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nCent

A Decentralized Protocol for Incentive Markets

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Mission

A fairer internet, where you own the value of your network

Abstract

nCent enables users to realize the value of their work directly and also from utilizing their own networks. Our personal and professional networks contain a treasure trove of information about our capabilities, skills, interests and relationships. The Internet of today has no mechanism to properly attribute this value back to users, and therefore does not provide correct incentives. The result of this is inefficient and broken markets. The dream of unlocking the power of crowdwork and the gig economy at scale remains a dream deferred. Furthermore the trusted institutions that have the eyeballs, data and deep pockets to organize crowd work have missed the mark. In many cases trust in them is rapidly fading, they cannot work together trustlessly for our benefit, and they suffer inherent misalignment of incentives with users. What is missing is a way to do this value attribution in a transparent and auditable way that provides the correct incentives, and allows markets to form.

We introduce nCent, a decentralized protocol for incentive networks. Users of nCent are incentivized to form specialized networks to perform valuable work as a group. This work can take the form of solving problems characteristic of search/matching, crowdwork/funding, and social networking. nCent creates incentive networks through a novel blockchain protocol that offers a decentralized design, and unique transparency and auditability properties to establish integrity of the protocol. We present an initial application with focus on customer acquisition markets for highly viral communities such as sports, viral brands, and influencers. We also focus on a recruiting use case for our own internal purposes. This approach can generalize to many forms of crowd-work, and can eventually be used to deconstruct the corporation around incentives.

Keywords: blockchain, incentives, smart contracts, cryptocurrency, social networks

TEAM

Core Team

Kapil K. Jain - *Lead Developer*

Prior to founding nCent Labs, KK was Director of the Computational Finance program at Stanford. He ran quantitative and macro hedge fund strategies at Citigroup, Perry Capital and D.E. Shaw & Co. KK holds an M.S. from Stanford University and an A.B. from Dartmouth College.

Dr. Rajeev Surati - *Core & Backend Development*

Prior to joining nCent Labs, Dr. Surati co-founded Flash Communications (Microsoft), Photo.net (GoDaddy) and Scalable Display Technologies which commercialized his MIT Ph.D. thesis. Dr. Surati holds a Ph.D., S.M., and S.B. from MIT in EECS. Dr. Surati holds over 10 patents in Instant Messaging, Computational Display, and Image Processing.

Michael Barile - *Partnerships & App Development*

Prior to joining nCent Labs, Michael co-founded Kryptomon.io, an ethereum-based virtual game, and was active in the blockchain community. He was previously an engineer at Google where he worked on travel search and has experience at Uber and Oliver Wyman. He holds an A.B. from Dartmouth.

Contributing Team

Strategy

Naval Ravikant
Founder- AngelList

Steve Jurvetson
Founder- DFJ Ventures

Blockchain

Prof. Dan Boneh
Stanford Computer Science

Dr. Danny Yang
Founder, Blockseer

Prof. Mooly Sagiv
Technion Computer Science & Smart Contract Verification

Systems

Prof. David Mazieres
Chief Scientist- Stellar.org & Stanford Computer Science

Prof. Olin Shivers
Northeastern Computer Science

Dr. Patrick Lincoln
Vice President, SRI International

Social Networking

Prof. Jure Leskovec
Chief Scientist- Pinterest & Stanford Computer Science

Jay Borenstein
Facebook & Stanford Computer Science

Data Science

Dr. Adam Coates
Partner- Khosla Ventures & Founder- Baidu AI Laboratory

Dr. Carol Fan
Data Science- SoFi

Incentive Design

Prof. Balaji Prabhakar
Stanford Computer Science

Prof. Seth Hill
UCSD Political Science

Financial Markets

Kevin Russell
Chief Investment Officer- UBS

George Brokaw
Founder- Trafalet, Brokaw & Co.

