Reputation System

Generalized Ontology, Temporal Graph Architecture, Temporal Weighted Liquid Rank

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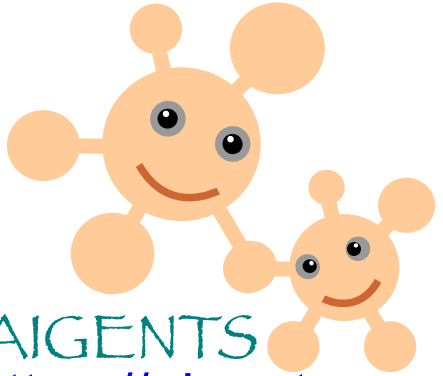

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Reputation System – Solving Problems

Marketplaces	Churning and gaming ratings
News filtering	Fake news, information wars
Social Networking	Spam, abuse, harassment
Socio-psychological security	Broken relationships
Financial security	Scam
Blockchain consensuses	Consensus takeover
Democratic Governance	State instability

Reputation System - Ingredients

Data:

Ratings
Stakes
Payments
Spendings
Reviews
Mentions
Tips
etc.

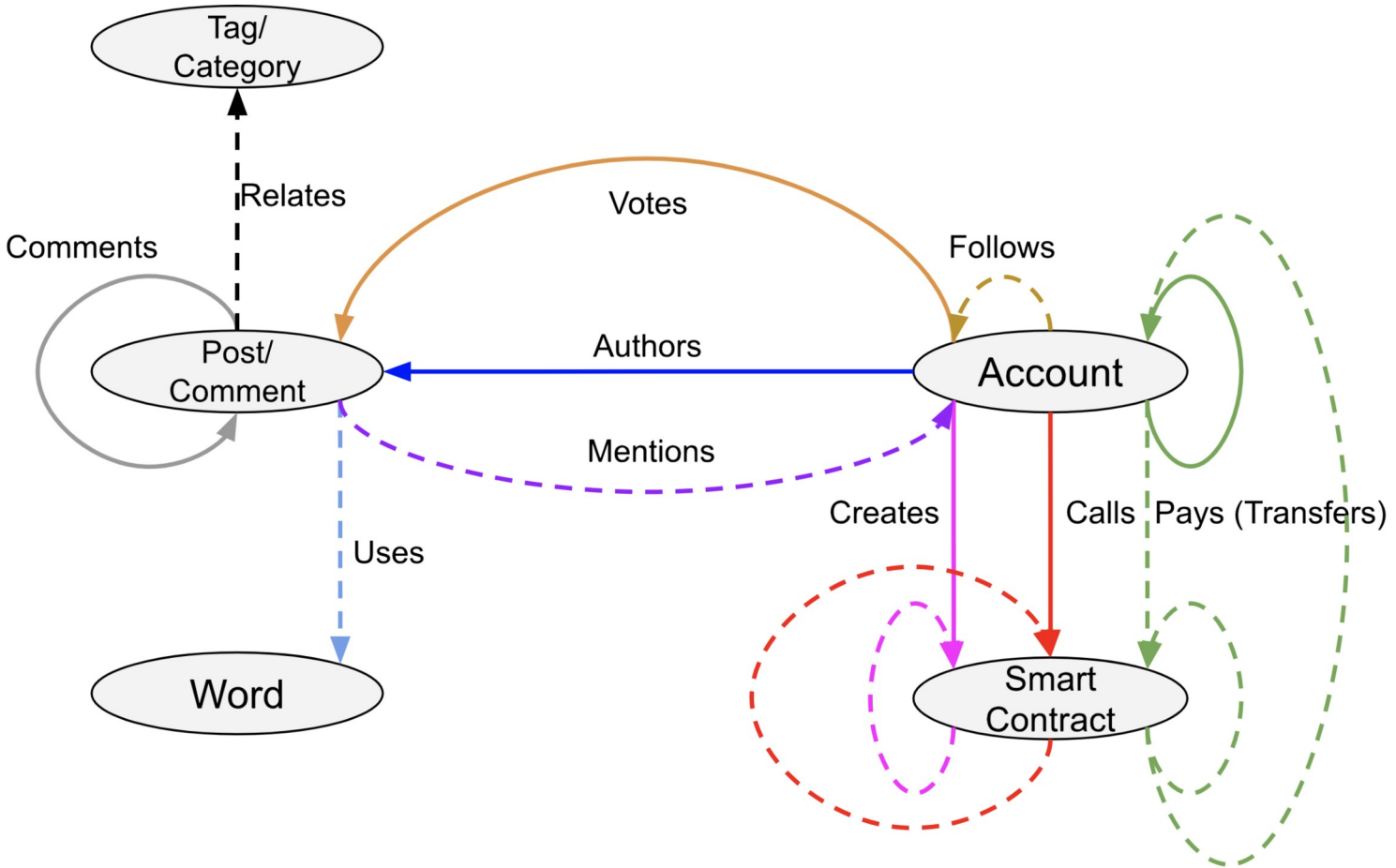
Principles:

Liquid ranking!
Weighted ranking!
Time scoping!
Data openness!
Code openness?
Human precedence?
Non-anonymity?
No right to oblivion?

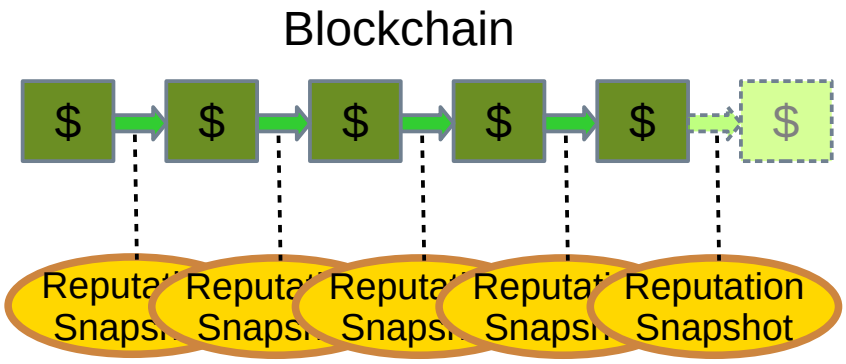
Results:

