PiterPy
Conference

2018
November 2-3

PASCAL VAN KOOTEN
Jibes Data Analytics

HIGH-FREQUENCY
CRYPTOCURRENCY TRADING
USING ASYNCIO

whoami

- BSc Sociology
- MSc Methods & Statistics
- Intel AI Innovator
- Loves:
    - Open-source
    - Innovation
    - Human & Machine Interaction
- Lead Data Scientist @ Jibes
    - 35 data scientists
    - 4 years and ~15 different companies
    - Worked on blockchain, social robots, NLP, ML / DL, computer vision
- Earlier at EuroPython with "When to use Machine Learning"

Open source

Pinned repositories   Customize your pinned repositories

≡ **whereami**

Uses WiFi signals 📊 and machine learning to predict where you are

● Python   ★ 3k   ⑂ 197

≡ **neural_complete**

A neural network trained to help writing neural network code using autocomplete

● Python   ★ 1k   ⑂ 107

≡ **yagmail**

yagmail makes sending emails very easy by doing all the magic for you

● Python   ★ 1.2k   ⑂ 109

≡ **TwitterQA**

Forked from Conchylicultor/DeepQA

Deep learning based Twitter Imposter Chatbot

● Python   ★ 148   ⑂ 34

≡ **xtoy**

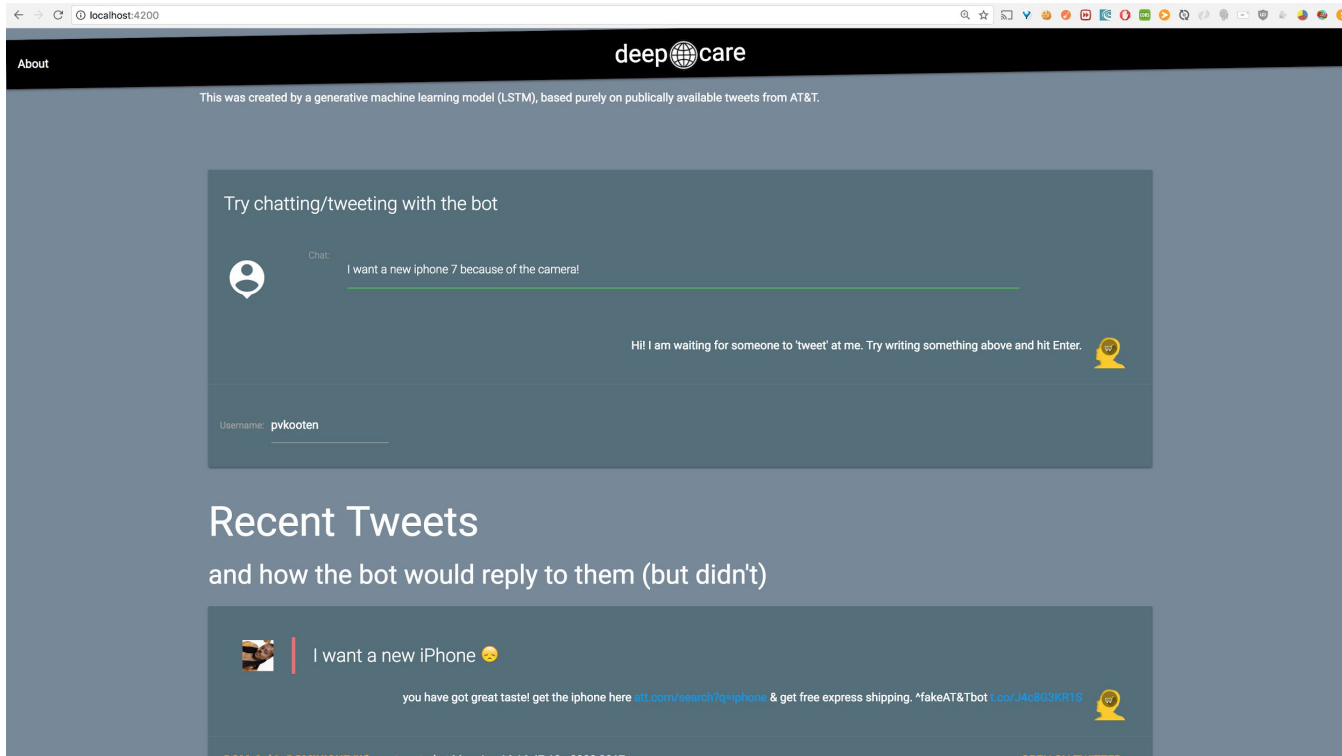Automated Machine Learning: go from 'X' to 'y' without effort.