Joshua Berkowitz
Founder- Woodbine Capital

Launch Strategy

Justin Kan
Founder- Atrium.co, Twitch, Justin.TV

Waikit Lau
Founder- Scanscout

Selected Investors

SEQUOIA

Naval Ravikant

ZhenFund
真格基金

WINKLEVOSS
CAPITAL

METASTABLE

QCP
CAPITAL

SVAngel

Steve Jurvetson

FLOODGATE

AME CLOUD
VENTURES

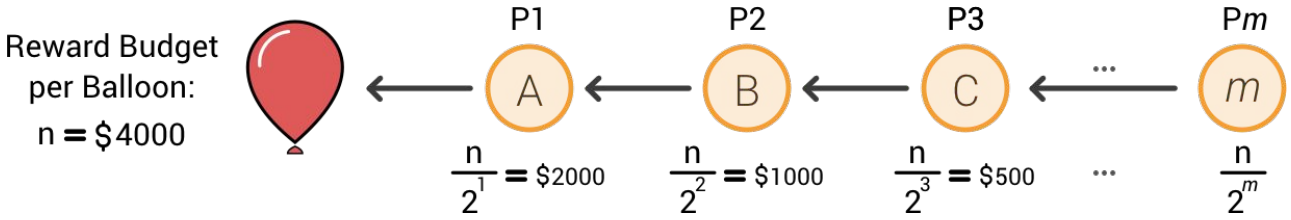
SIGNIA

INTRODUCTION

Red Balloons Everywhere

VALUE ATTRIBUTION CREATE POWERFUL INCENTIVES

In 2009, DARPA hosted the Red Balloon Challenge. The first team to find 10 red balloons scattered across the USA would win a $40,000 prize[3]. Shockingly, the MIT Media Lab organized a team that solved the Challenge in less than 9 hours, with only a few days of preparation. Their solution used recursive incentives to reward all the people who helped recruit balloon finders: If the MIT team won the challenge, $4000 would be allocated to each balloon's chain of finders & recruiters: $2000 to the person who found it, $1000 to the person who recruited the finder, $500 to the person who recruited the person who recruited the finder, and so on[4].



In this experiment, the MIT team proposed an answer to the problem of attributing value in social networks: recursive incentives. Recursive incentives rewards people not only for doing the work, but also for contributions in the form of connecting the jobs to the worker. This allows influential nodes in a network to earn higher expected payoffs, rewarding them for the higher portion of network value they bring in. We could easily come up with examples similar to the Red Balloon Challenge where recursive incentives are extremely effective:

DECONSTRUCTING THE FIRM WITH INCENTIVE MARKETS

Work Function	**The Red Balloons are ...**
Sales	Customers
Recruiting for Software Company	Developers
Real Estate	Houses
Online Markets	Limited Edition items
Fraud Detection/ Whistleblowers	Bad Behavior

Markets Organize People Better

"Boost how we harness our collective talents, and you will boost every problem solving effort on the planet... the sooner the better!"
-- Douglas Engelbart

Markets are the optimal way[1] to organize our group capabilities efficiently[2],

Markets can only form when correct incentives[3] exist,

Incentives on the Internet are broken[4], leaving broken markets everywhere[5]

(1) Firms are notoriously inefficient, and have layers of incentives that misaligned both internally and externally. Peer participation does not attribute value correctly or scale

(2) Markets efficiently allocate labor, capital and other resources. A valuable resource in particular is the information contained in our networks: capabilities, skills, goals and interests of others

(3) Proper value attribution needs to occur to motivate users to contribute work, otherwise the payoff is too uncertain for an incentive to be created

(4) The Internet is dominated by a few actors with eyeballs, user data and deep pockets to facilitate markets. User trust in these firms is rapidly fading, as their fundamental misalignment of incentives with their users becomes clearer. Furthermore, they cannot trust each other to coordinate markets to deliver user value at scale.

