

NCENT: A Platform for Decentralized Applications with Strong Network Effects

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Abstract--

This paper presents a novel approach for achieving strong network effects to perform valuable work on a blockchain, called Recursively Incentivized Crowdsourcing (RIC). Unlike traditional networks that exist by virtue of centralized corporate first mover advantage, RICs are inherently justified by first principles of sustaining decentralized user incentives. RICs achieve a Nash-equilibrium optimal incentive for users to both create and persistently maintain a strong network.

We further introduce an efficient implementation of RICs, called NCENT (n¢), for building decentralized applications (DApps) that exploit these strong network effects. The n¢ platform represents a fundamental innovation in how dapps acquire and maintain strong network value.

Keywords--

decentralized applications; distributed systems; crowd-sourcing; network security; game theory; query incentive networks

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Apps built atop the nc RIC protocol can solve:

- 1) **Customer Acquisition** (Sales, social, messaging etc.)
- 2) **Supervised Learning** (massive labeled datasets for Search, Vision/ Mapping, NLP/ Speech etc.)
- 3) **Brokered Markets** (Recruiting/ Matchmaking, Real Estate/ Finance, Auto Sales/ Ride-sharing etc.)

RICs create the most viral known network effects

- Recursive incentives can be the provably optimal Nash equilibrium of individual incentive that can be given to perform a given network task
- Efficient incentives to both add utility to the network as well as recruit others who also add utility

RICs are a better way to organize networks

- No sustaining “first principles” basis exists for corporate ownership of network monopolies (other than first mover advantage at the time of creation)
- RICs are defensible by first principles, as the optimal incentive feature intrinsic to our networks

RICs cannot exist in the real world at scale

- Good RICs guarantee convergence (meaning the total payouts converge to less than or equal to the total value coming into the network), such as the below:

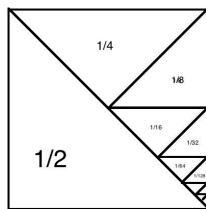


Figure 1: RIN similar to one used by MIT team to win DARPA’s Network

- Tokens are spent on crowdsourced data reward, or to consume the utility of the product that results from the crowdsourced data

Companies can develop a full end-to-end RIC solution with our enterprise platform

- One stop shop to design, implement and monitor a RIC for customer acquisition, supervised learning, brokered markets, or any other campaign level use
- Key ingredient to prevent large subtree ownership

“Red Balloon Challenge” has payout liability always less than 1

- Bad or “divergent” RICs cannot generate enough network asset value for the payout liability. History is filled with these fraudulent “ponzi schemes” that have ruined the reputation of even good RICs (especially when convergence is hard to measure) such that no RICs ever appear in the real world at scale.

Blockchain is the enabling technology for RICs

- We can provably guarantee convergence as a “hard-coded” matter of mathematical protocol
- Full and transparent auditability via the blockchain ledger anytime by anyone

“Proof of distribution” is a viral network incentive

- New blocks are awarded probabilistically to each wallet that distributed a currently outstanding token, and recursively to the ownership history “sub-tree”
- This creates a natural incentive for our users to actively distribute tokens to a wide array of users, particularly to other users who will also create wide subtrees, as frequently as possible

Any user can easily crowdsource information

- Our MVP offering allows any user to easily offer a RIC based reward for crowdsourced information

- Deep expertise in machine learning, software engineering, advertising technology/ marketing and building multi-billion dollar technology driven businesses lines, available to augment your team’s internal strategy and capabilities

Our protocol incentivizes verified user identity

- The protocol has the benefit of verified identity to collect mining rewards, validated ecosystems

References--

- S. Nakamoto (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. <http://bitcoin.org/bitcoin.pdf>
- V. Buterin (2013). A Next Generation Smart Contract and Decentralized Application Platform. <https://github.com/ethereum/wiki/wiki/White-Paper>
- D. Mazières (2016). Stellar Consensus Protocol: A Federated Model for Internet-Level Consensus. <https://www.stellar.org/papers/stellar-consensus-protocol.pdf>
- V. Buterin (2014). Slasher: A Punitive Proof-of-Stake Algorithm. <https://blog.ethereum.org/2014/01/15/slasher-a-punitive-proof-of-stake-algorithm/>
- J. Benet (2017). Filecoin: A Decentralized Storage Network. <https://filecoin.io/filecoin.pdf>
- R. Metcalfe (2013), "Metcalfe's Law after 40 Years of Ethernet", *Computer*, vol. 46, pp. 26-31.
- P. Robinson (1989). *Field of Dreams*, Universal Pictures.
- M. Cebrian, L. Coviello, A. Vattani, P. Voulgaris (2012). Finding Red Balloons with Split Contracts: Robustness to Individuals' Selfishness, *Proceedings of the ACM Symposium on Theory of Computing (STOC)* pp. 775-788, New York, USA.
- J. M. Kleinberg and P. Raghavan (2005). Query incentive networks. *IEEE Annual Symposium on Foundations of Computer Science (2005)*, pp 132–141.
- J. Nash (1950). Equilibrium points in n-player games. *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, vol 36, no 1, pp 48-49.
- R. Hoffman, J. Lilly, C. Yeh, A. Blue (2015). Technology-enabled Blitzscaling, *Stanford University CS 183C Class Notes*. <https://medium.com/cs183c-blitzscaling-class-collection>
- Affinity Fraud: Fleecing the Flock (2012). *The Economist*, Jan 28th 2012 edition.
- Genesis 3:13-15, *The New International Translation Study Bible*
- S. Micali (2016). Algorand: The efficient and democratic ledger. <https://arxiv.org/abs/1607.01341>