● Python   ★ 30   ⑂ 5

≡ **sky**

🌅 next generation web crawling using machine intelligence

● Python   ★ 169   ⑂ 23

@ O'Reilly & Intel AI Conference

Today

- My Background for this talk
- Explaining Cryptocurrency & Trading
- High-Frequency Crypto Trading
- Explaining Asyncio
- Live Coding

Background for this talk
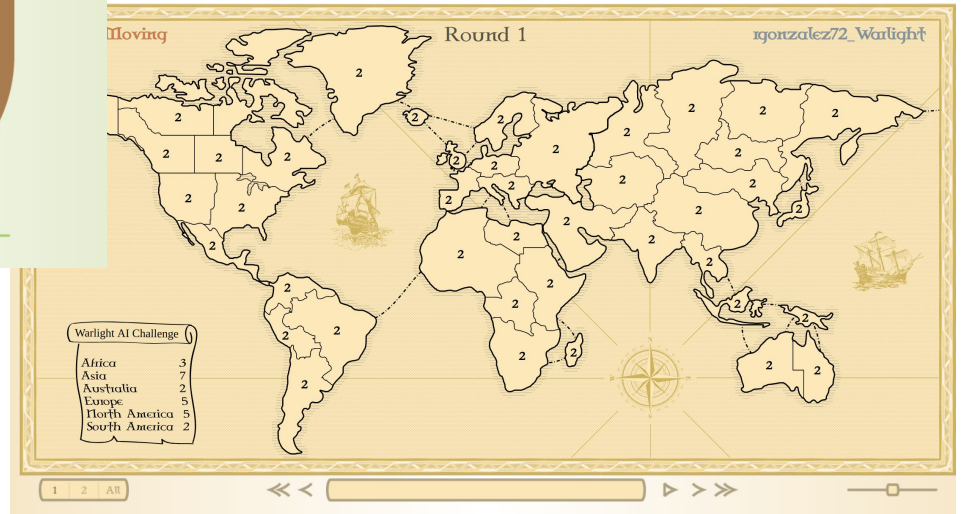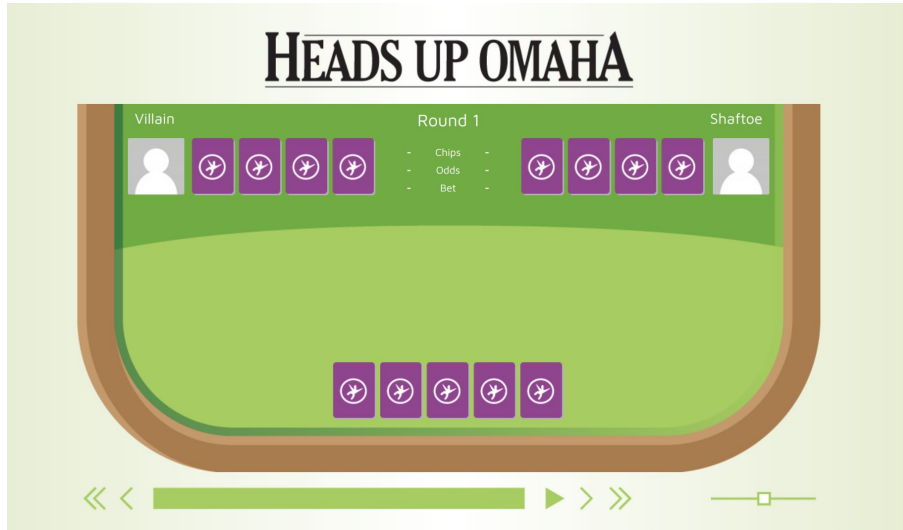
Who has been **trading** cryptocurrency?