Rank
Reputation
Karma
Social capital

Reputation System – Generalized Ontology

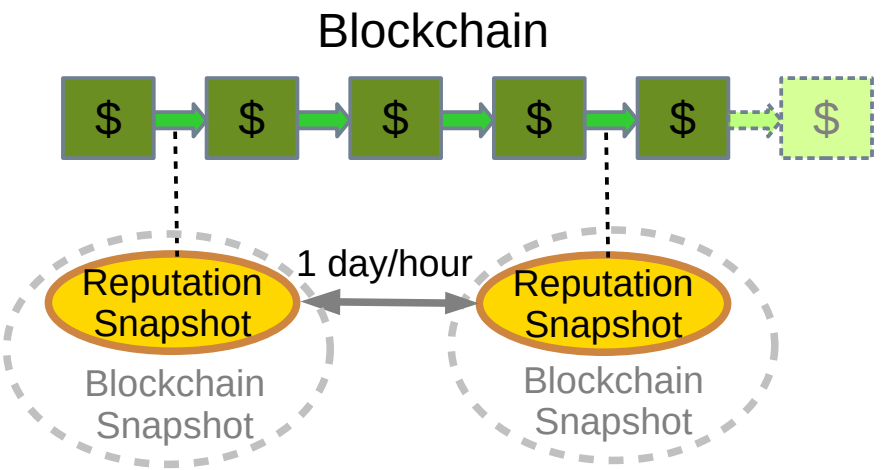


Reputation Temporal Graph and Synchronization Options



Block-wise
(expensive)

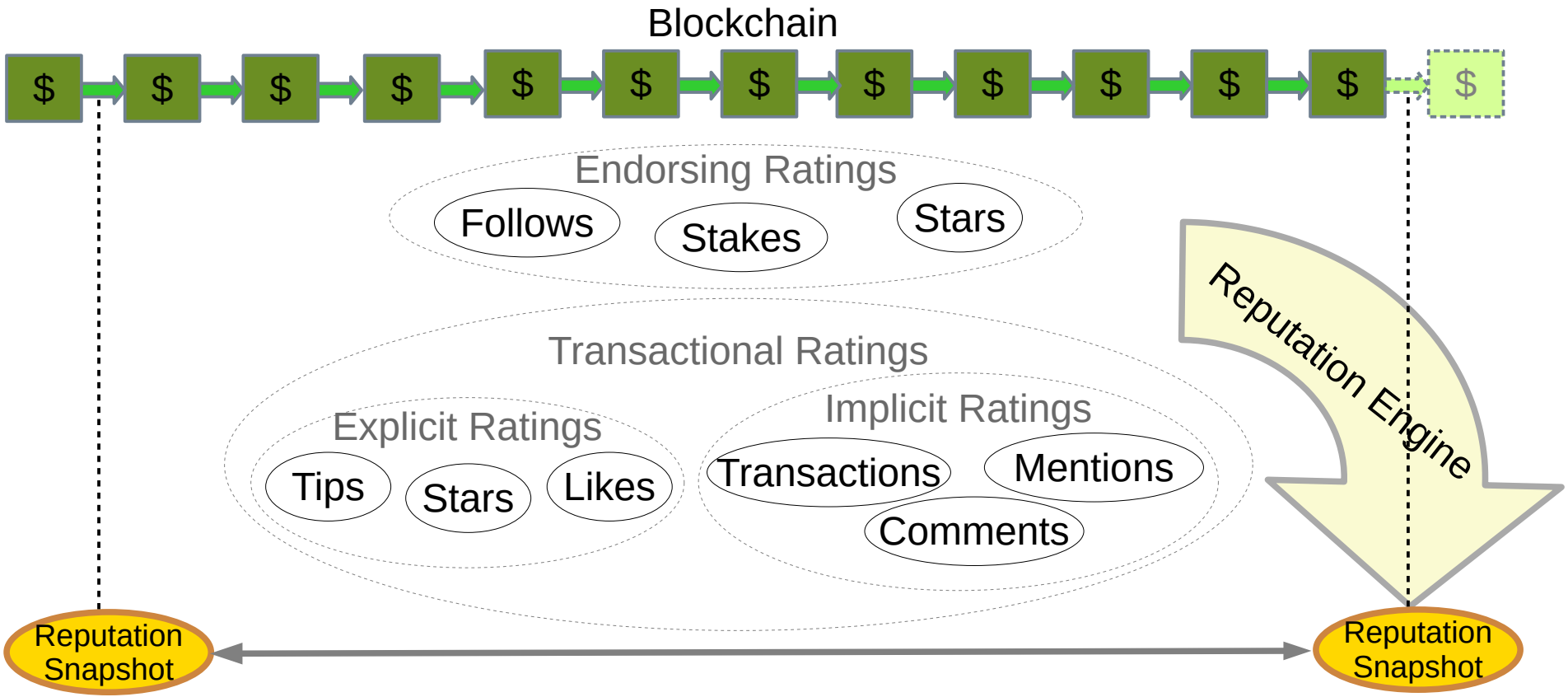
Transaction-wise
(prohibitively expensive)



Periodic
(optimal)

A Reputation System for Artificial Societies
Anton Kolonin, Ben Goertzel, Deborah Duong, Matt Ikle
https://arxiv.org/pdf/1806.07342.pdf

