



Lightning Network

Identifying Beneficial Connection Types in a Payment Channel Network

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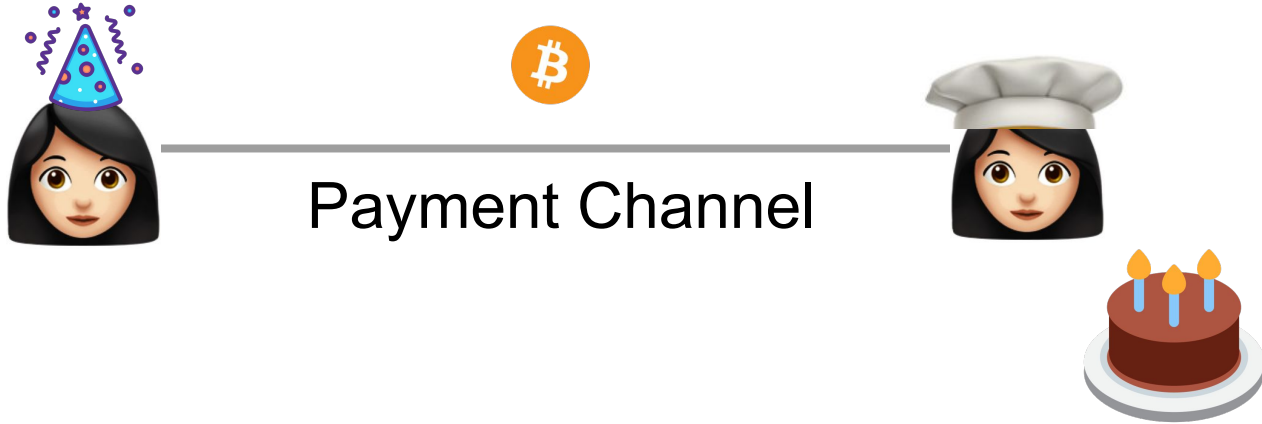
Welcome to EvaWorld



Making digital payments



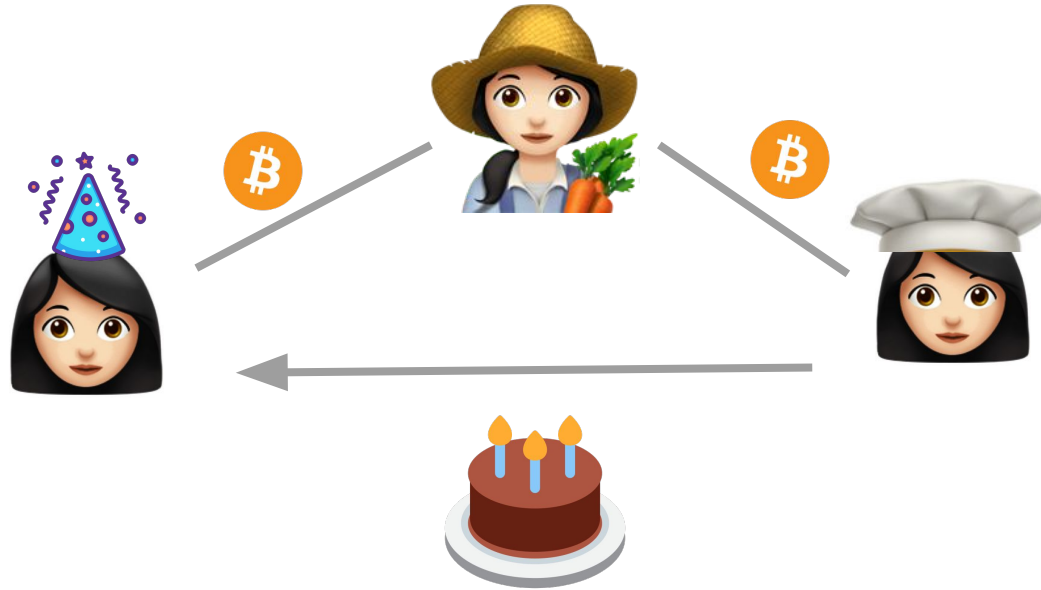
Cryptocurrencies!