~~Trading~~ because:

    ✗ need "big/beefy" machines...

    ✗ "Short" cable to the exchange

    ✗ commission for trading is very high

    ✗ data is expensive

Crypto...currency?

- E-currency

- Bitcoin

- Unregulated field:
    - Obtained a few Ethers
    - And lost them…

r/ethereum · Posted by u/pvkooten 8 months ago

76

I lost 24.04 ether 2 years ago to the 0x0 address while trying to do the split.

Explaining Cryptocurrency & Trading

18	NEM	$878,092,519	$0.097566	$11,221,834	8,999,999,999 XEM *	-3.01%		•••
19	VeChain	$744,396,400	$0.013423	$17,237,049	55,454,734,800 VET *	-3.12%		•••
20	Zcash	$670,649,221	$137.74	$141,291,164	4,869,106 ZEC	5.87%		•••
21	Dogecoin	$665,039,001	$0.005719	$18,175,581	116,280,623,285 DOGE	-1.90%		•••
22	OmiseGO	$501,774,785	$3.58	$40,000,849	140,245,398 OMG *	-0.58%		•••
23	Bytecoin	$428,486,837	$0.002328	$7,085,107	184,065,170,335 BCN	15.68%		•••
24	0x	$385,652,204	$0.714220	$21,123,347	539,962,574 ZRX *	13.66%		•••
25	Bitcoin Gold	$385,239,307	$22.33	$5,196,658	17,251,824 BTG	-0.83%		•••
26	Lisk	$379,221,091	$3.43	$4,381,856	110,466,960 LSK *	-2.09%		•••
27	Ontology	$361,770,582	$1.96	$38,109,139	184,206,203 ONT *	-4.63%		•••
28	Qtum	$349,383,605	$3.93	$129,293,563	88,913,536 QTUM *	-3.00%		•••

Explaining Cryptocurrency & Trading

bitcoin 🔍

Cryptocurrencies

Ⓑ Bitcoin (BTC)

Ⓞ Bitcoin Cash (BCH)

Ⓑ Bitcoin Gold (BTG)

◈ Bitcoin Diamond (BCD)

Ⓑ Bitcoin Private (BTCP)

Ⓑ Bitcoin Interest (BCI)
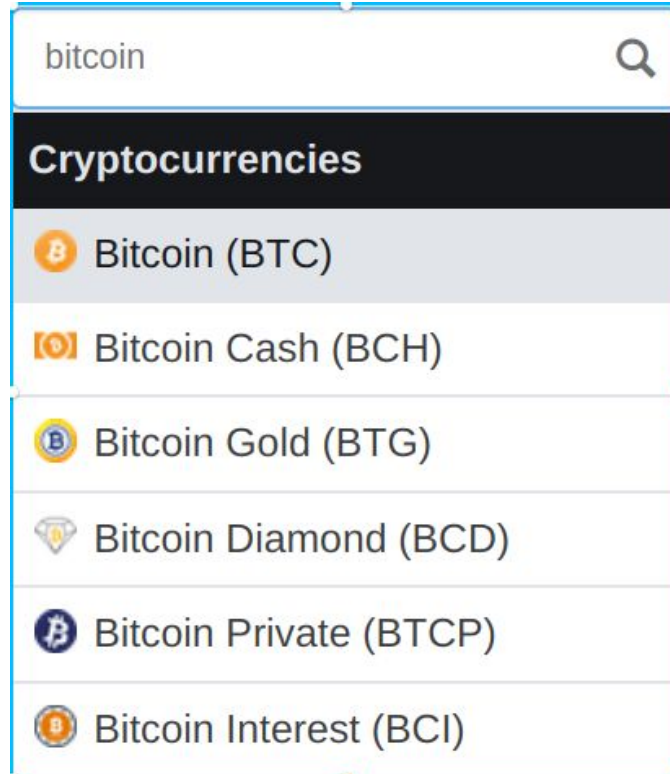
3 Ways to trade