Reputation Snapshots and Rating Sources



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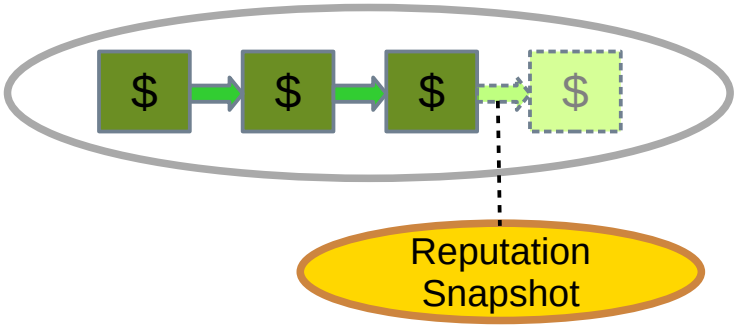
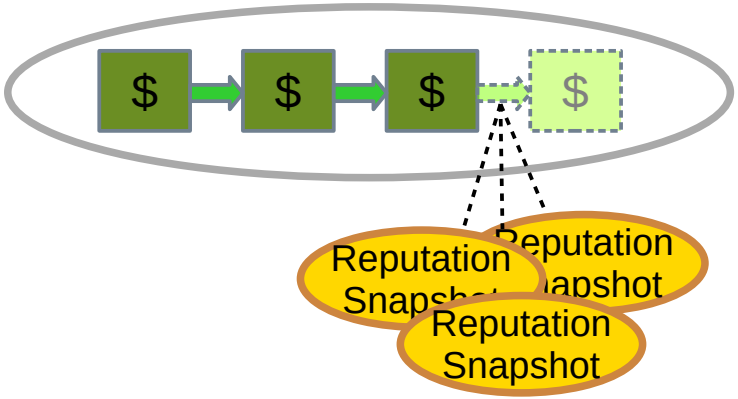
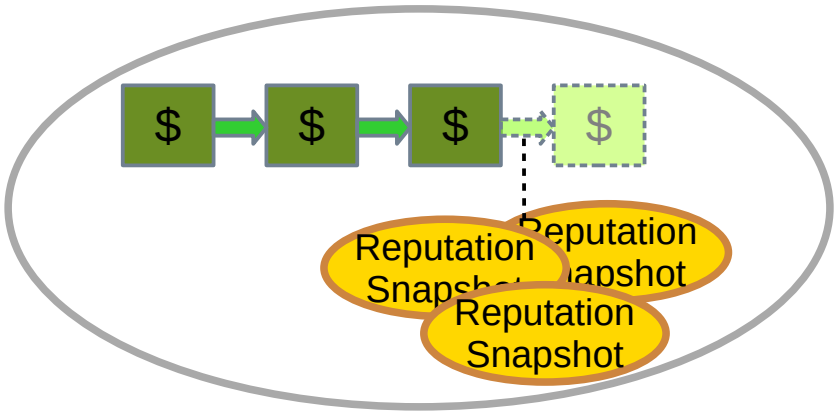
Reputation Consensus Engine – Design Options



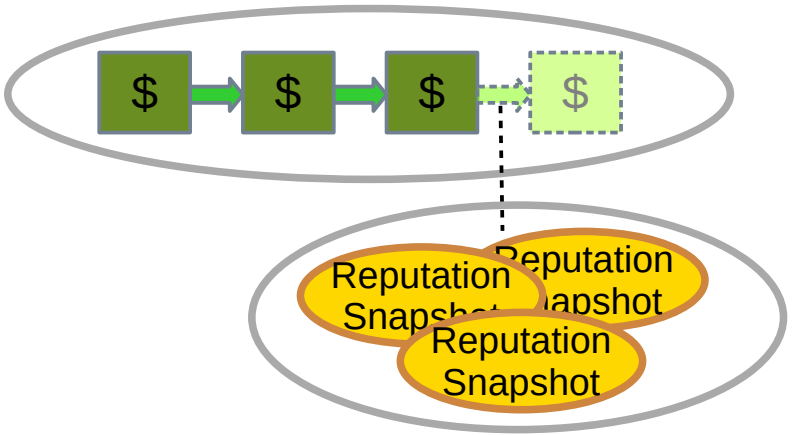
Centralized off-chain



Decentralized off-chain



Decentralized on-chain (reputation mining)



Decentralized side-chain (reputation consensus)

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Temporal
Weighted
Liquid Rank

A Reputation System for Multi-Agent Marketplaces

Anton Kolonin, Ben Goertzel, Cassio Pennachin, Deborah Duong, Matt Iklé , Nejc Znidar, Marco Argentieri

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https://github.com/singnet/reputation

https://github.com/aigents/aigents-java/blob/master/src/main/java/net/webstructor/peer/Reputationer.java

Reputation System Engine

Algorithm 1 Weighted Liquid Rank (simplified version)

Inputs:
1) Volume of rated transactions each with financial value of the purchased product or service and rating value evaluating quality of the product/service, covering specified period of time;
2) Reputation ranks for every participant at the end of the previous time period.
Parameters: List of parmeters, affecting computations - default value, logarithmic ratings, conservatism, decayed value, etc.
Outputs: Reputation ranks for every participant at the end of the previous time period.

1: **foreach of** *transactions* **do**
2: **let** *rater_value* be rank of the rater at the end of previous period of default value
3: **let** *rating_value* be rating supplied by trasaction rater (consumer) to ratee (supplier)
4: **let** *rating_weight* be financial value of the transaction of its logarithm, if logarithmic ratings parameter is set to true
5: **sum** *rater_value*rating_value*rating_weight* for every ratee
6: **end foreach**
7: **do** normalization of the sum of the muliplications per ratee to range *0.0-1.0*, get *differential_ranks*
8: **do** blending of the old_ranks known at the end of previous peiod with differential_ranks based on parameter of conservatism, so that *new_ranks = (old_ranks*conservatism+N*(1-differential_ranks))*, using decayed value if no rating are given to ratee during the period
9: **do** normalization of *new_ranks* to range *0.0-1.0*
10: **return** *new_ranks*

- R_d - default initial reputation rank;
- R_c - decayed reputation in range to be approached by inactive agents eventually;
- *C* - conservatism as a blending "alpha" factor between the previous reputation rank recorded at the beginning of the observed period and the differential one obtained during the observation period;
- *FullNorm* – when this boolean option is set to *True* the reputation system performs a full-scale normalization of incremental ratings;
- *LogRatings* - when this boolean option is set to *True* the reputation system applies *log10(1+value)* to financial values used for weighting explicit ratings;
- *Aggregation* - when this boolean option is set to *True* the reputation system aggregates all explicit ratings between each unique combination of two agents with computes a weighted average of ratings across the observation period;
- *Downrating* - when this boolean option is set to *True* the reputation system translates original explicit rating values in range *0.0-0.25* to negative values in range *-1.0* to *0.0* and original values in range *0.25-1.0* to the interval *0.0-1.0*.
- *UpdatePeriod* – the number of days to update reputation state, considered as observation period for computing incremental reputations.