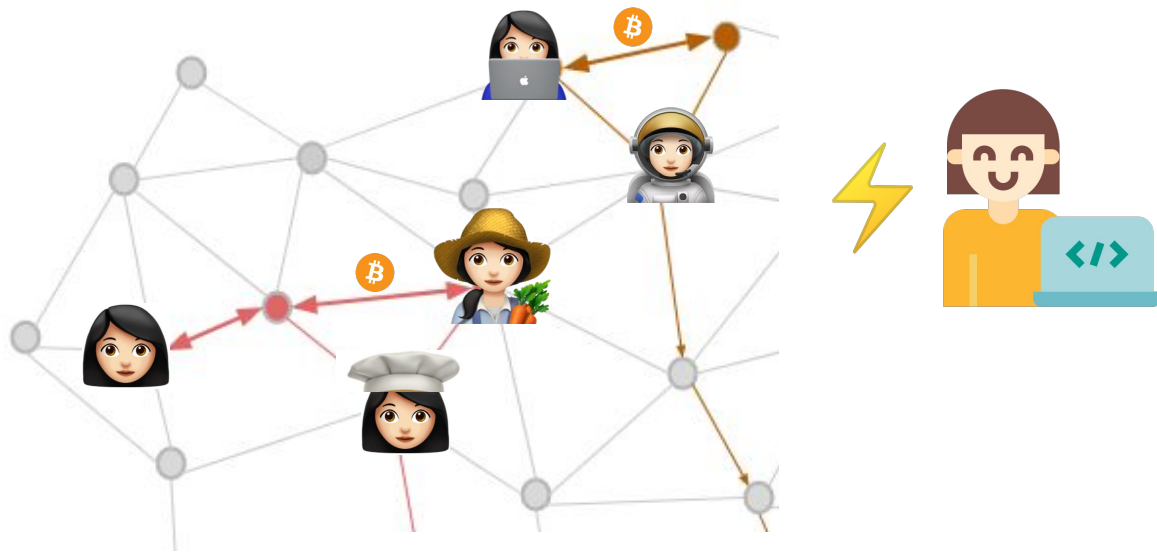
Payment Channels require effort to set up



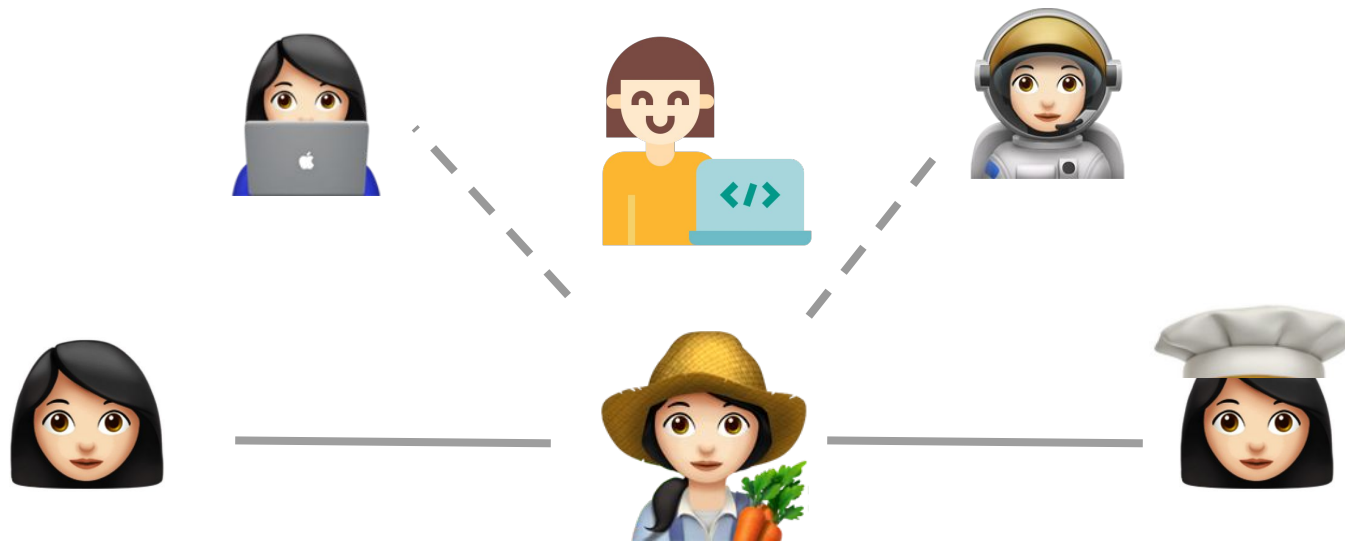
Let's get help from others to send Transactions