(5) All kinds of market incentives problems are left unsolved today. Open source software development remains under-incentivized, allocating labor and jobs correctly remains broken, advertising is unfocused and inefficient, our attention is being tested as engagement increasingly looks like spam

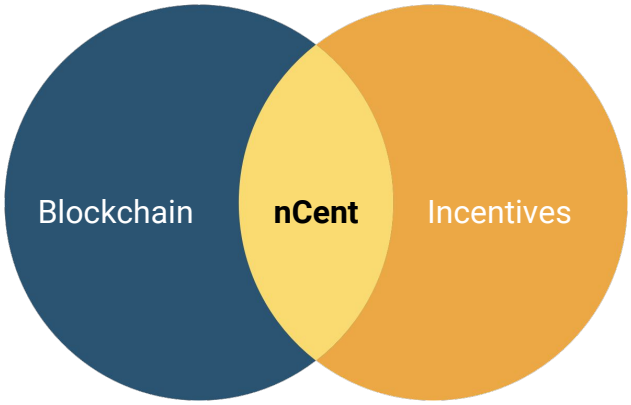
Blockchain is a Path Forward

A PROTOCOL FOR THE VALUE ATTRIBUTION REQUIRED FOR INCENTIVES IS THE MISSING LINK

- **Value attribution** Everyone will reconstruct the same chain of referrals by querying the smart ledger associated with blockchains, so value attribution is unambiguous, transparent and auditable. This is important because people will participate if they believe they will be rewarded accordingly, and blockchain makes this possible.

- **Trustless Exchange** Blockchain allows the formation of distributed exchange, where sponsoring organizations can participate in markets driving value to a user, without being in a trust relationship with each other.

- **Scalability for network effects** Red Balloon networks and recursive incentives to date have not reached internet scale. Part of our thesis is that blockchain properties are unique and facilitate a complex contour of trust forming among a spirited community, that facilitates the scaling of these types of networks. We also address certain problems such a Sybil attacks generally, facilitating creation of ad hoc incentive programs that benefit.



NETWORK OVERVIEW

Design Considerations

Unlike current leading cryptocurrency projects, nCent is designed to be optimized for facilitating efficient user incentives to form incentive markets.

				
Fast Processing, High Throughput	✗	✗	✔	✔
Ecologically Sound, Internet Scale	✗	✗	✔	✔
Payments	✔	✗	✔	✔
Protocol Incentives	✔	✔	✗	✔
Smart Contracts	✗	✔	✗	✔
Secure Scripting	✗	✗	✔	✔
Application Incentives	✗	✗	✗	✔
Volatility Control/Stability	✗	✗	✗	✔

Protocol Incentives

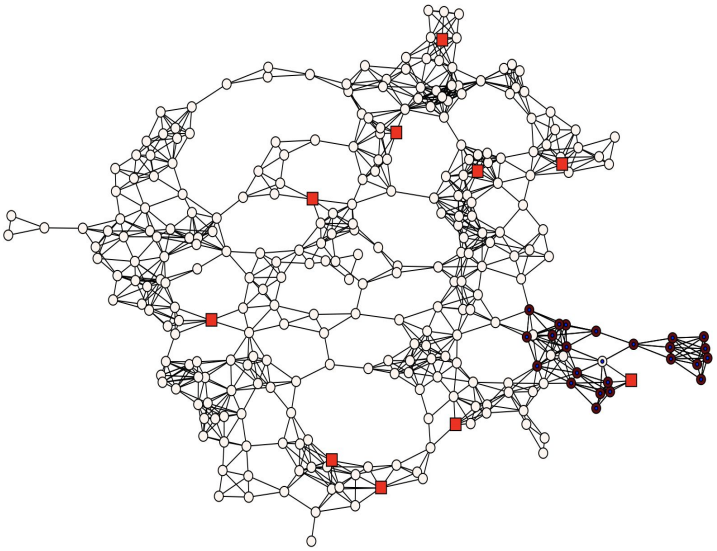
Incentives are a core component of the nCent protocol. Separate from the application incentives designed and implemented by nCent's users, the nCent protocol distributes several types of incentives to promote and maintain the functionality of the nCent network. These incentives are denominated in NCNT and are important channels to bring NCNT into circulation.