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Reputation System for Social and Online Media

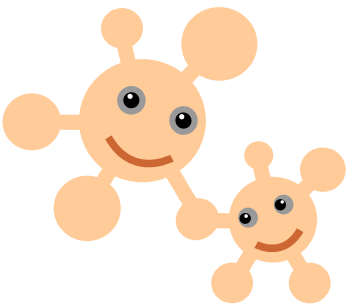
Aigents® Social Computing Platform

Blockchains

Ethereum

Steemit

Golos.id



Social Networks

VKontakte

Twitter

Reddit

Messengers

Slack

Telegram

Forums

Discourse

Unified Liquid Rank Reputation computation across diverse social media platforms

https://arxiv.org/abs/1912.00176

https://aigents.medium.com/aigents-bot-for-telegram-groups-1dba32140047

https://aigents.com/

https://github.com/aigents/aigents-java

Reputation System - Fraud Resistance

"Weighted Liquid Rank" algorithm for protection from scam identifying dishonest suppliers.

Ranks of Suppliers, dishonest Supplier (including alias) in red and honest suppliers in blue

https://arxiv.org/pdf/1905.08036.pdf
https://blog.singularitynet.io/minimizing-recommendation-fraud-7dabbee8fc00
https://aiforgood2019.github.io/papers/IJCAI19-AI4SG_paper_28.pdf

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https://singularitynet.io

Reputation System - Content Recommendation

Results Qualitative Analysis: Decision Support

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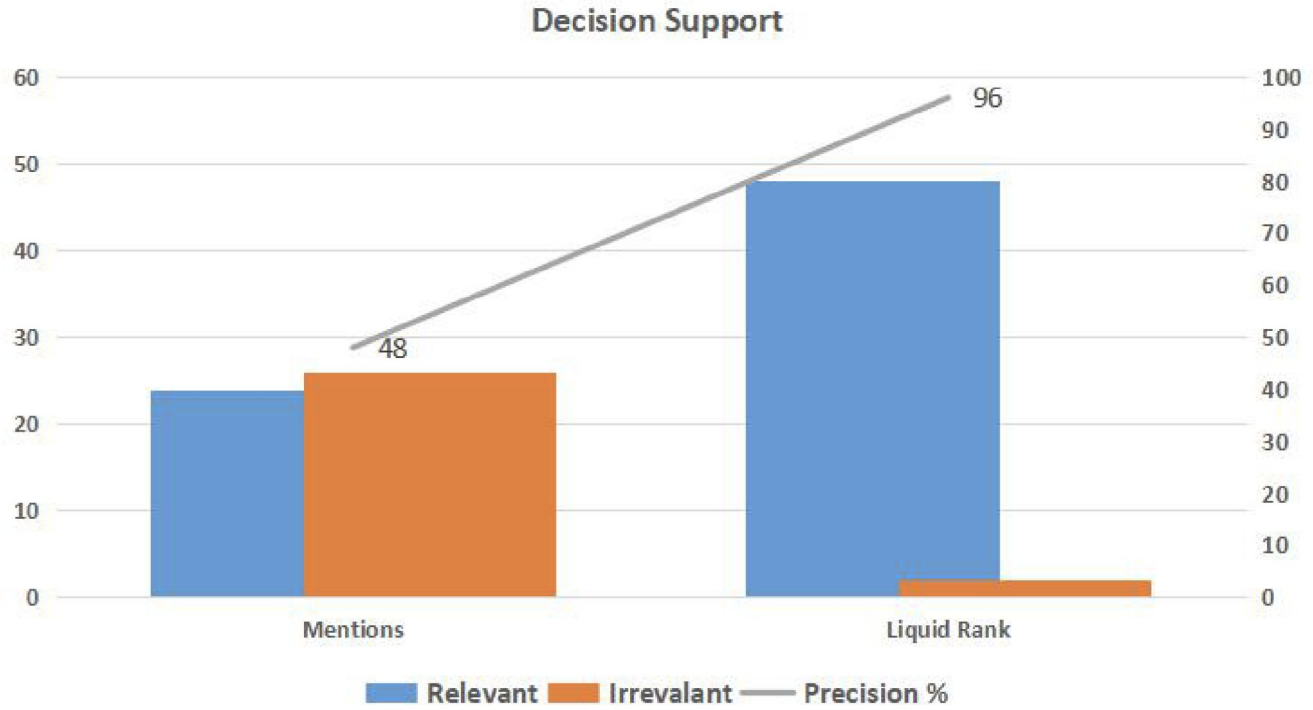
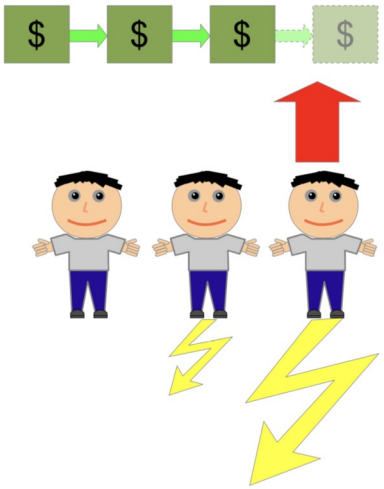


https://arxiv.org/abs/2209.07641
https://ieeexplore.ieee.org/document/9923352

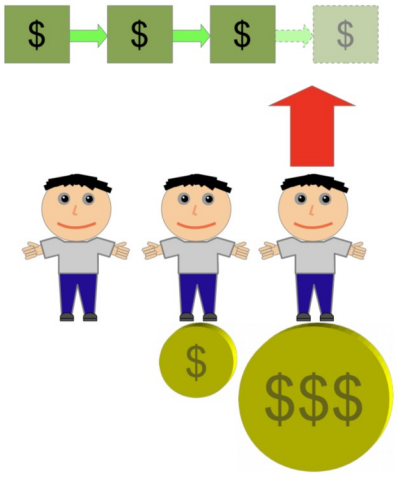
Reputation System for Blockchain Consensus

Proof-Of-Work



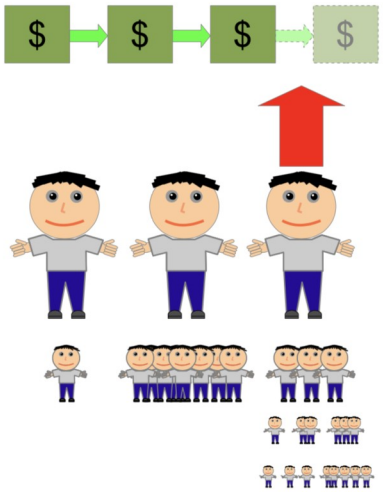
Force is Power:
Those who own more computing resources govern the network.

Proof-Of-Stake



Money is Power:
Those who have more money govern the network.

