BitExTract: Interactive Visualization for Extracting Bitcoin Exchange Intelligence

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COMPUTER SCIENCE
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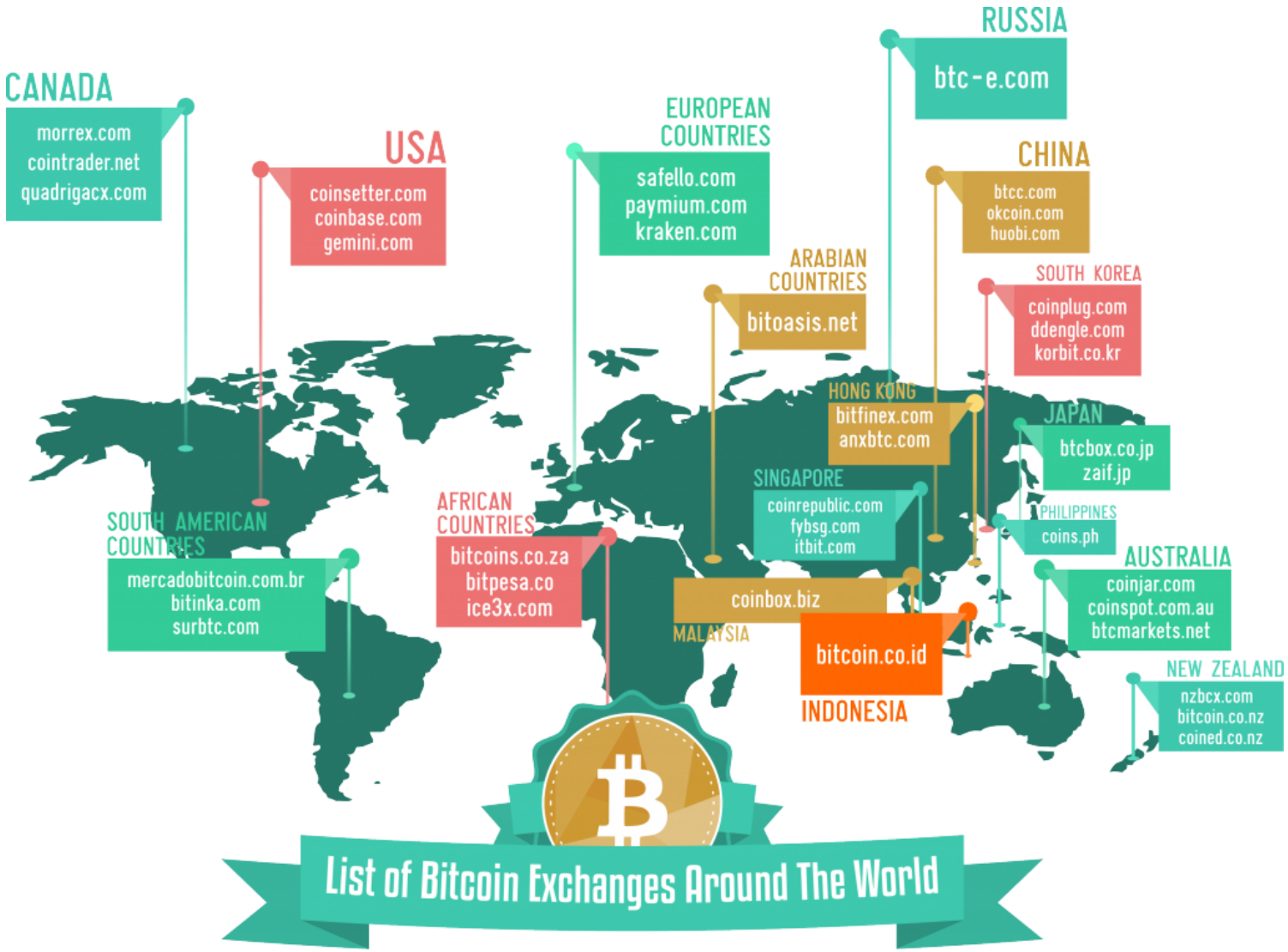
計算機科學及工程學系

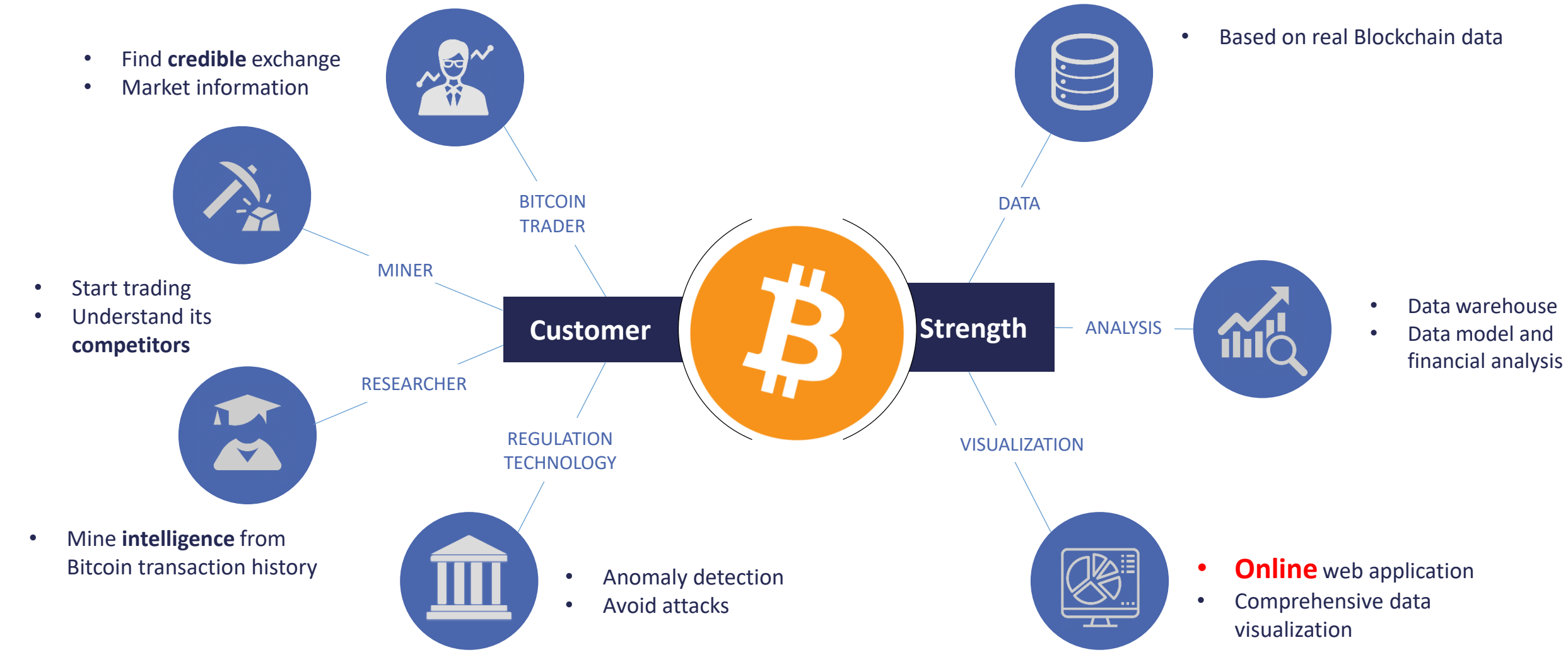
Why do we need Bitcoin exchange?




BITCOIN·DIGITAL·DECENTRALIZED·PEER TO PEER
1 TROY OZ .999 FINE COPPER
WE TRUST

-Video-

Why BitExTract?



Objectives

Data collection

Distributed data scrapper for building the database (OLTP).

Data warehouse (OLAP).