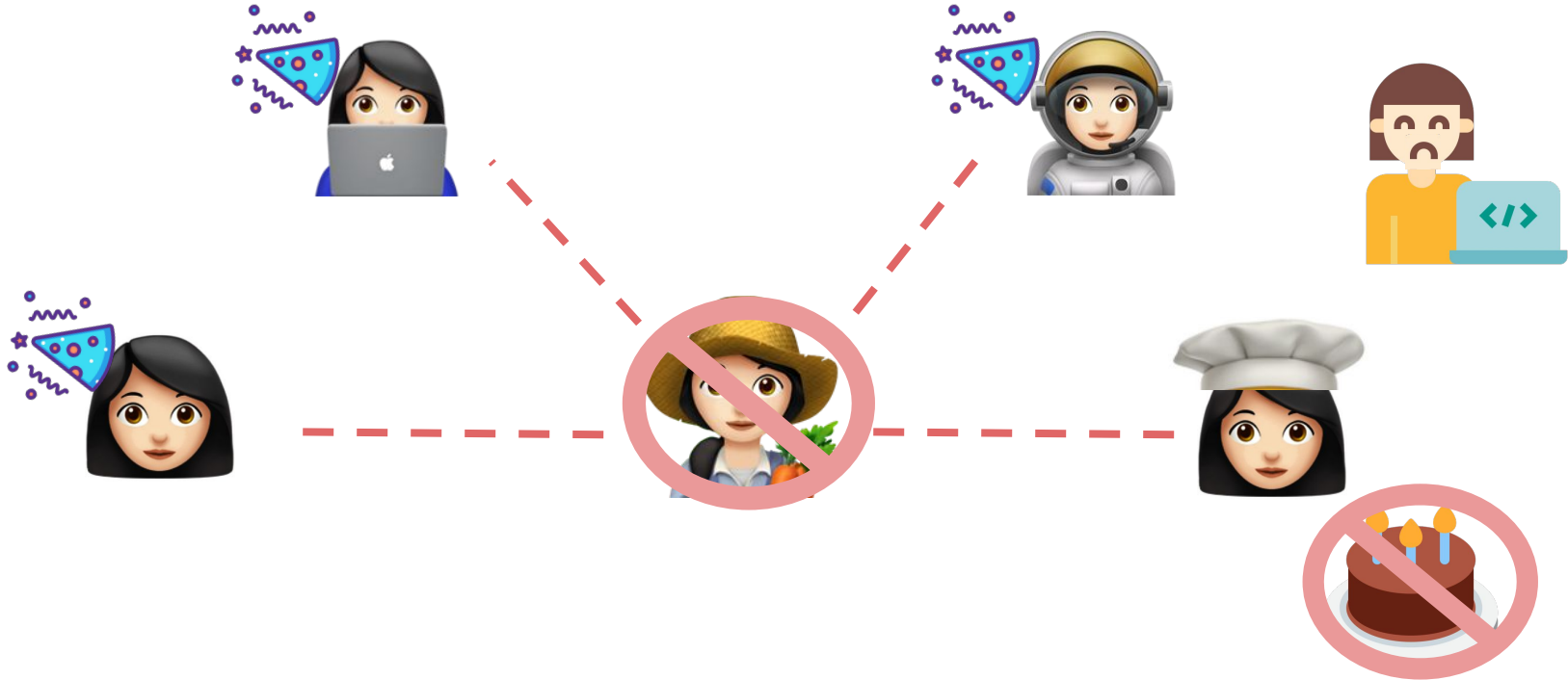
Payment Channel Network: Lightning



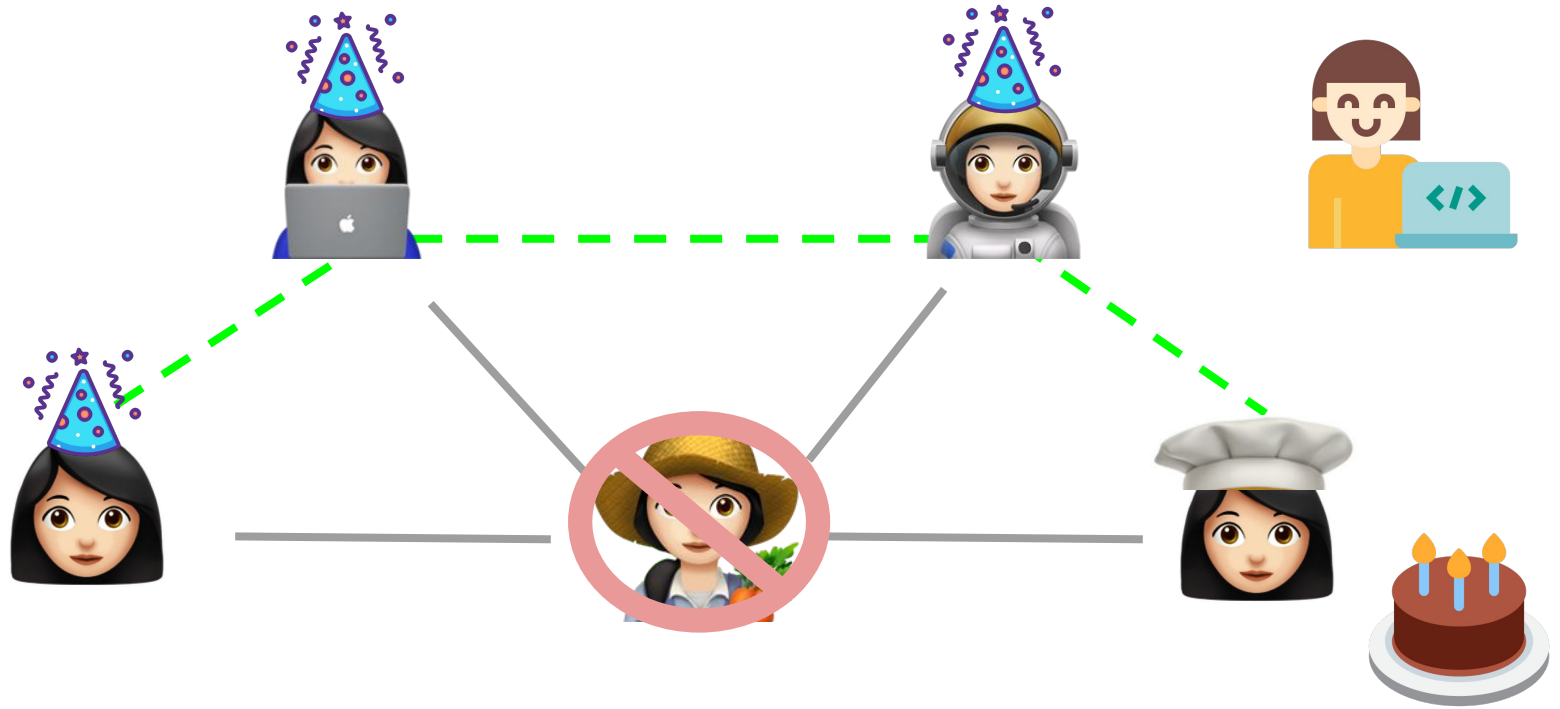
Fewer Hops = Speedy Network



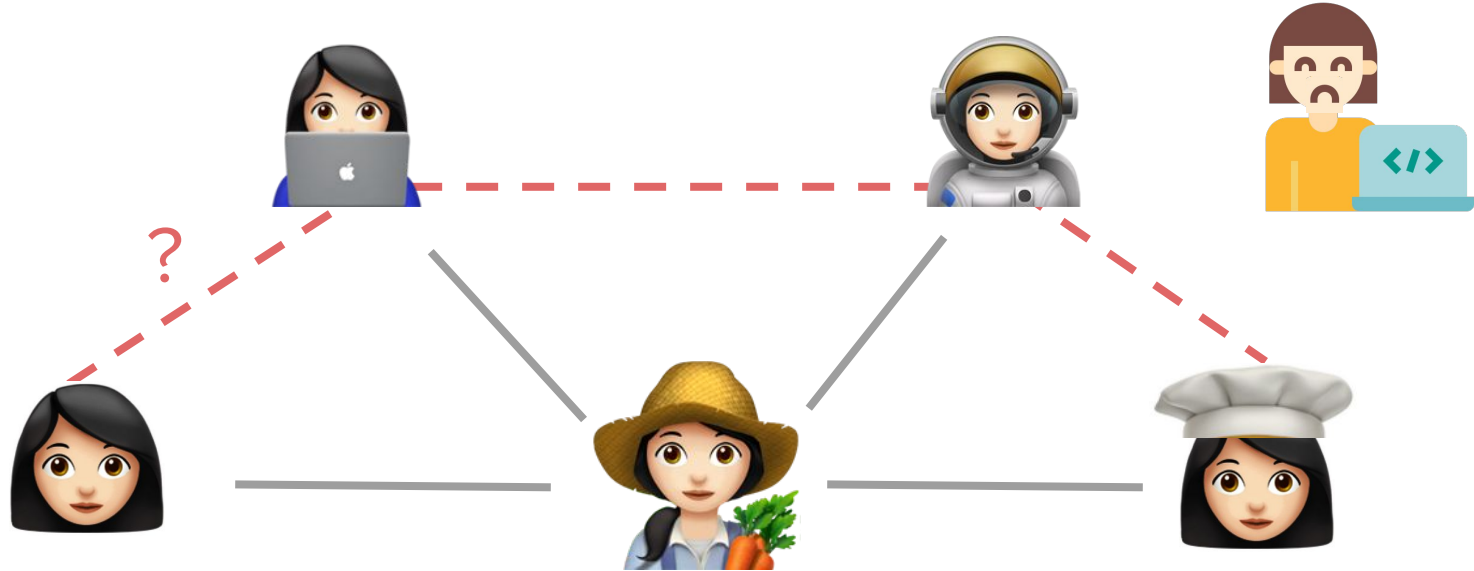
What if the network becomes too reliant on one participant?



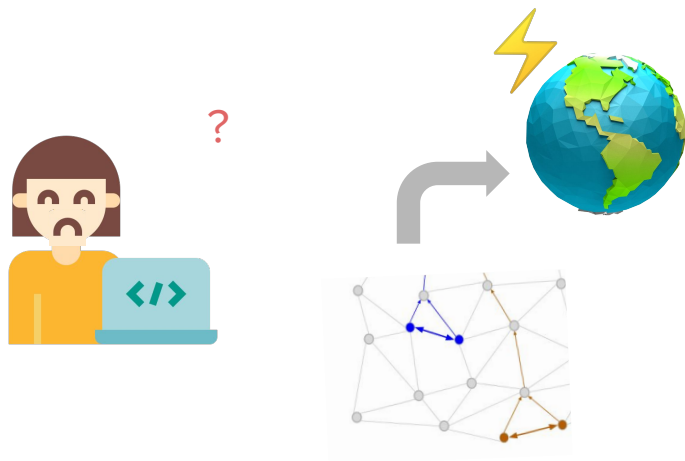
Alternative connections = Robust network



What if some of them don't benefit by connecting?