- **Progress incentives** are rewards given to tokens used to recruit new users to join the network (i.e, tokens that are transferred to create new wallets). Intuitively this type of incentive will make up the majority of protocol incentives and will decrease in importance as the nCent network size increases.

- **Consensus incentives** are the rewards given to the validators of the network for maintaining the validity and security of the network, similar to the coins and transaction fees awarded to the miners in Bitcoin.

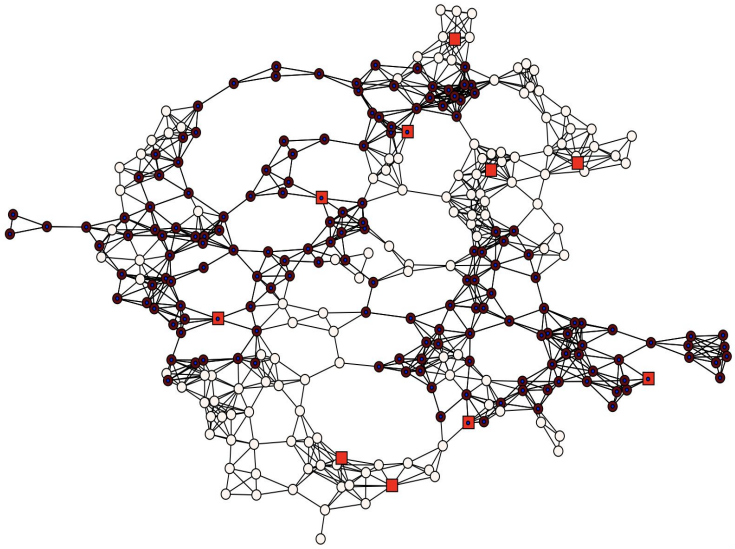
Simulation Results

Incentives increase virality. We show a token propagation for a search problem (like the Red Balloon Challenge) on a simulated 300-node social network graph. The goal is to find a red square in the graph. White dots are people who never got a token; black dots are people who got a token by the end of the simulation. Throughout the graph, there are 10 target nodes, represented by red squares.



WEAK INCENTIVES

This shows results of simulating a weak incentive, where nodes have little incentive to pass a token to their neighbors. The search covers only a small part of the network and no targets are found.



STRONG INCENTIVES

This shows results of simulating a stronger incentive, where nodes derive more benefit from passing a token to their neighbors. The search spreads virally across the network and 5 of the targets are found.

Growing Our Network

nCent is an ecosystem designed to grow the network, so all sponsors and participants in the network can benefit. We believe that there are three core components that determine the value of a network such at nCent:

- **Number of users** The number of wallets and participants. This is the main driver of network effect: well studied networks properties such as Metcalfe's law state the value of an network grows proportionally with the square of the users, so the value added by each additional new member increases as the network size increases [25].

- **Transaction velocity** An important indication of how vibrant the network is, both in terms of engagement and utility consumed on the network. Transaction values are core concepts in some models of networks such as Beckstrom's law [26].

- **Total stamp token value** The cumulative value sponsors endowed on the network. This represents the base economic value anchor of the network, while disregarding other factors such as social utility.