Proof-Of-Reputation



$$R_i = \sum_t \sum_j (R_j * V_{ijt})$$

Reputation is Power:
Those who earn a better reputation and a greater long-term audience base govern the network.

https://steemit.com/blockchain/@aigents/proof-of-reputation-as-liquid-democracy-for-blockchain
https://research.nsu.ru/en/publications/reputation-systems-for-human-computer-environments
https://ieeexplore.ieee.org/document/8109887

Reputation Consensus for Blockchain - Experiments

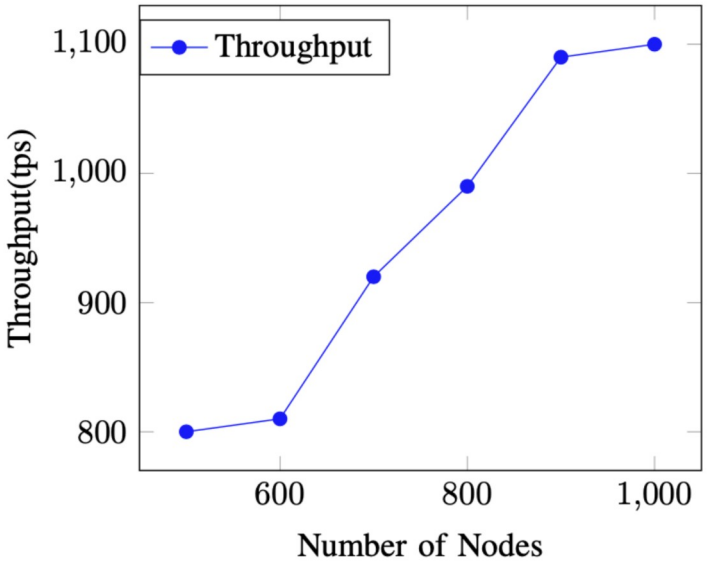


Figure 1: Throughput vs Number of network nodes

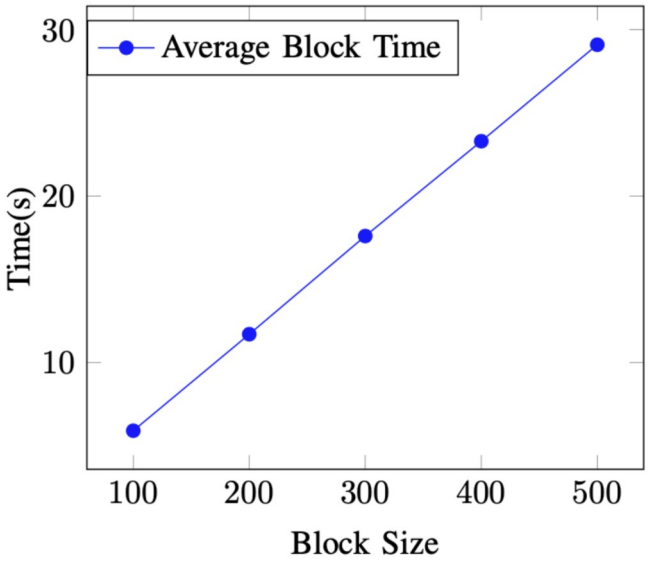


Figure 2: Average Block Time as the number of transactions in a single Block is varied

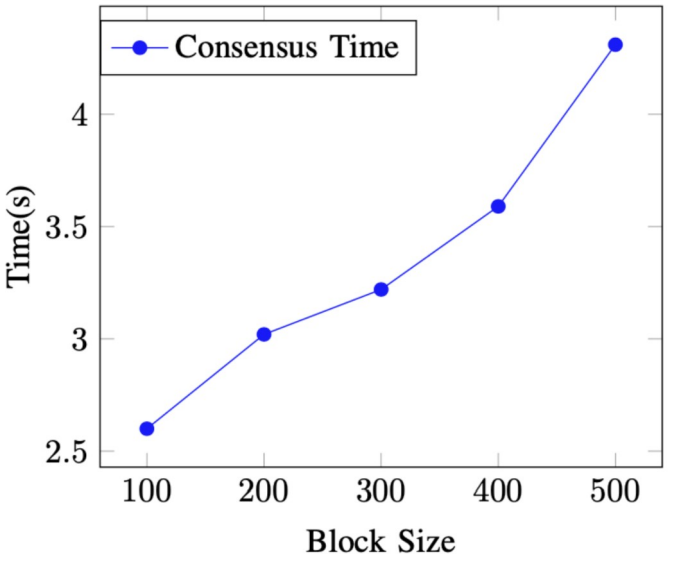
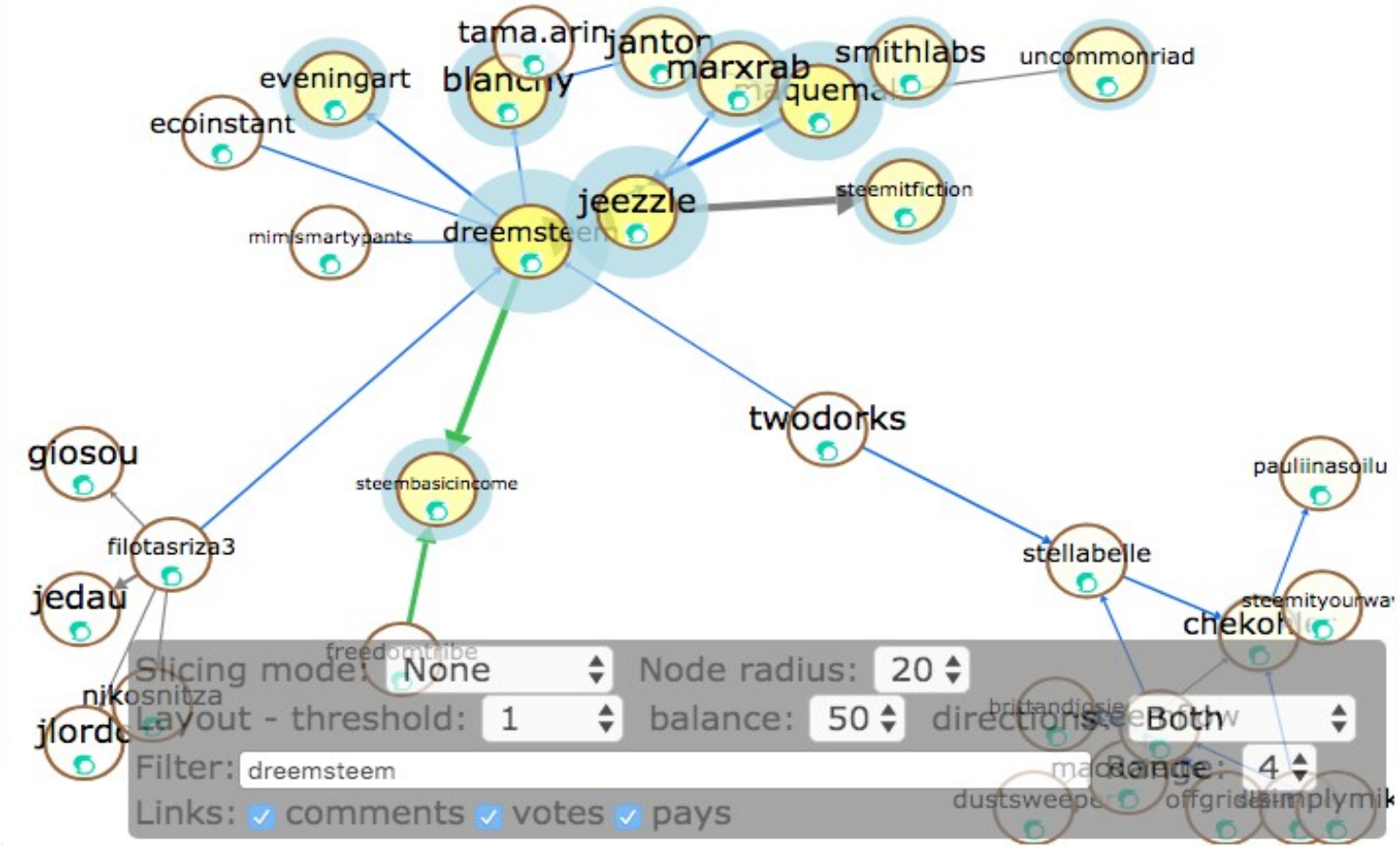