- **Fundamental**

- Technical

- Arbitrage

- Intrinsic value

- Uses financials, macro

- Usually longer term

3 Ways to trade

- Fundamental

- **Technical**

- Arbitrage

- Historic price

- Time series / patterns

- Usually short term

3 Ways to trade

-   Fundamental

-   Technical

-   **Arbitrage**

Exchange A: 1 BTC for $6000

Exchange B: 1 BTC for $5800

~~3~~ 4 Ways to trade

- Fundamental

- Technical

- Arbitrage

- **Event driven**

Event driven

IOTA Charts

Event driven

28th of November 2017

Microsoft and IOTA launch first cryptocurrency

Posted by u/7hr0w7h475h17 10 months ago

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Microsoft and IOTA launch first cryptocurrency market for the Internet of Things

thenextweb.com/hardfo...

IOTA makes it possible
to securely store, sell,
and access data streams.

Never has getting access to diverse,
fine-granular data been this easy!

TRY IT YOURSELF
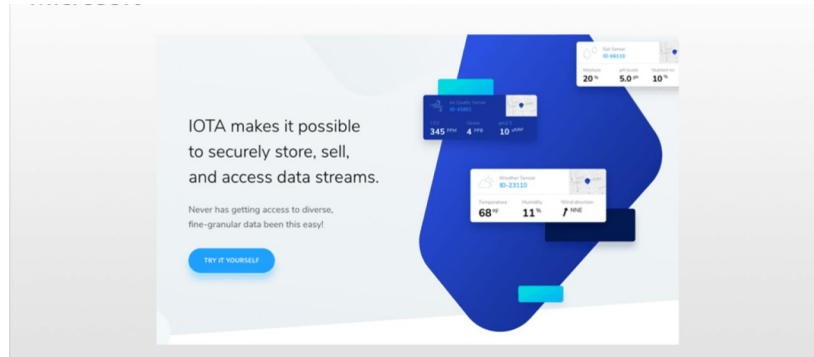
Bitcoin hard fork nightmare becomes
reality after testnet splits

Event driven

IOTA Charts

Zoom 1d 7d 1m

Wed Dec 06 2017 16:15:26 GMT+0100 (Central European Standard Time)

Posted by u/pyalot 9 months ago

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There seems to be no Microsoft press release confirming the IOTA partnership.

