postgresql and nginx on docker, 2 python files, and nginx is ready for proxy host.

All on Raspberry Pi 4



Dynamic DNS

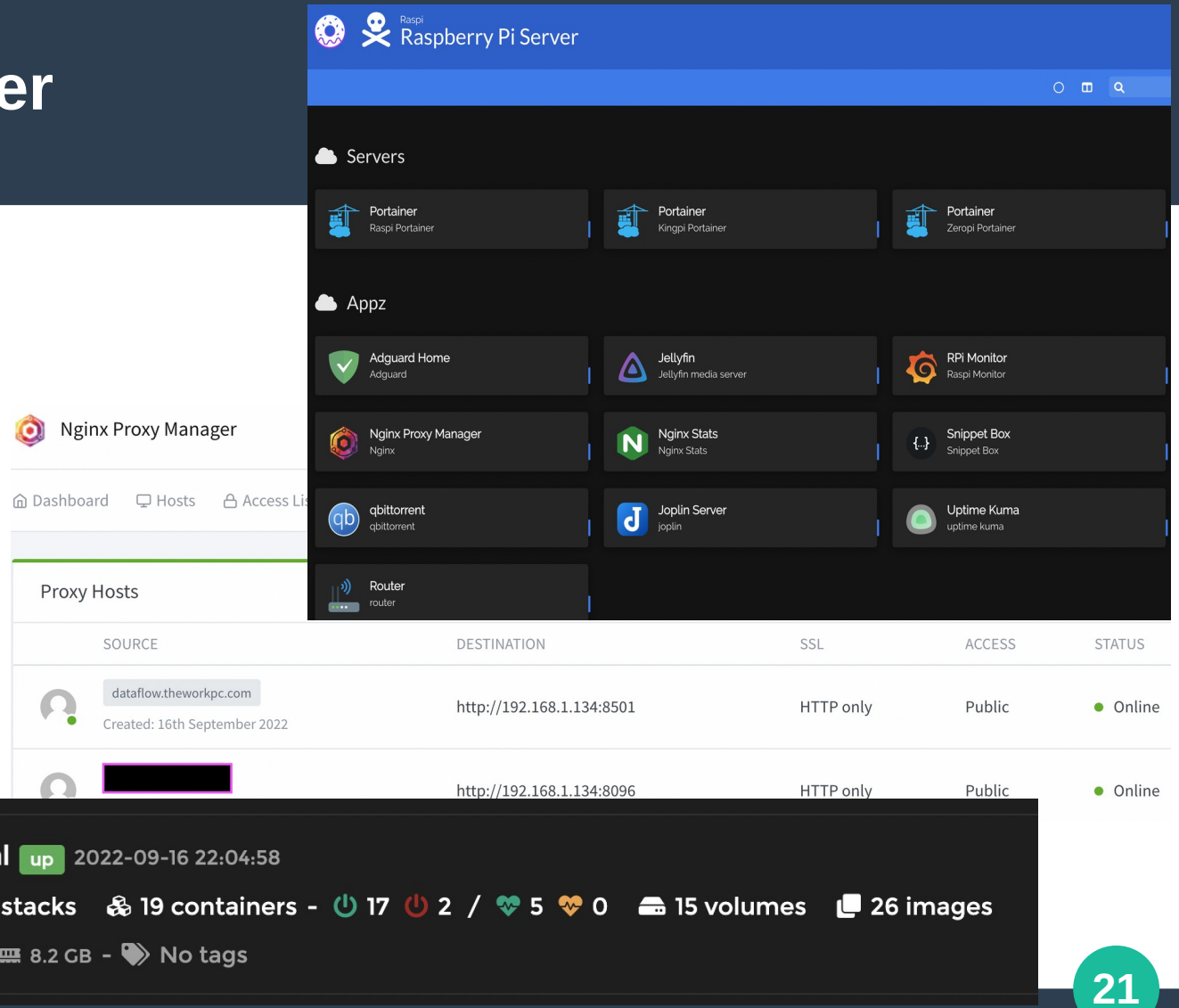
I made the necessary arrangements to forward the domain to my ip.



Nginx Proxy Manager

Settings for hosts and nginx.

- **NGINX is open source software for web serving, reverse proxying, caching, load balancing, media streaming, and more.**
- **I am using lot on my Raspberry Pi Servers.**



Things I plan to do in the future

- I am thinking of adding various analyses.
- Adding inputs where users can make their own choices.
- A structure where they can choose the desired timeframe.

  (like 1h, 4h, daily, weekly candlesticks)
- Adding other pairs and allow the user to select the one they want in the sidebar.
- I did the part up to 10 years in the daily timeframe but I didn't cover it here.
- Creating a live chart with datastream (rest api)

You can check it out, it is live!
dataflow.theworkpc.com