Figure 3: Consensus Time as the number of transactions in a single Block is varied

Proof-of-Reputation: An Alternative Consensus Mechanism for Blockchain Systems
Oladotun Aluko, Anton Kolonin
https://arxiv.org/abs/2108.03542
https://aircconline.com/ijnsa/V13N4/13421ijnsa03.pdf

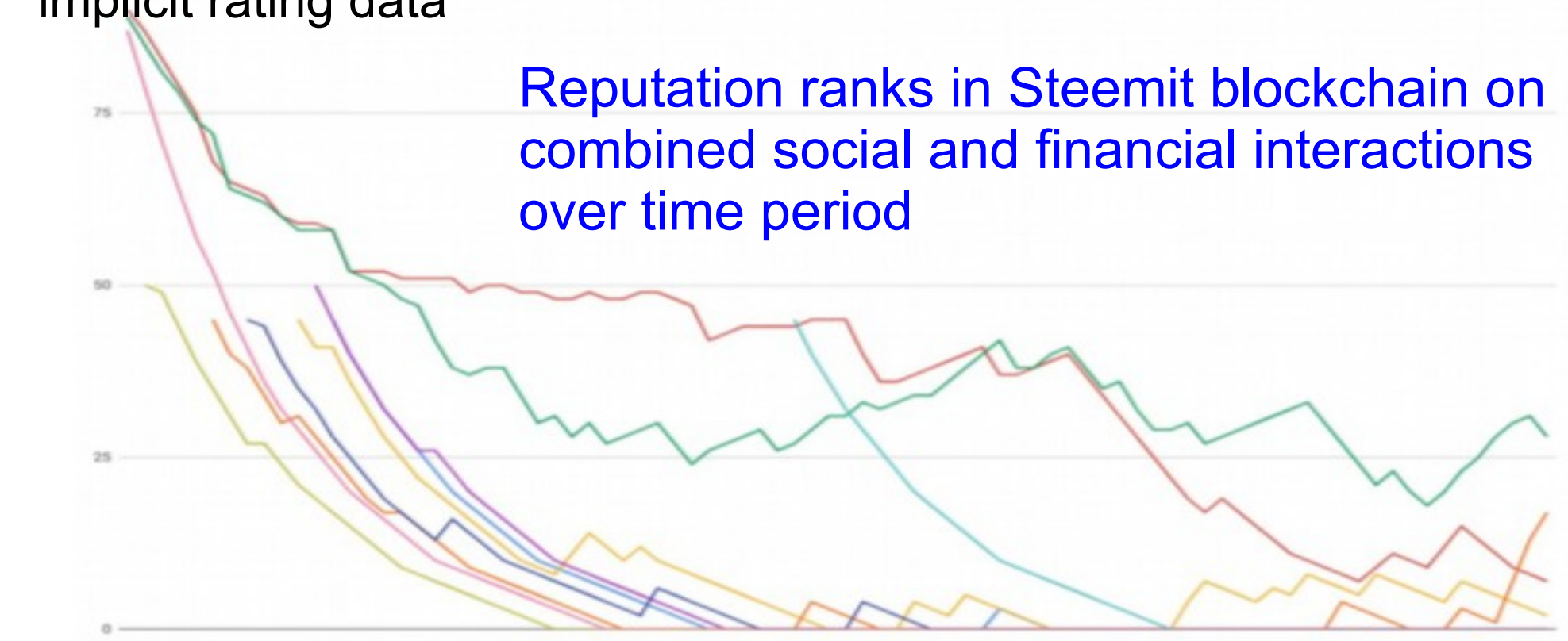
Reputation System for Financial Security

Making sense of complex socio-financial network dynamics based on synergy of financial, textual and emotional interactions in distributed online platform such as Steemit