The Developer's problem: Finding the right connections



Goals

- Speed
- Robust
- Individually beneficial

Possible Approaches

- Analytical **X**
- Numerical Optimizations **X**
- Simulations **X**

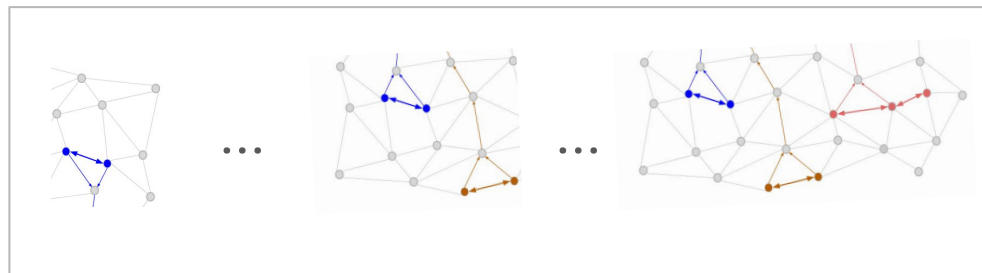
Research Questions

RQ1: *How are the different **types** of pair-wise **connections** **predictive** of the Lightning Network's **payment speed** and **robustness** over time?*

RQ2: *Do the types of connections that produce positive network outcomes also **benefit individual** participants?*

Methodology

36k Network snapshots over 2 years



5 Semi-structured interviews



Clustering and Linear Regression
Analysis

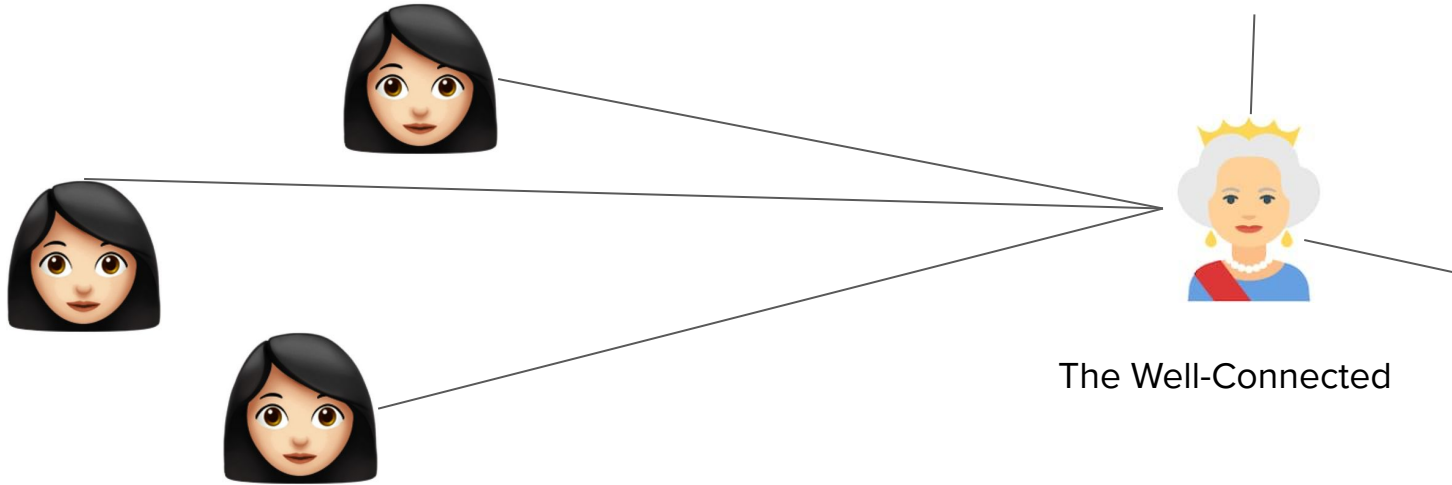
- ❑ Participant characteristics
- ❑ Network Properties Calculation

Results

Research Questions

RQ1: How are the different **types** of pair-wise **connections** **predictive** of the Lightning Network's **efficiency** and **robustness** over time?