Tuesday, Nov 28 2017, 17:54:25 UTC+02:00
● Market Cap: **3,477,414,746 USD**
● Price (USD): **1.25**
● Price (BTC): **0.00012657**
● 24h Vol: **291,542,000 USD**
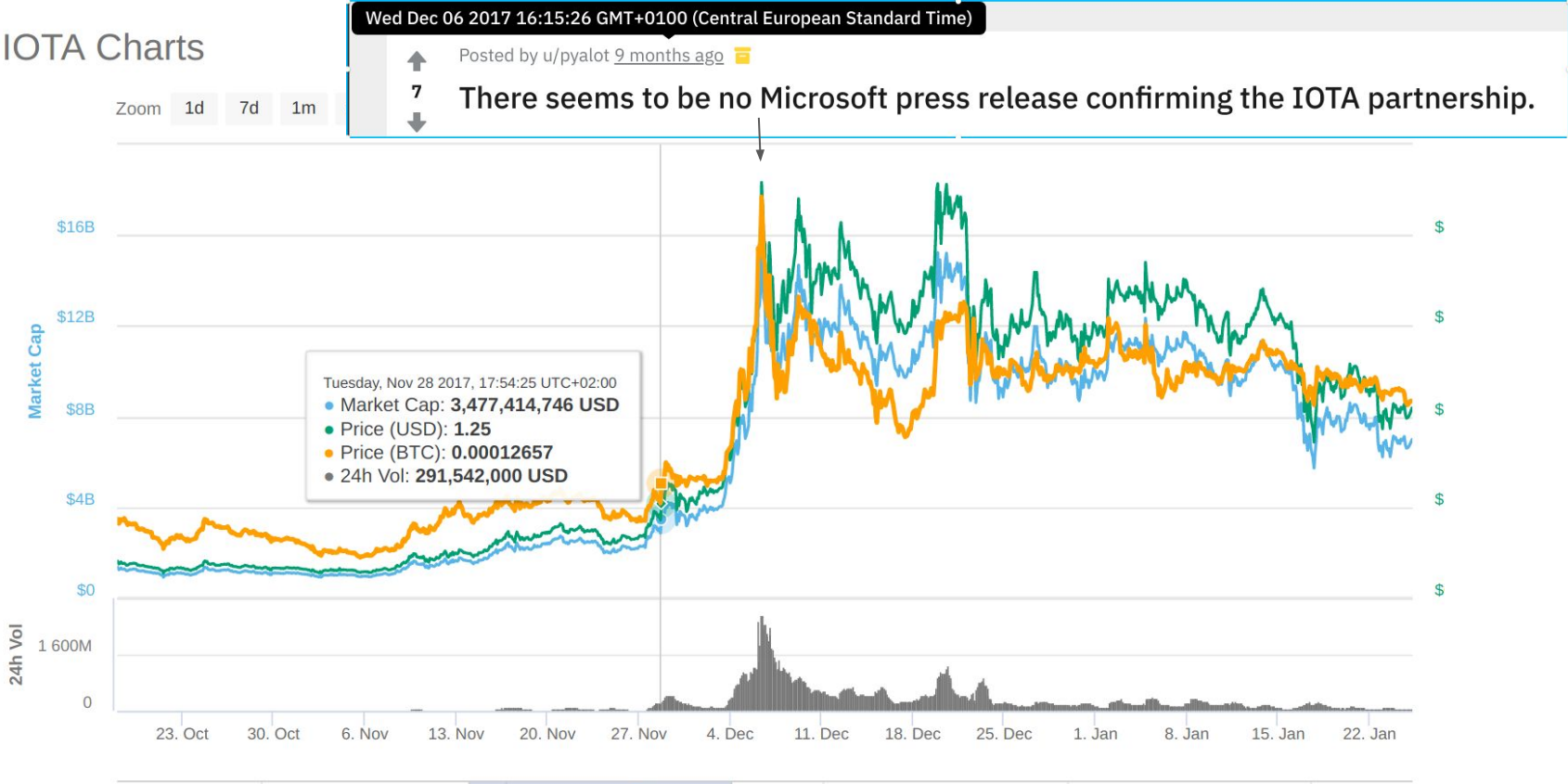
Event driven

Oct 23, 21:33:38	0.000000071	855000/855000	0.000000071	0.060705000	Filled
Oct 23, 21:31:54	0.000000079	0/855000	0	0	Cancelled
Oct 23, 21:31:47	0.000000070	855000/855000	0.000000070	0.059850000	Filled
Oct 23, 21:31:34	0.000000095	0/855000	0	0	Cancelled
Oct 23, 21:31:05	0.000000068	855000/855000	0.000000068	0.058140000	Filled
Oct 23, 21:30:50	0.000000079	0/855000	0	0	Cancelled
Oct 23, 21:30:38	0.000000067	3017000/3017000	0.000000067	0.202139000	Filled
Oct 23, 21:29:49	0.000000095	0/855000	0	0	Cancelled
Oct 23, 21:27:05	0.000000058	855000/5384000	0.000000056	0.047880000	Expired
Oct 23, 21:26:49	0.000000049	4727000/10987000	0.000000048	0.226896000	Expired

Simulation

Live Coding!

Further Requirements

- Interactivity

- Only trade on *real* signals

- Ability to quickly react

What was next?

- Create wrapper on Exchange API to send myself a direct link to buy

    - Buy: /buy?symbol=IOTBTC -> **go all-in**

    - Sell: /sell?symbol=IOTBTC -> convert IOT back to BTC

    - Slackbot

    - Would always be too slow - bots were trading almost immediately

Who ever needed **high-frequency** transaction speed?