Data mining and visualization

Data analysis from financial models

Data visualization

System overview

Data Collection and Storage

WalletExplorer

Bitcoin News

Exchange Info

(a)

Data processing and mining

Exchange-Exchange Transactions

Exchange-Client Transactions

Extract

(b)

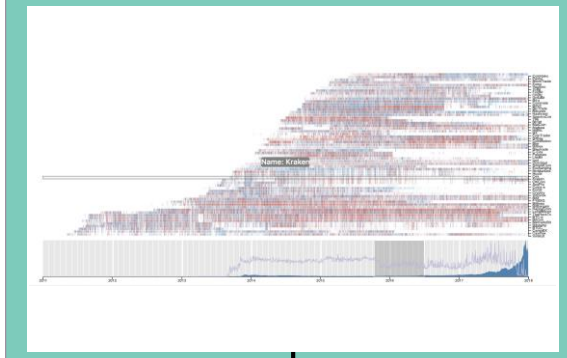
Market Share

Network Standing

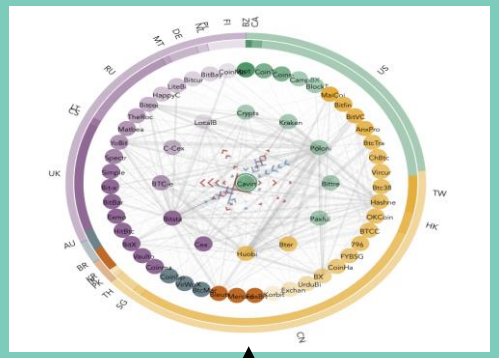
relationships

Visualization

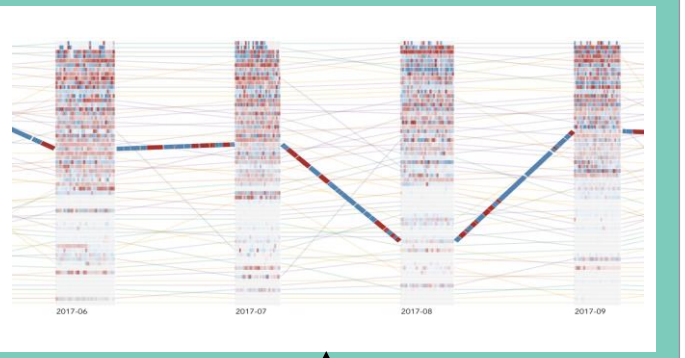
Massive sequence view



Connection view

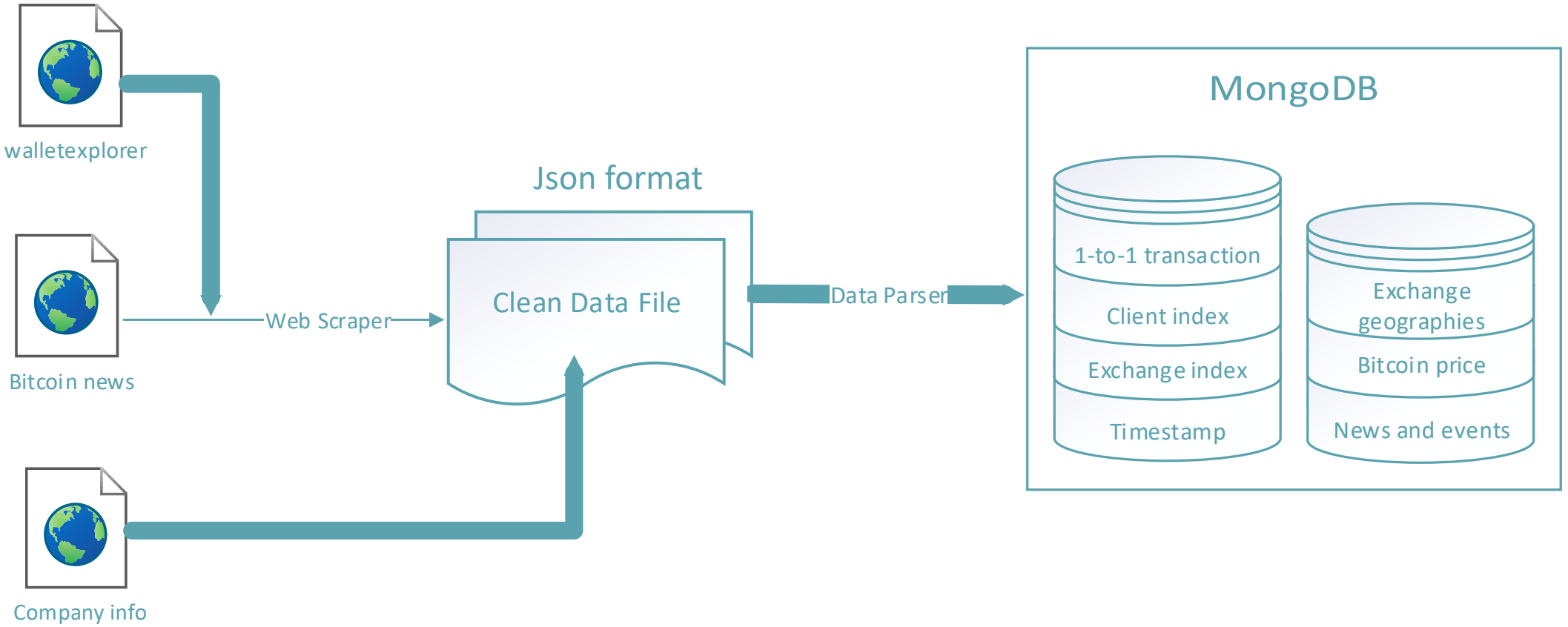


Comparison view

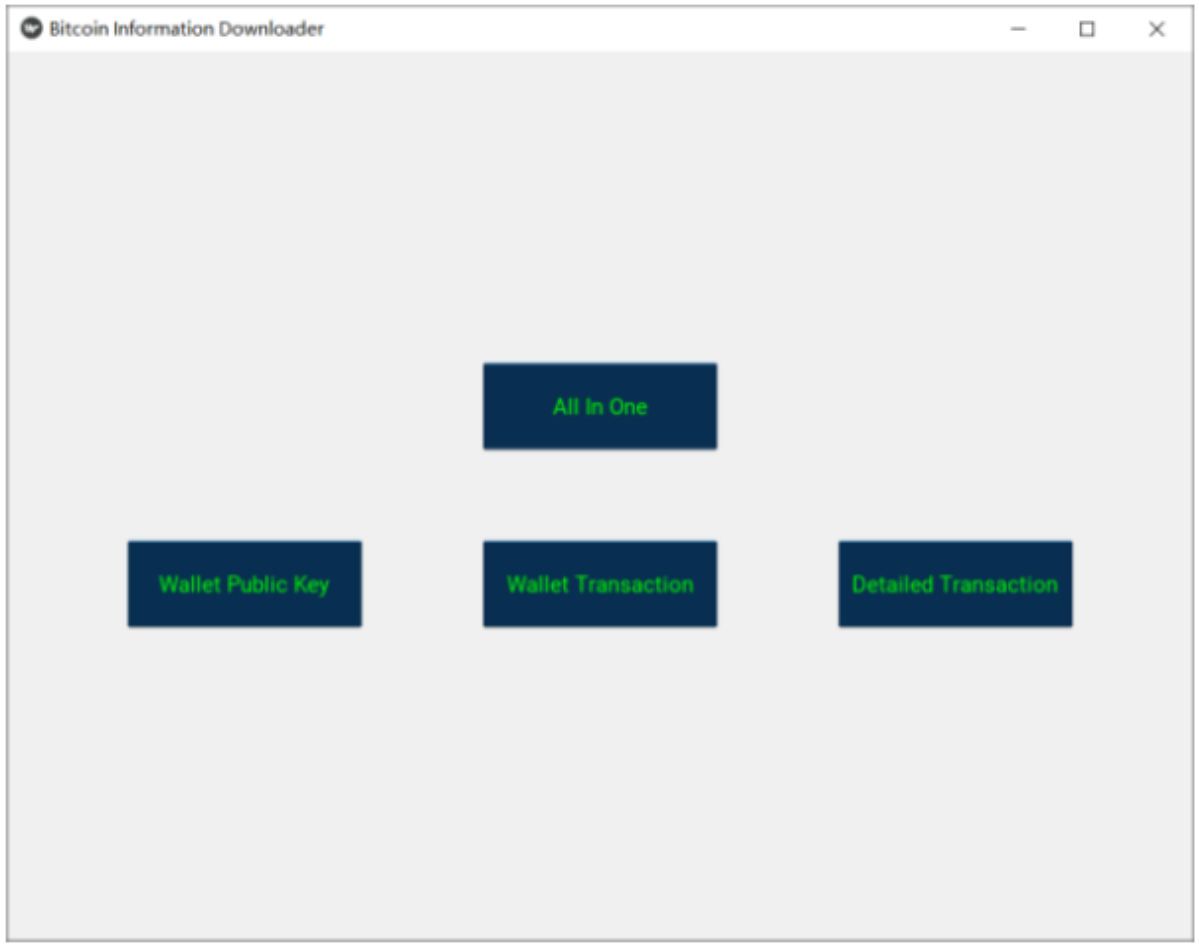


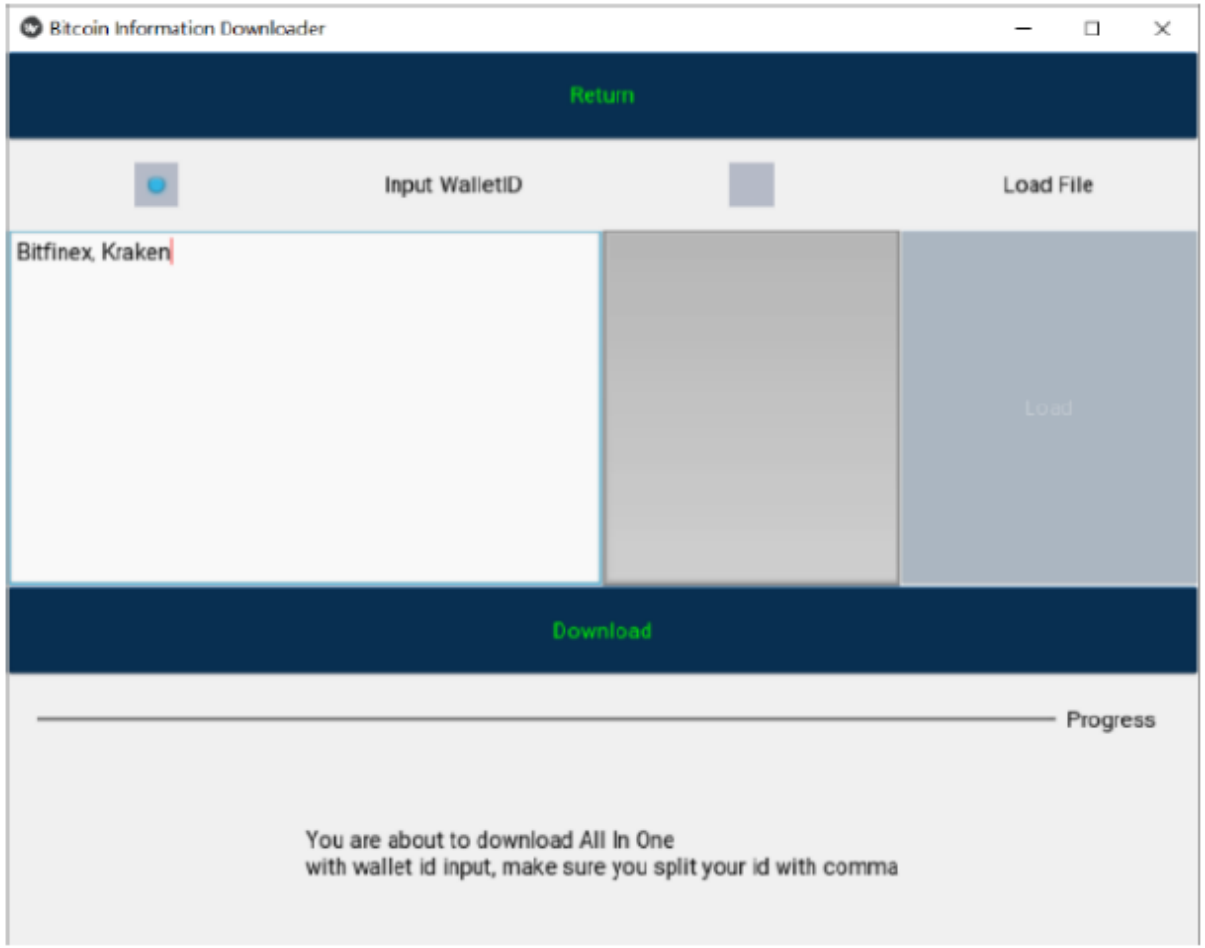
(c)