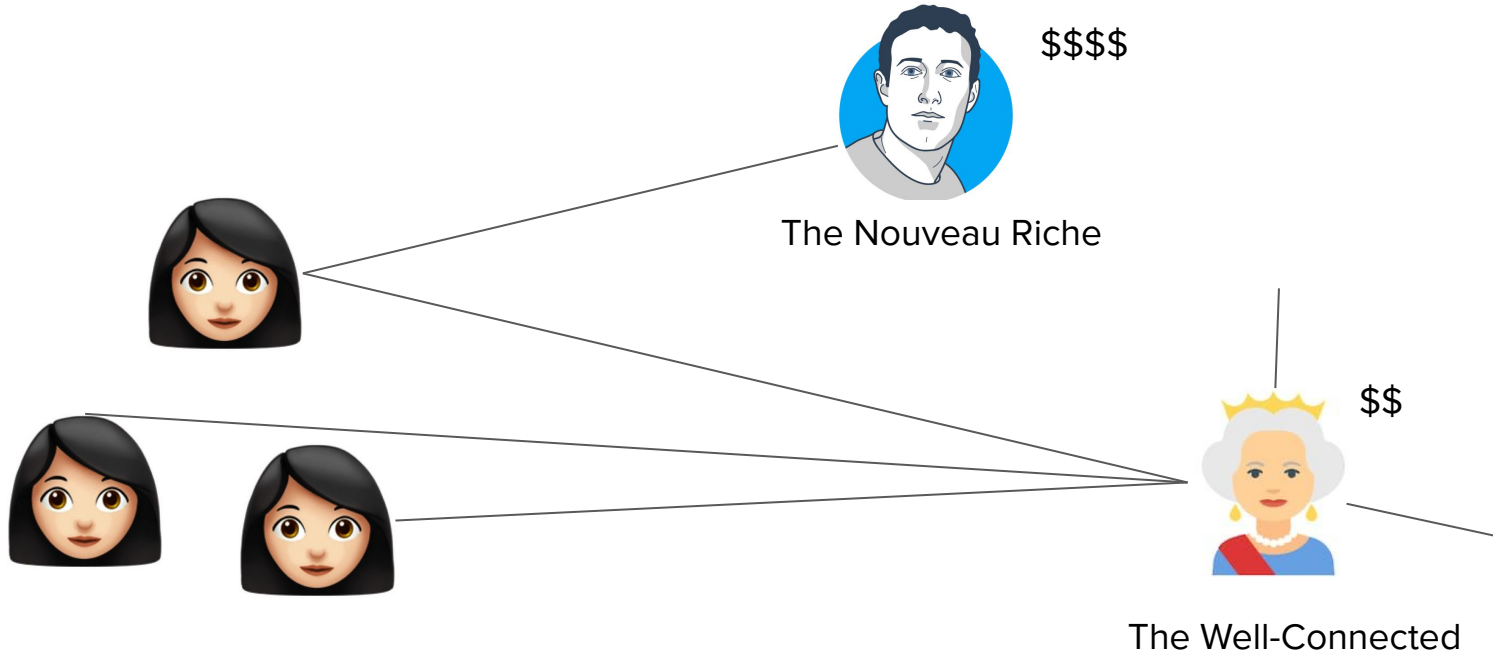
Participant Types



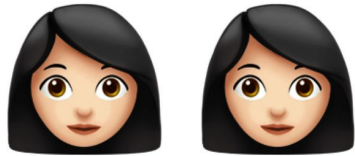
The 99%

The Well-Connected

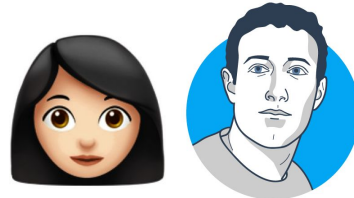
Three Salient Participant Types



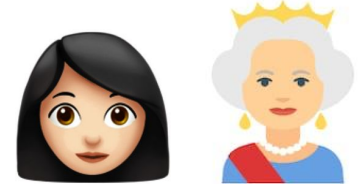
Three Salient Connection Types



The 99%