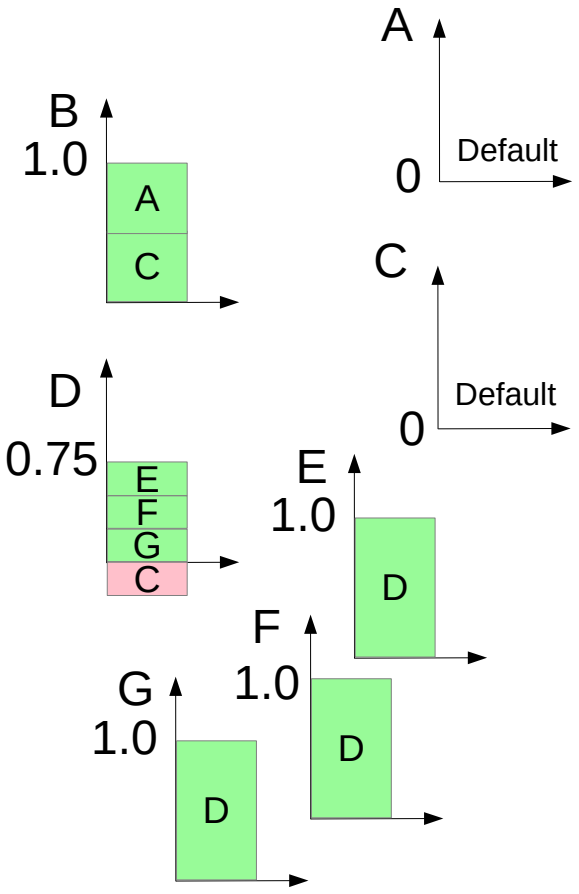
Reputation System for Financial Security

Evaluate trustworthiness and its dynamics for anonymous accounts in open public networks based on reputations computed on explicit and implicit rating data

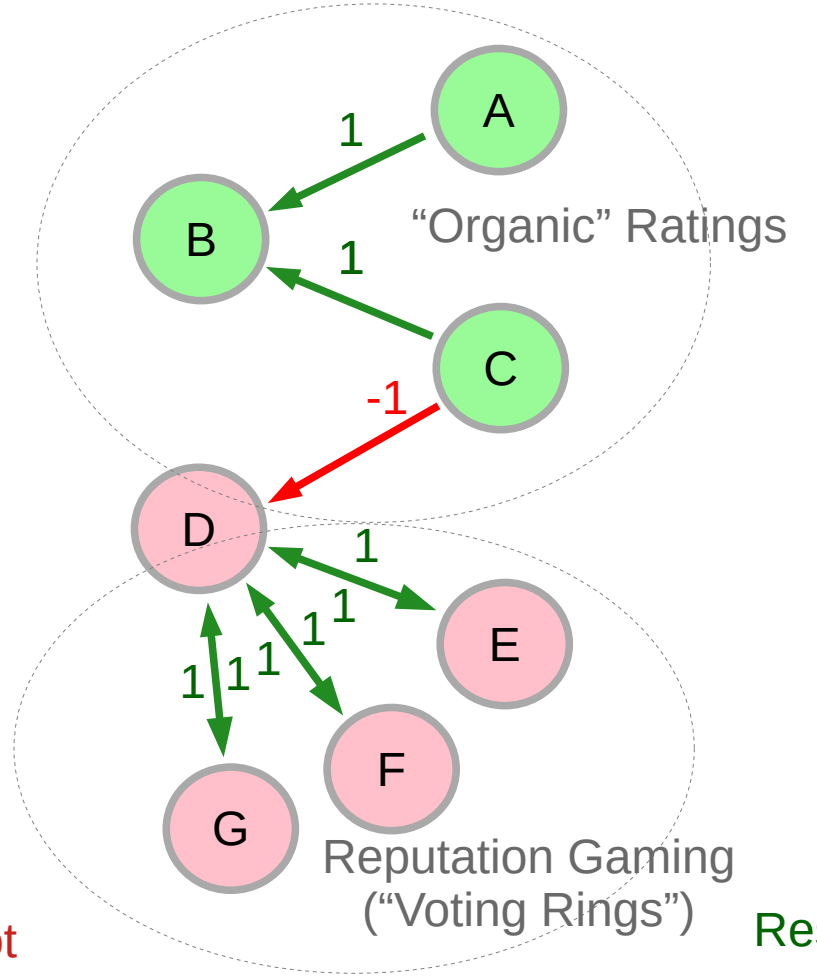


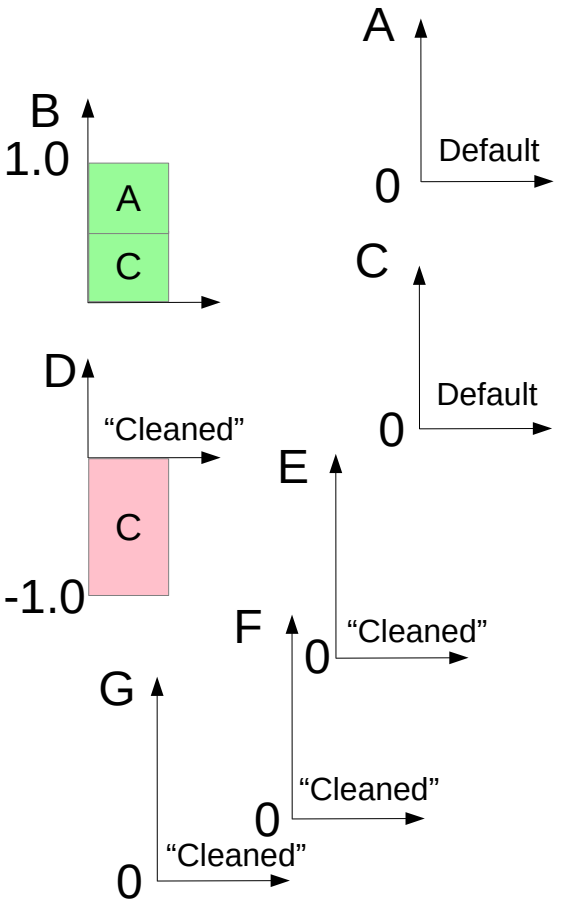
Reputation ranks in Steemit blockchain on combined social and financial interactions over time period

Next: Resisting Reputation Gaming (Churning) [1.0..-1.0]