Data collection and storage

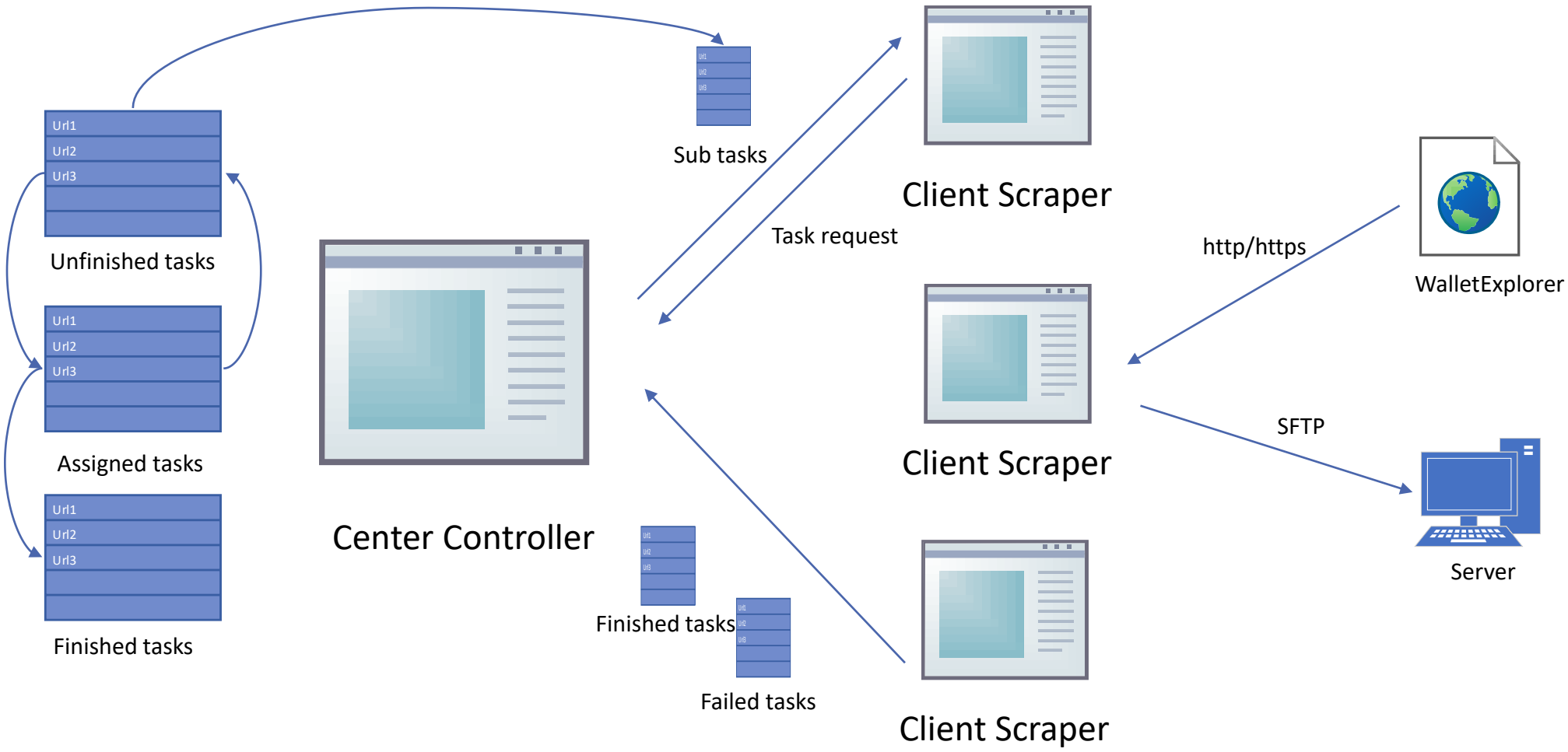


Web Scraper

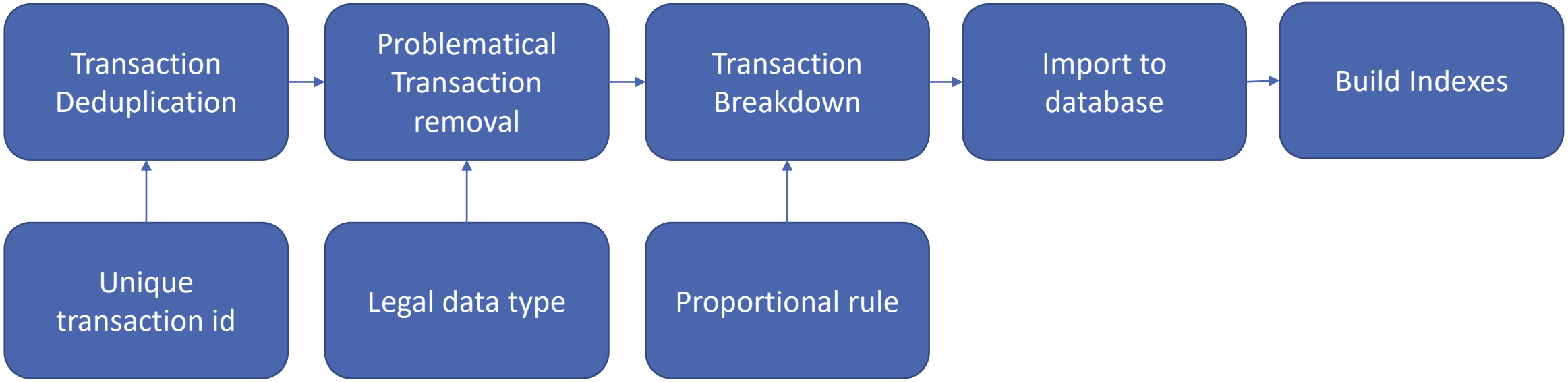

Bitcoin Information Downloader
All In One
Wallet Public Key
Wallet Transaction
Detailed Transaction


Bitcoin Information Downloader
Return
Input WalletID
Load File
Bitfinex, Kraken
Load
Download
Progress
You are about to download All In One
with wallet id input, make sure you split your id with comma