High-Frequency Crypto Trading

1. Get signal ASAP
2. Determine buy price
3. Make buy order ASAP
4. Execute sale strategy*
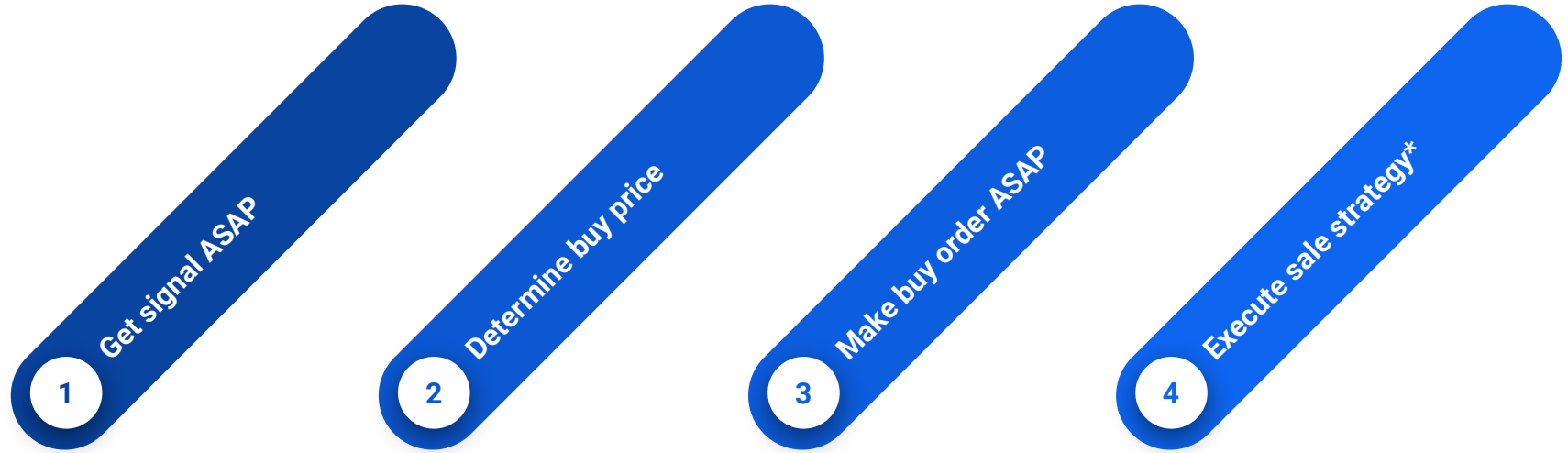
High-Frequency Crypto Trading

```
order = {
    "method": "newOrder",
    "params": {
        "type": "limit",
        "side": "buy",
        "symbol": "BTCUSD",
        "quantity": float_round(USD_AMOUNT / TICKER_PRICE),
        "price": TICKER_PRICE,
        "timeInForce": "IOC",
        "clientOrderId": "uniqueperday1",
    },
}
```

High-Frequency Crypto Trading

- Minimize delay between real-time-event and buy order
- "Stories" in trading
- Spoiler: in the end I got it down to ~**0.7ms**

High-Frequency Crypto Trading

- Phone / Email / Slack notification
- Sentry ("error" tracking)
- Quart (async flask)
- healthcheck.py
    - Recent enough URLs visited
    - Process alive

High-Frequency Crypto Trading

Cloud comparison in June, 2018 ($5 dollar offering):

	Internet speed	Geographical Availability	CPU
GCP (Google)	Great	Great	VCPU
DigitalOcean	Average	Limited	VCPU
AWS EC2 (Amazon)	Average	Great	VCPU
Dedicated Machine*	Slow	Very limited	Good
Linode	Great	Sufficient	<3