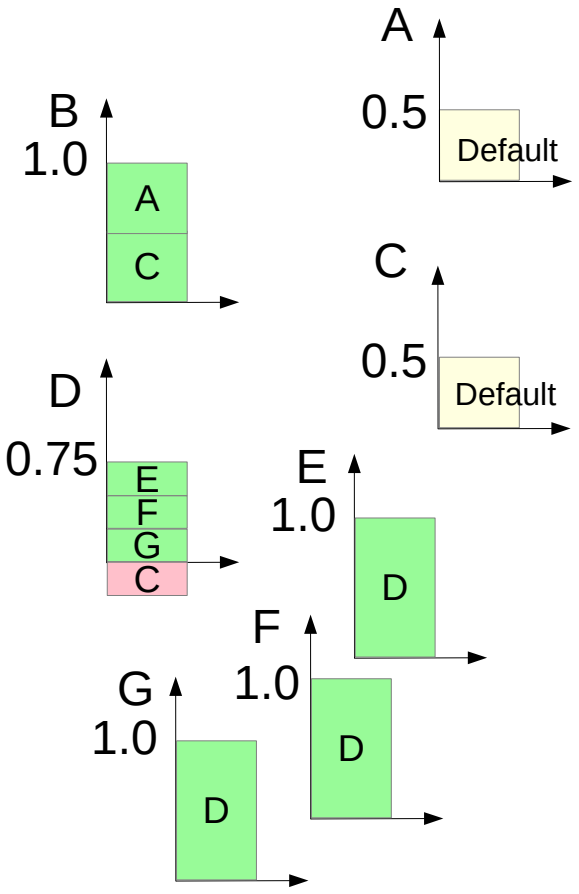
Abused Reputation Snapshot



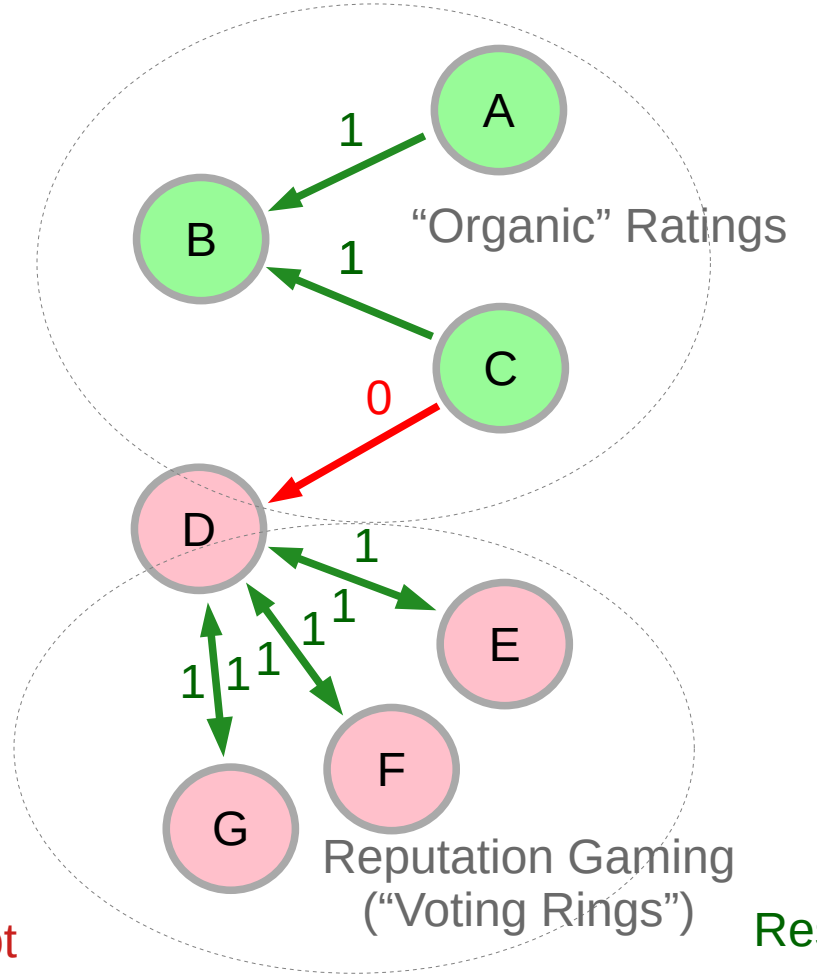


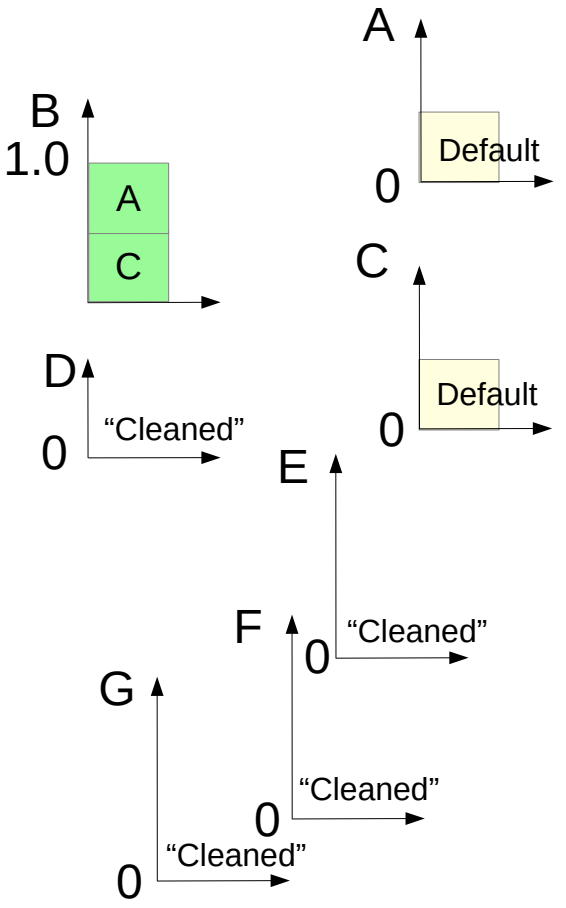
Rescued Reputation Snapshot

Next: Resisting Reputation Gaming (Churning)



Abused Reputation Snapshot





Rescued Reputation Snapshot

Thank You and Welcome!

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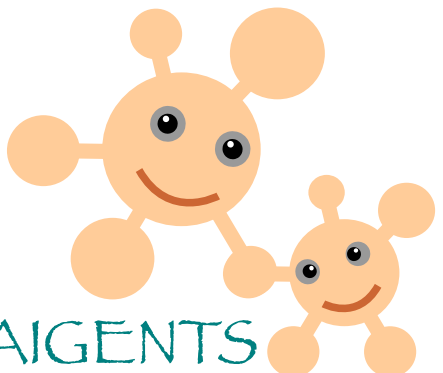

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