Distributed design



MongoDB database

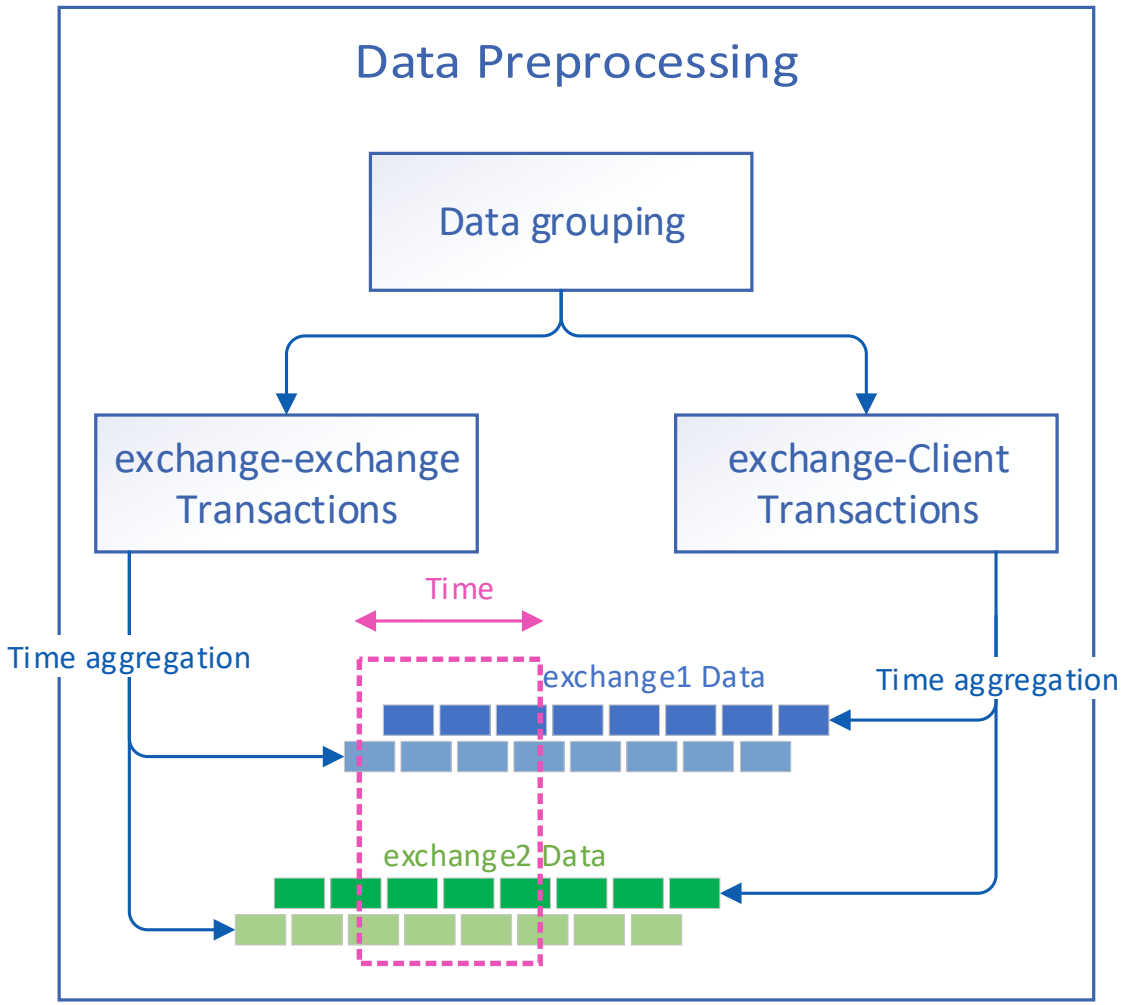


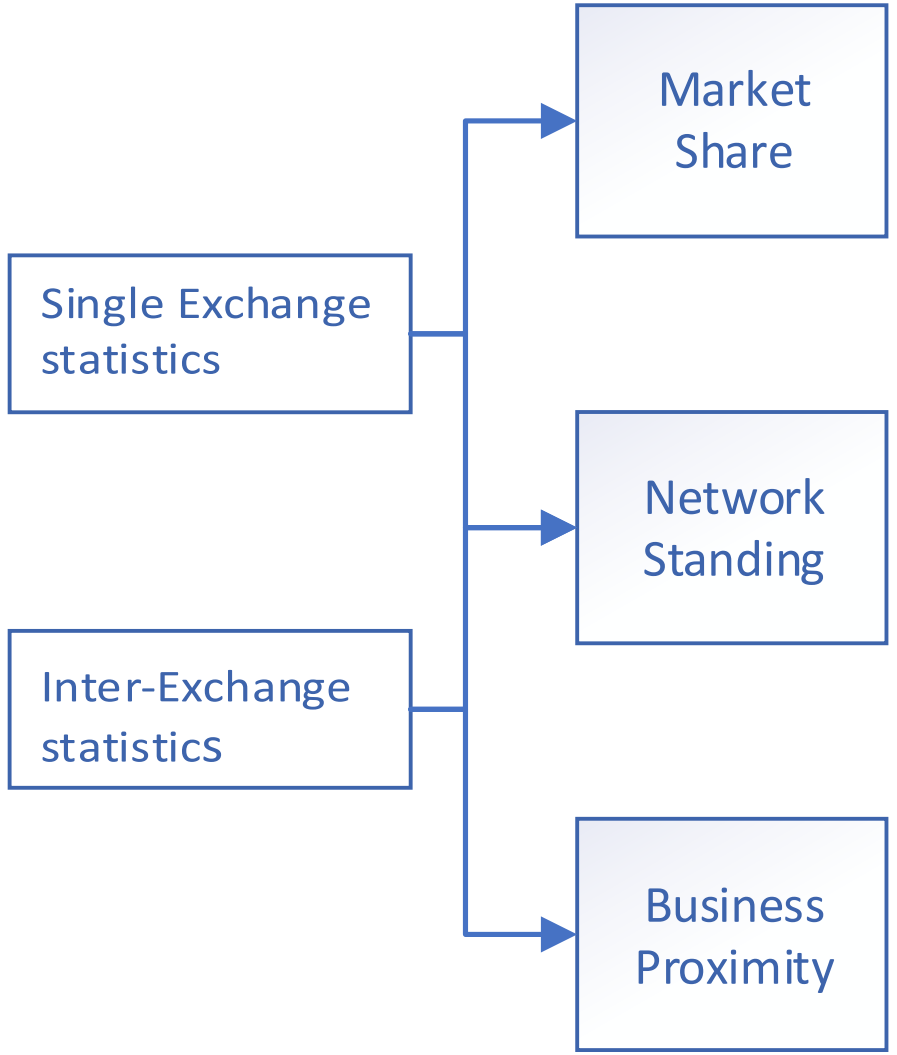
MongoDB database

```
_id: ObjectId("5a60c99c32721547496da8ba")
wallet: "00246b90d72248c4"
to: "796.com"
txid: "477bacb83ba1ca899a59496e0d579524024d64f72fe985dcbf79bf0ff4adb341"
amount: 0.01
time: 1404288123
usd: 6.428
```

```
_id: ObjectId("5a60cac53272154749aed707")
wallet: "Bitfinex.com"
to: "BTC-e.com-output"
txid: "af2a2739580c7c8046c490d8a45f32157efc6dea28897f7a8a1a45228ee3820f"
amount: -942.75024266
time: 1433257748
usd: -212729.23538062235
```

Data processing module





Data mining module

Network standing

$$Stand_t^i = \alpha \cdot I_t^i + \beta \cdot Share_t^i + \gamma \cdot \frac{\sum_{p \in E} V_{t-1}^{p,i} \cdot Stand_{t-1}^p}{\sum_{p \in E} V_{t-1}^{p,i}}$$

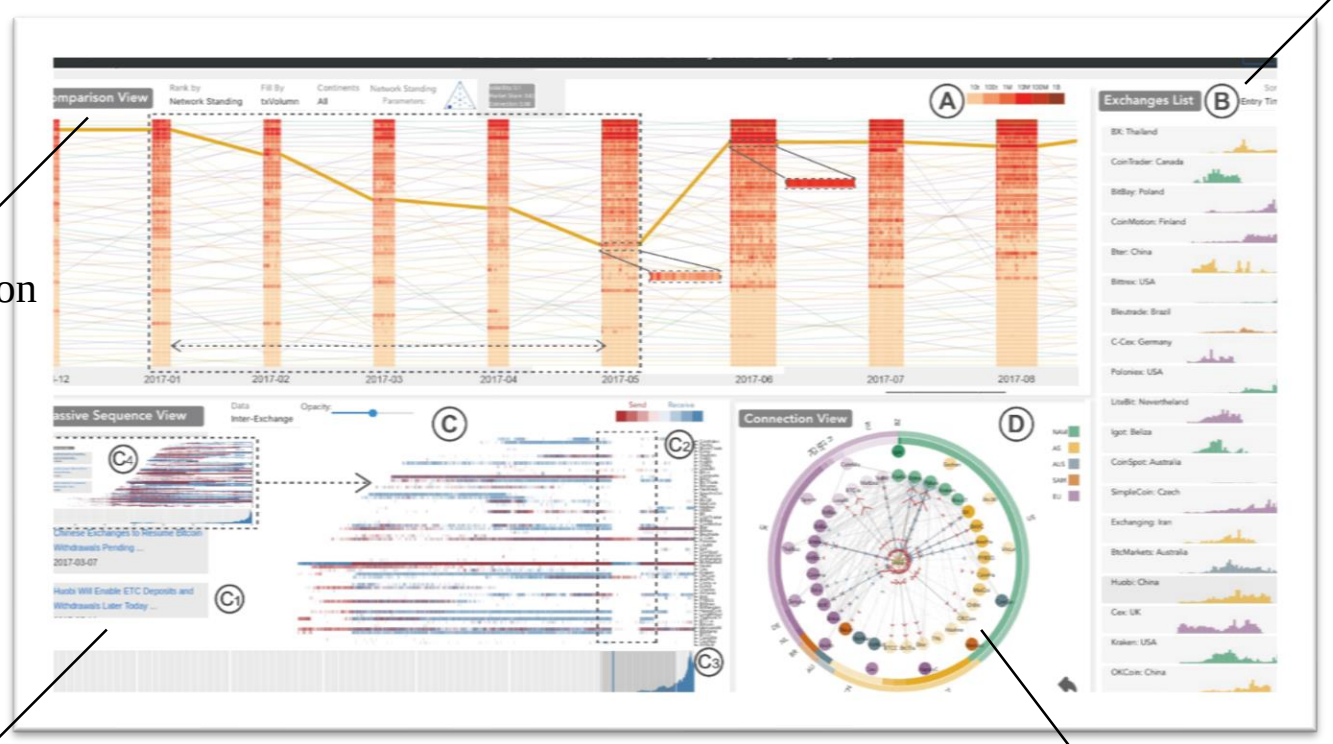
- Balance volatility
- Market share
- Network standing of its partners
- **Adaptive** weights from user interface

Business proximity

$$P_t(a,b) = \alpha \cdot V_t(a,b) + \beta \cdot F_t(a,b)$$

- Geographical distribution, market, technology
- Trading volume between exchange *a* and *b*
- Inner-transaction frequency