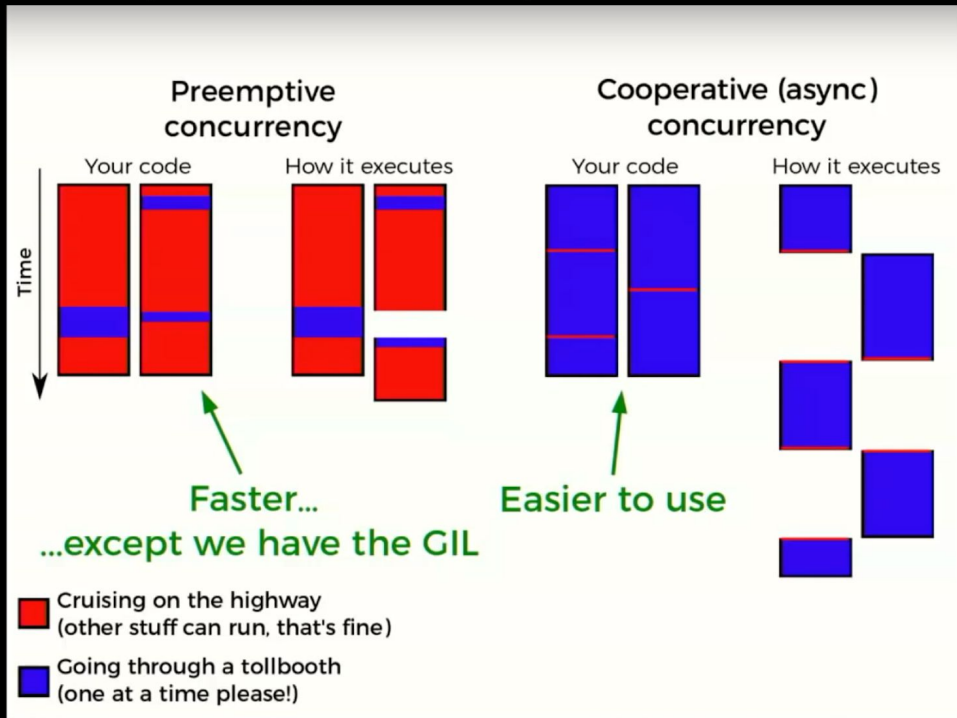# Technical Architecture v10.1.2.1 Final.docx.py
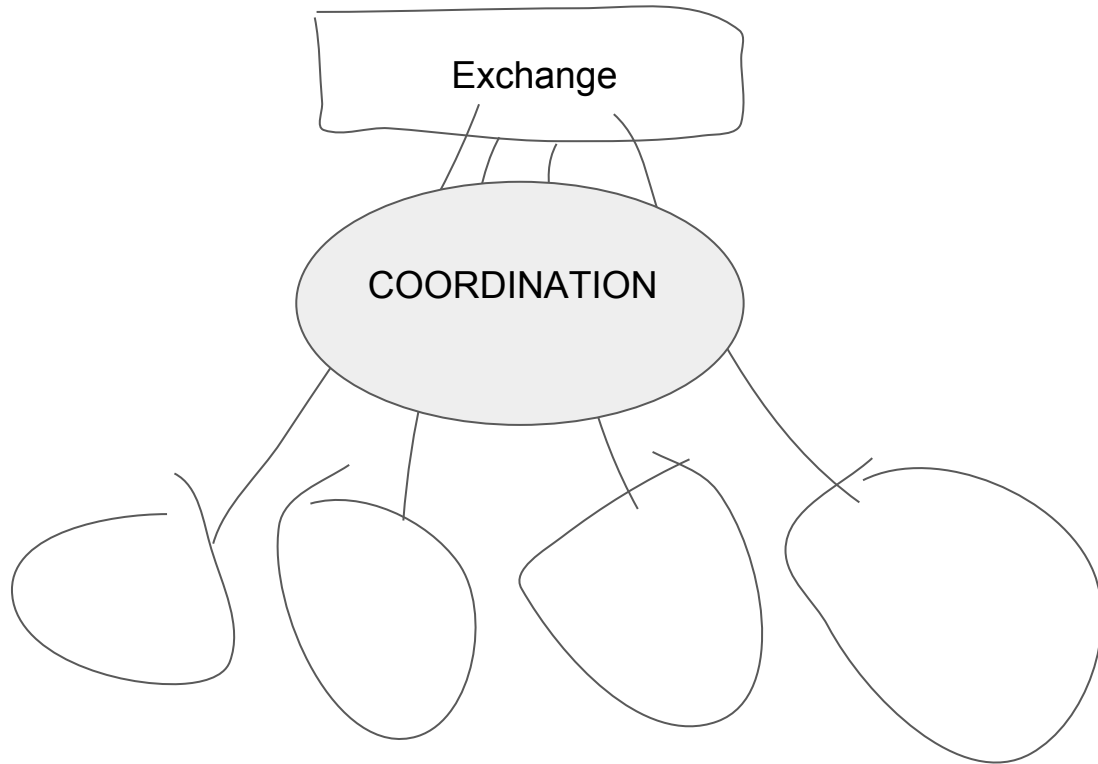
Who has **used asyncio?**