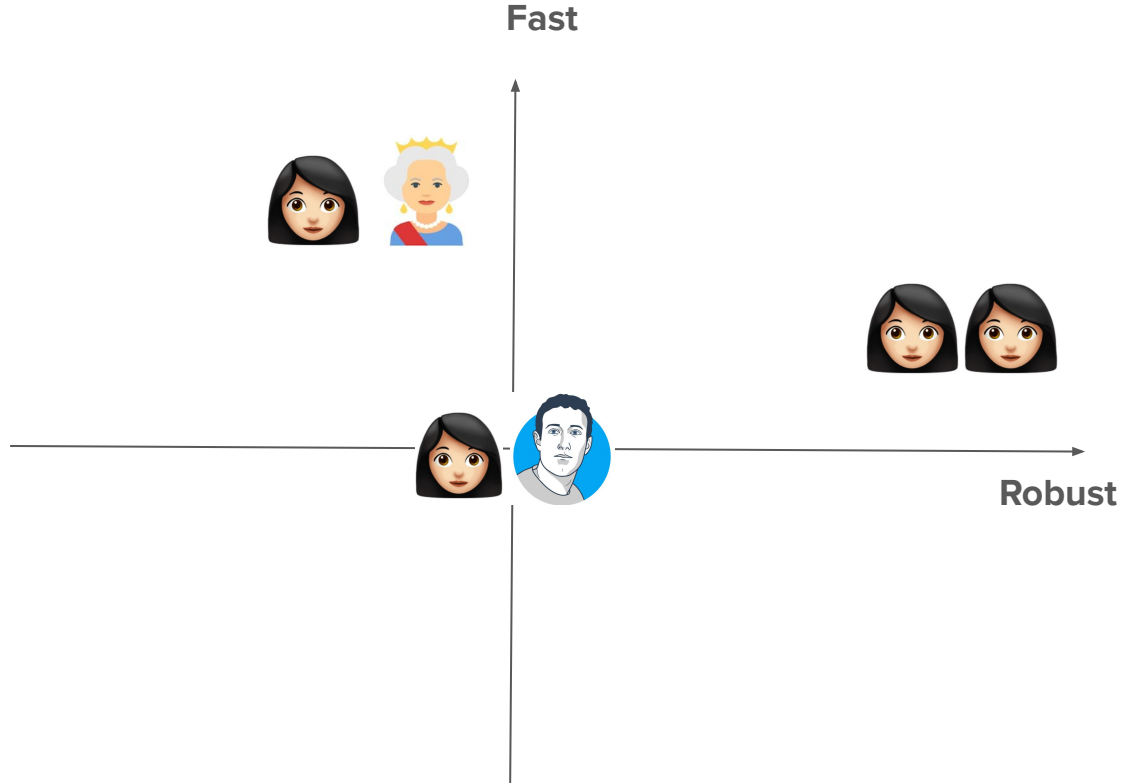


The 99% - The Nouveau Riche

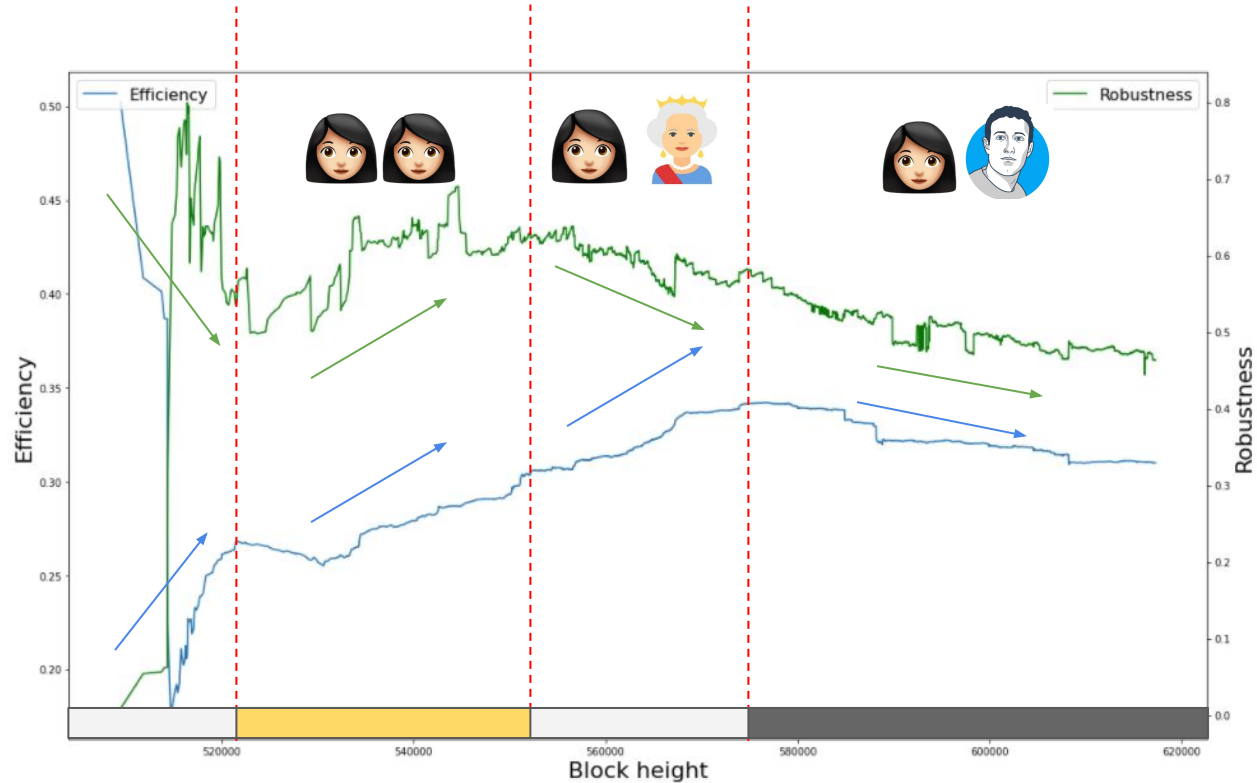


The 99% - The Well-connected

Effects of Connection Types on the Network



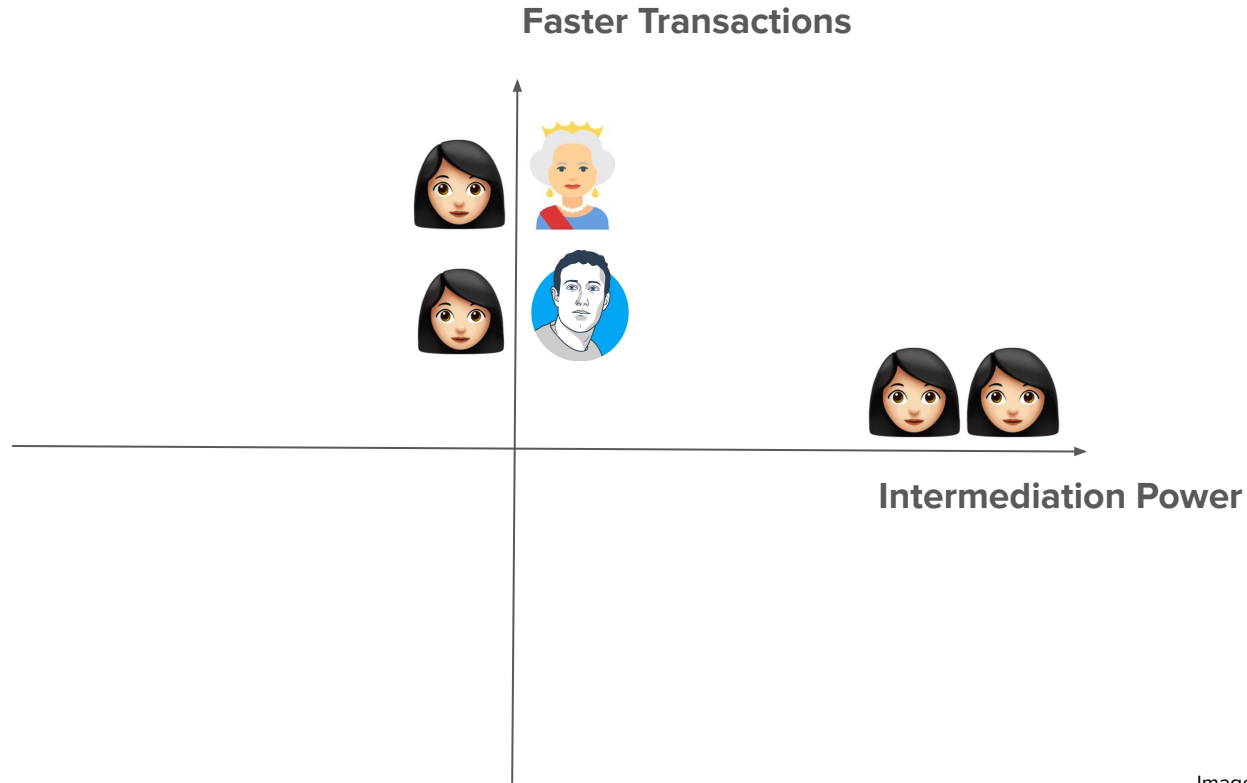
Network Evolution



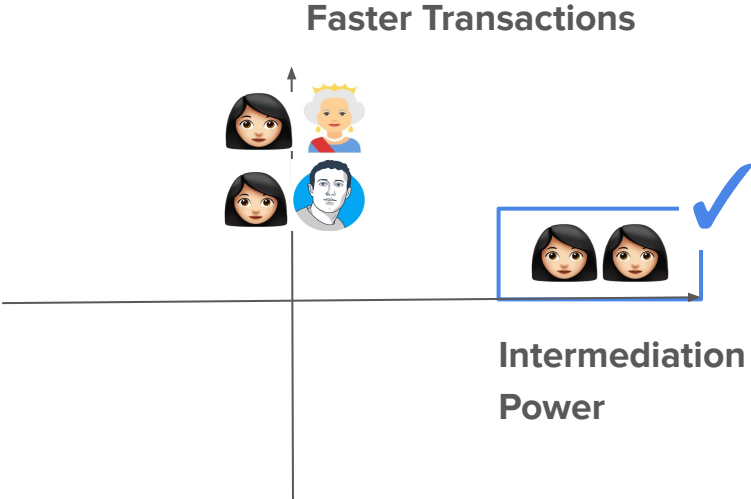
Research Questions