Visual analytic system



Exchange List View

Comparison View

Massive Sequence View

Connection View

Design Rules

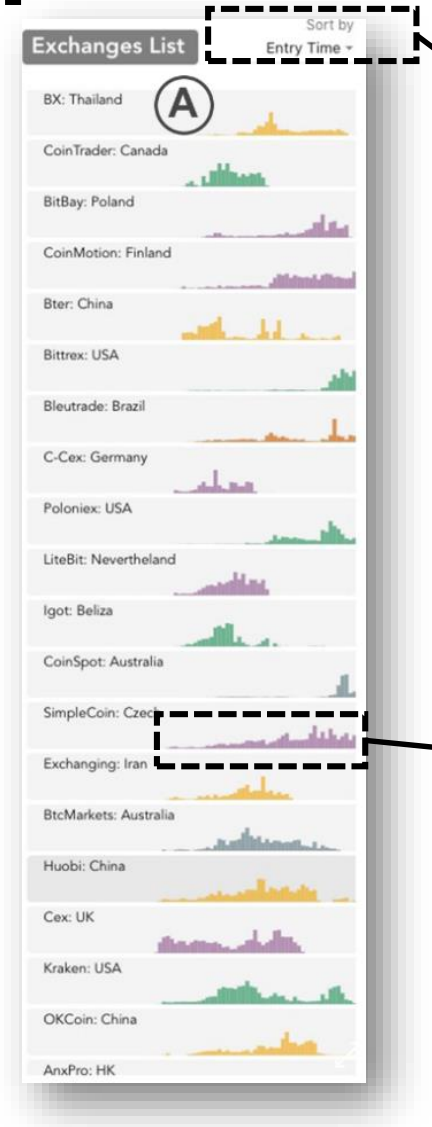
User Centric

Overview first, zoom and filter, details on demand

Flask

Vue.js

Visual design – Exchange List Panel

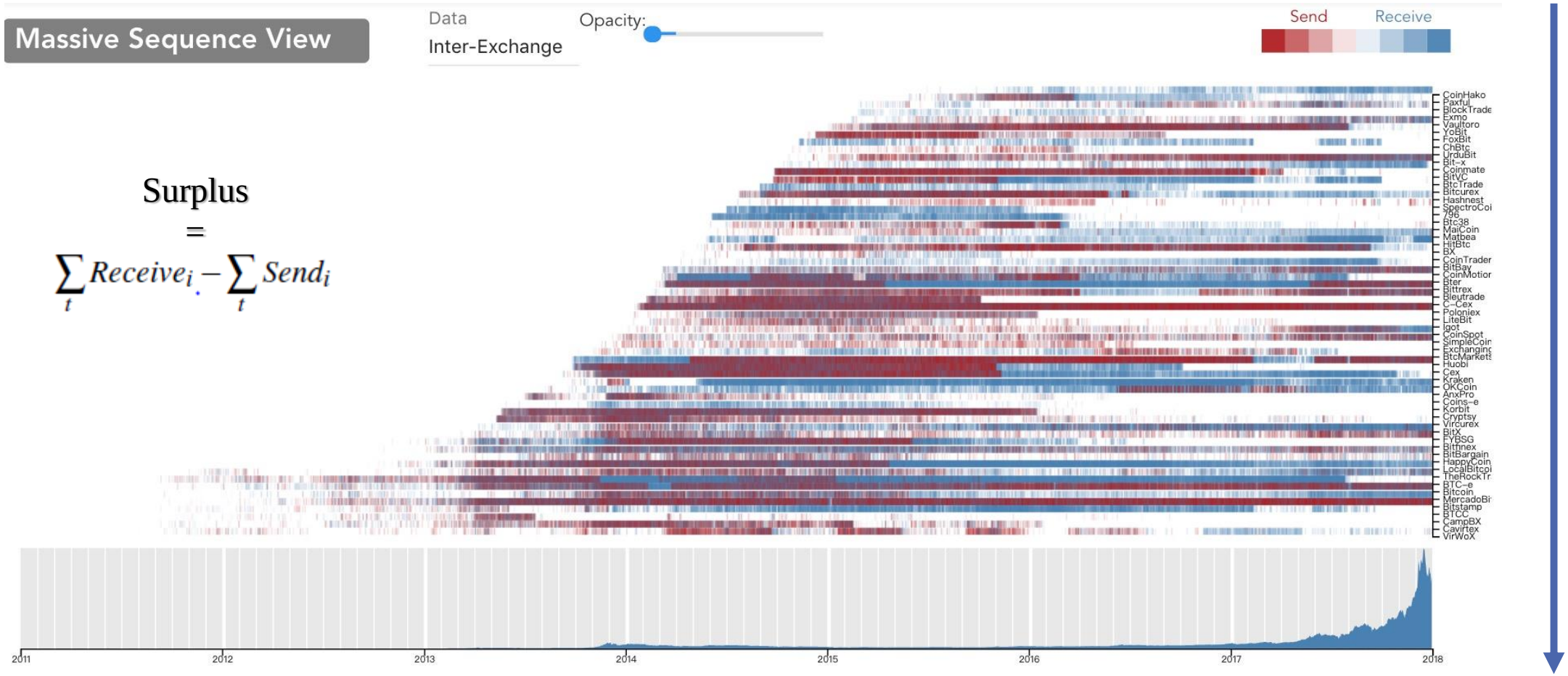


Quick Selection of Exchanges

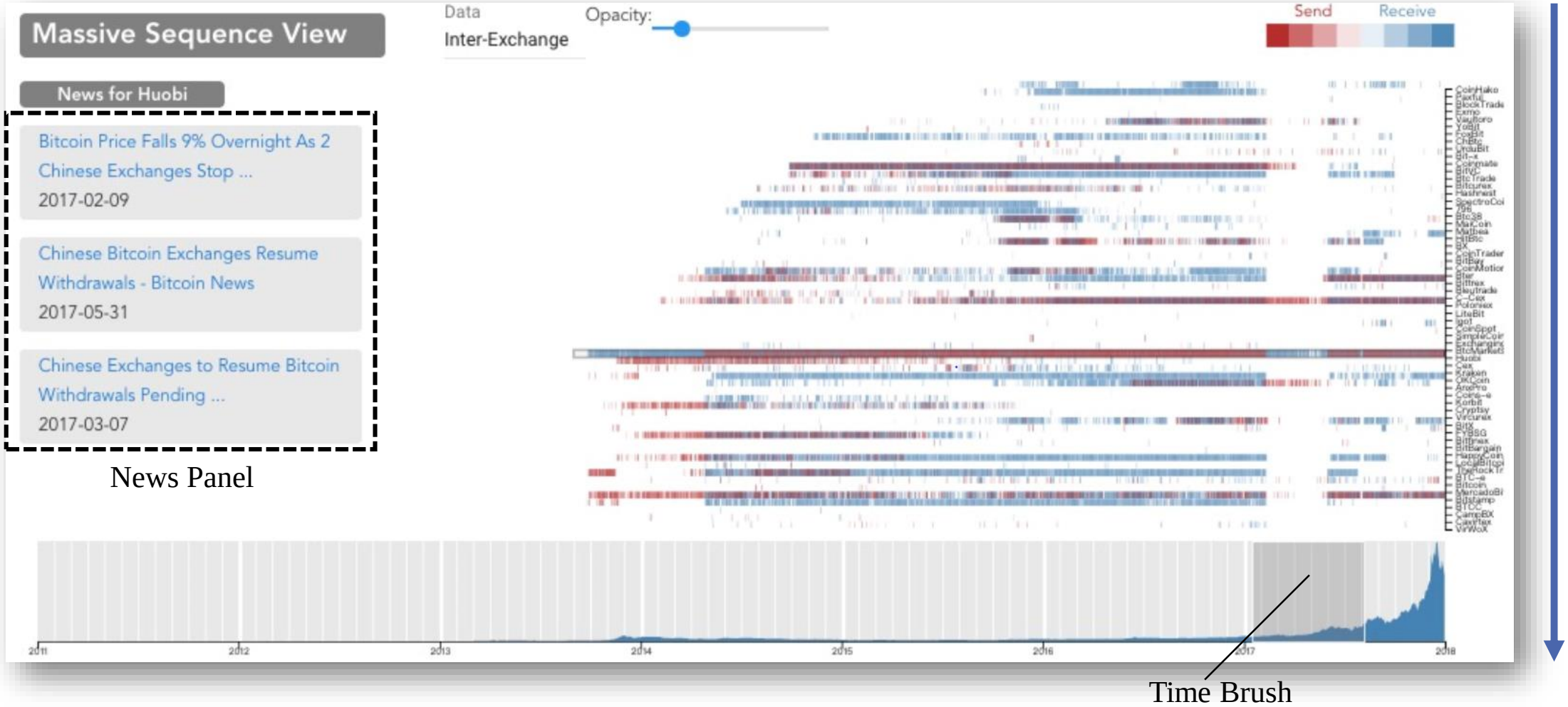
Sort Exchanges by Entry Time or Continents