Asyncio

- Challenge: doing multiple things at the same time:

    - CPU (calculations, natural language classification) -> use multiple processes

    - IO (http connections, sockets, database)   -> use multiple threads / asyncio

- I did not like the Thread interface at all :-)
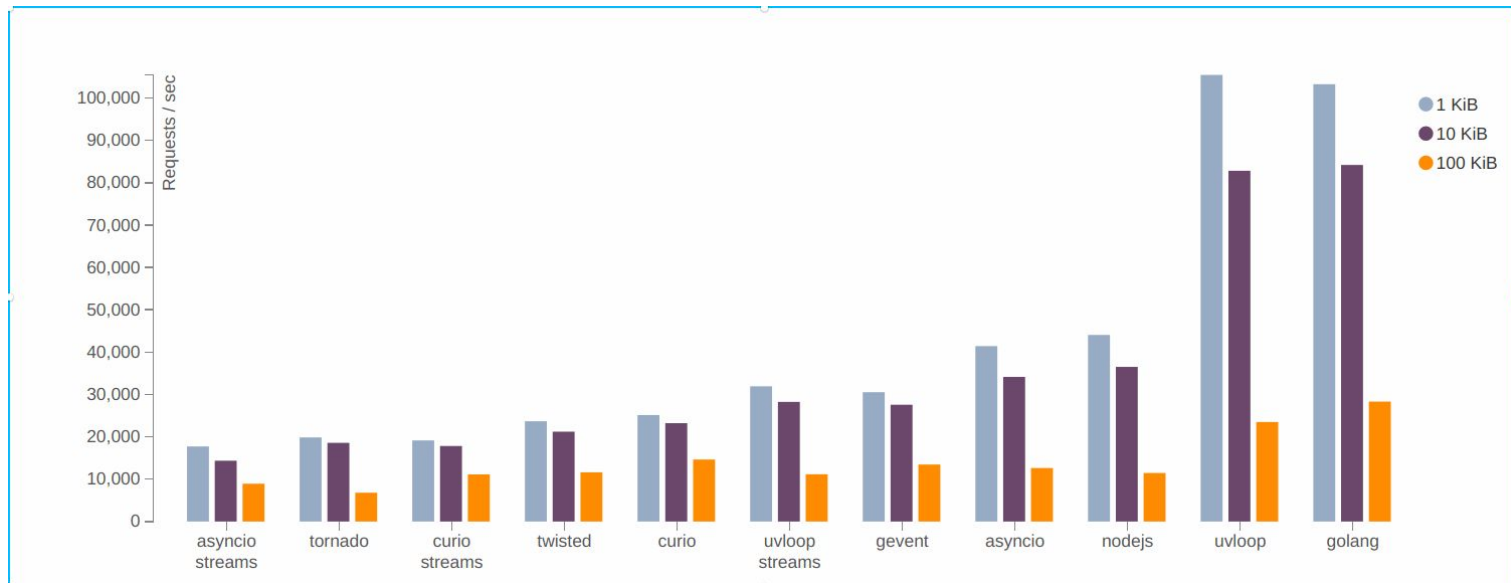
- Bonus: no need for locks!

Asyncio

Asyncio over time

- 3.3

- By 3.6 it was an ok experience

- 3.7: distinction became clear between user and library creators

Asyncio

uvloop makes asyncio 2-4x faster

Asyncio

- Async code can only be called by other async functions...

- … or by `asyncio.run`

Live Coding!

Key Takeaways

- **Disclaimer:** no trading advice! You will lose money.
- It's not all fun - on one trade I lost 20%
  - Still, coding with this kind of pressure taught me some nice tricks
- Benefits of introspection, centralized error logging, round-robin deploy
- Always do backtesting & favor a simpler model
- Use ML/analysis upfront -> deploy rule based
- Python's async implementation is much better than you'd think!
- Once you go async, you have to fully go async

-> And now is a better time than ever to get started!