RQ2: *Do the types of connections that produce positive network outcomes also **benefit individual** participants?*

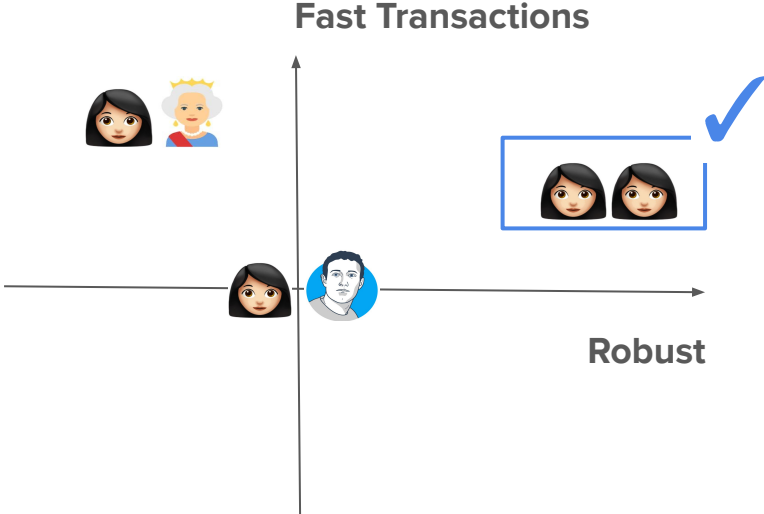
Effects of Connection Types on Individuals



Conclusion



Pair-wise Benefits



Network Benefits



Thank You

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