Encode Transaction Volume, color encode continents

Visual design – Massive Sequence View



Visual design – Massive Sequence View

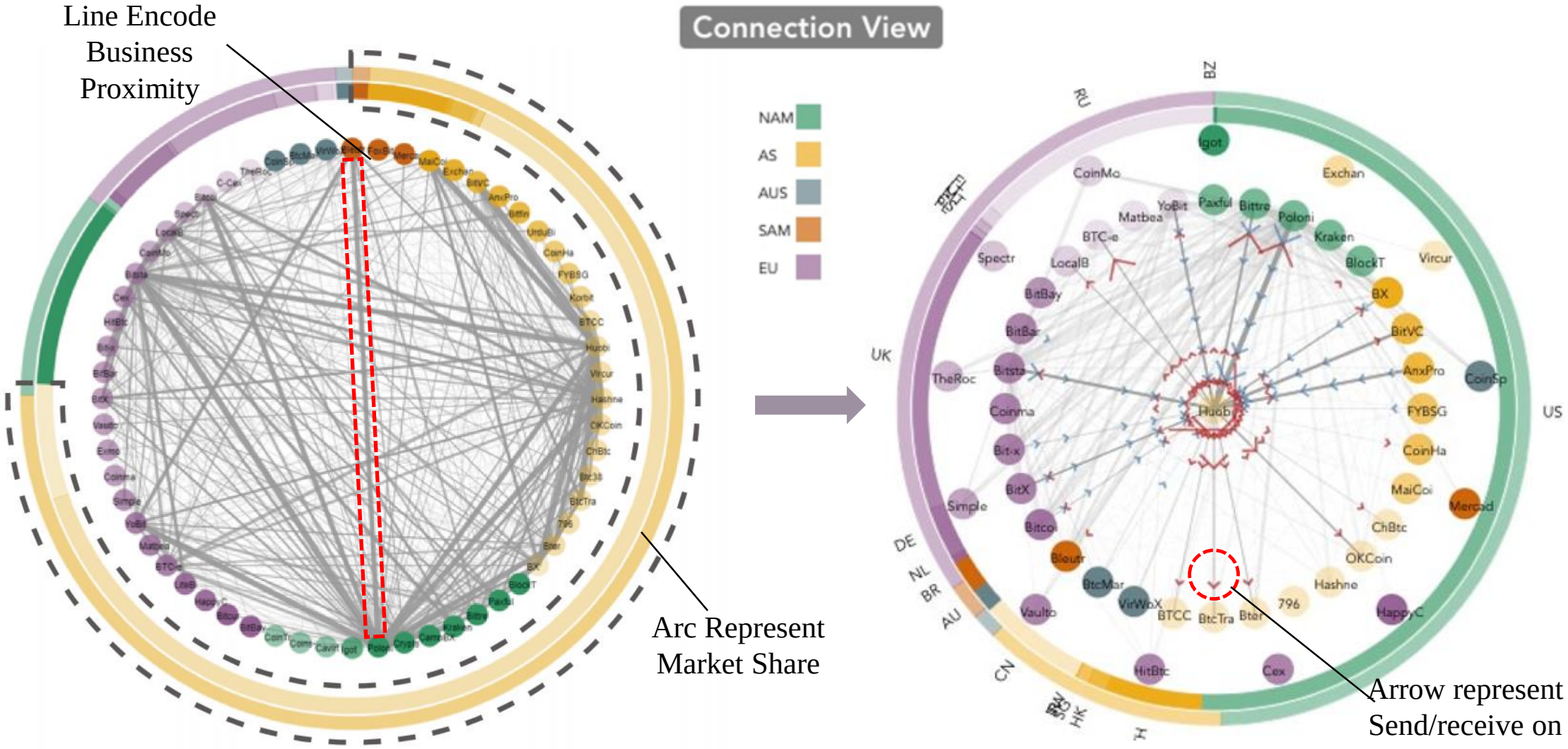


News Panel

Time Brush

Visual design – Connection View

Line Encode Business Proximity



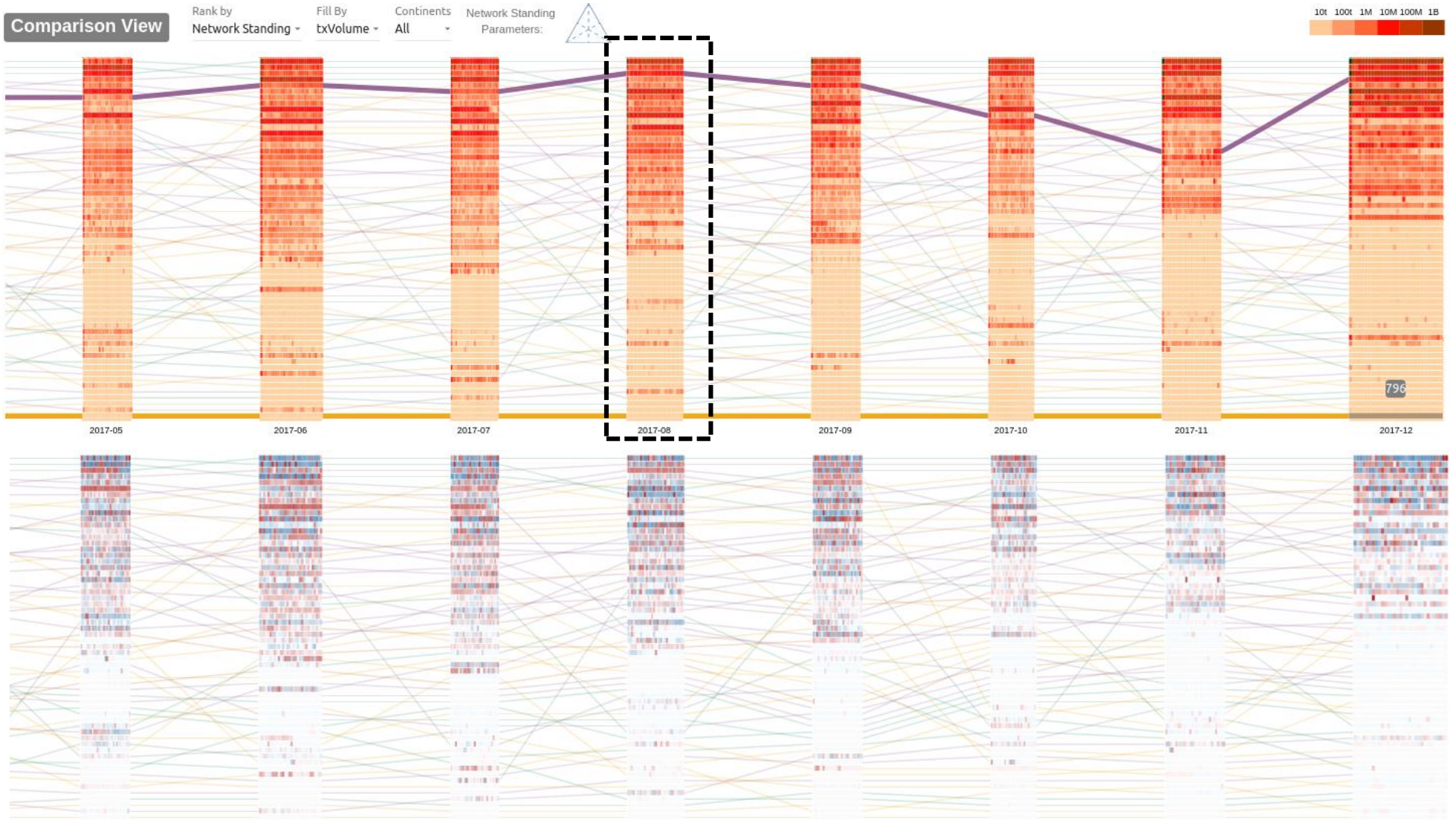
Arc Represent Market Share

Arrow represent Send/receive on a daily basis

Visual design – Comparison View

Fill by Transaction Volume

Fill by Surplus



Case Study:
Effect of Chinese policy

Case Study:

Effect of BitGo service

BitGo®

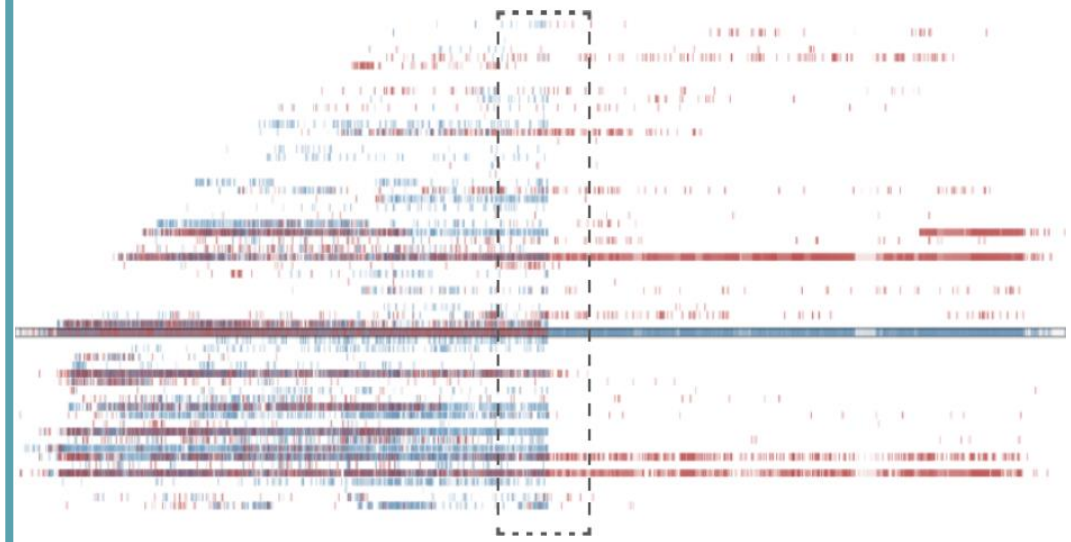
Case study 2 – Effect of BitGo service

What is BitGo ?

- Multisignature Bitcoin wallet service to make transaction more secure
- Reduce transaction confirmation time
- Used by Kraken and Bitfinex

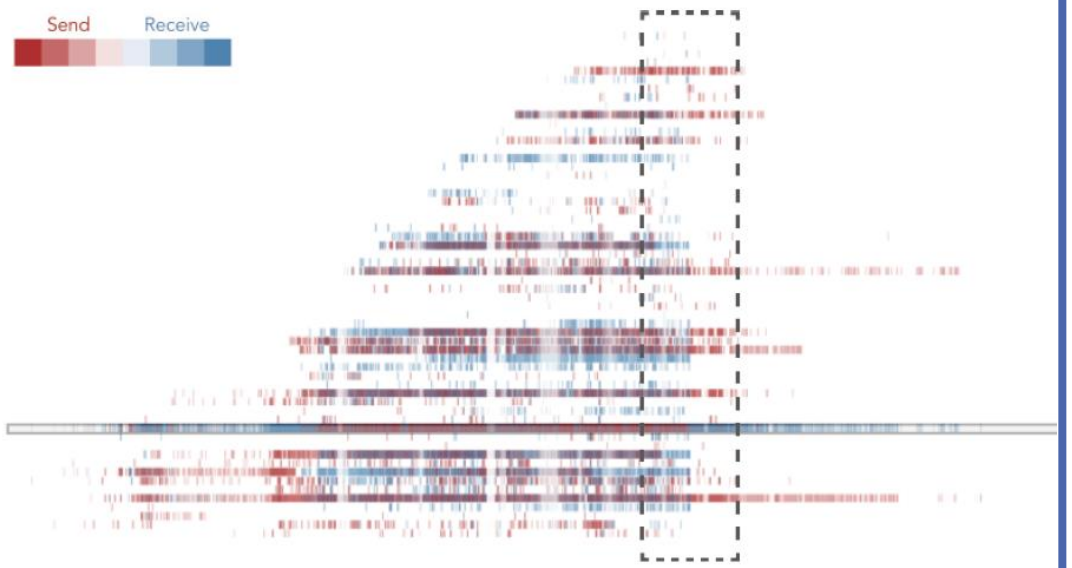
Case study 2 – Effect of BitGo service

kraken



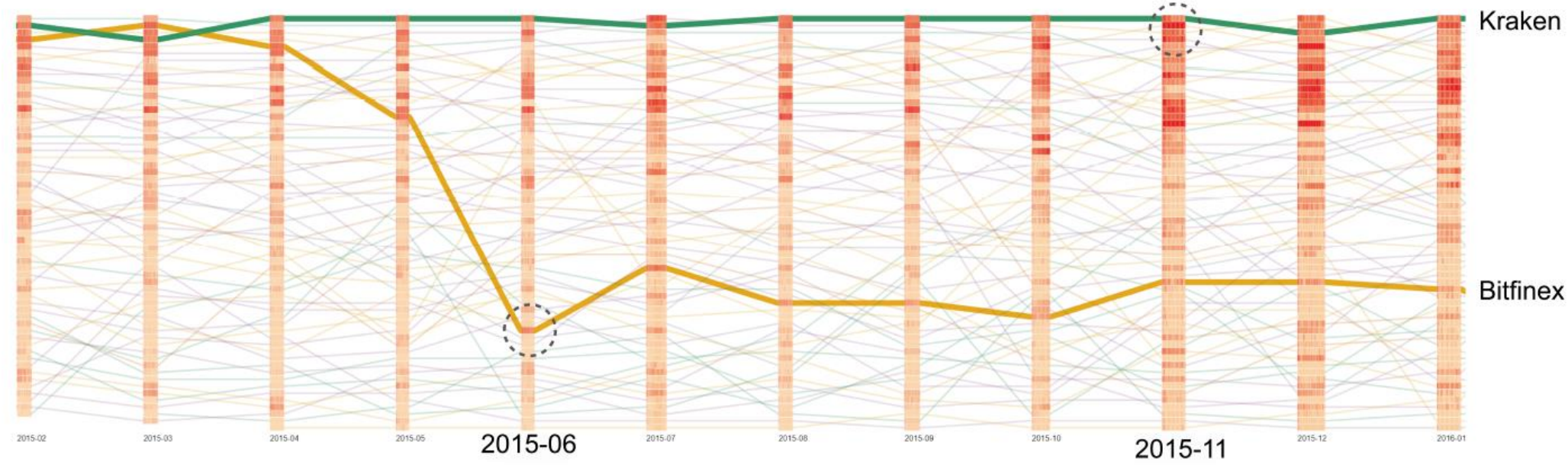
- In November, 2015, Kraken stopped sending out Bitcoins to its partners.

BITFINEX



- In June 2015, Bitfinex stopped sending out Bitcoins to its partners

Case study 2 – Effect of BitGo service



kraken
Bitcoin Exchange

Kraken kept most of its Bitcoin in its own wallet and transferred only a necessary amount to the BitGo hot wallet, its network standing remained unaffected

BITFINEX

By adjusting the weighting scheme, we find that this drop was mainly caused by the increase in balance volatility

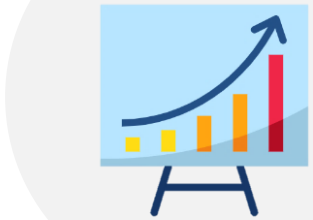
Bitfinex maintained only a small amount of Bitcoin in its old wallet, which made its wallet volatility quite high.

Conclusion and future work

Data collection and storage

Data warehouse and analysis

Visualization



Domain expert interview

Conclusion and future work

Make it real-time

Real-time scrapper to fetch transaction data

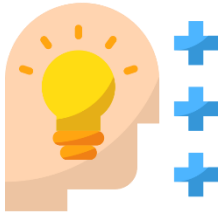
Real-time analysis to update the online system

BitExTract will be ***REAL-TIME***

Short-term impact analysis

cryptographic attacks related with cryptocurrency payments

Bitcoin forks, or dramatic price fluctuation

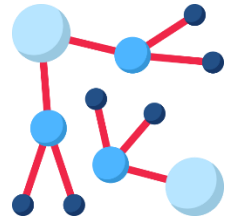


BitExTract can ***REASON***

Extend to other cryptocurrencies

Can be extended to other proof-of-work frameworks

Users can compare various crypto-currencies

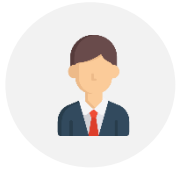


BitExTract is ***EXTENDABLE***

Acknowledgement

Dr. Huamin Qu

Hosting this Final Year Project and consistently guide us along the way, including the paper submission



Dr. Dimitrios Papadopoulos,
Dr. Dik Lun LEE

Guiding us along this project

Ted Spaeth

Helping us check the language use for paper submission and reports

Xuanwu Yue,
Xinhuan Shu

Working together for the paper submission

Q & A


BitExTract: Interactive Visualization for Extracting Bitcoin Exchange Intelligence
Comparison View
Exchanges List
Massive Sequence View
Connection View