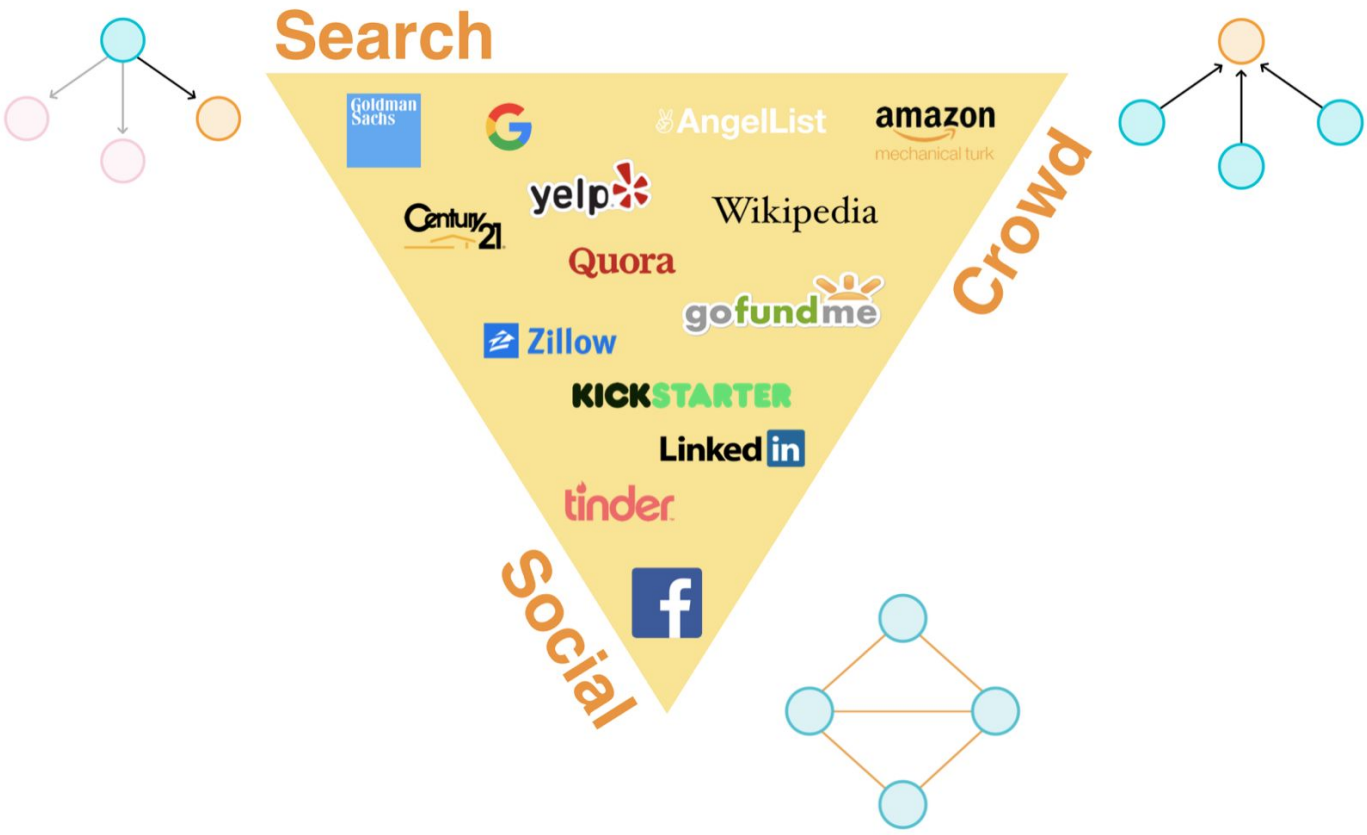
25 http://www.cs.umd.edu/~golbeck/downloads/Web20-SW-JWS-webVersion.pdf
26 http://www.beckstrom.com/images/law.pdf

APPLICATIONS

nCent is a Generalized Protocol

THE META-NETWORK TO ORGANIZE USERS

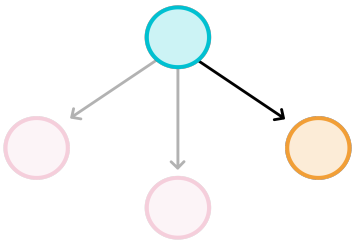
nCent is a generalized protocol. Specific applications and business that leverage incentives can be built on top it. Over time, these application layer networks have the potential to cover significant areas of economic and social activity taking place over the internet today. Our users will ultimately come up with novel ways to put nCent's incentive structures and technological foundation to use.



nCent Launch Applications

We are implementing particular use cases for our launch applications.

A search problem involves finding a path from users looking for something to the things or people that they are looking for. Recursive incentives, such as those used by the MIT team in DARPA's Red Balloon Challenge, are well suited for search problems.



Search

SEARCHING FOR THE CUSTOMER

Our first launch case involves customer acquisition, which is the lifeblood of consumer business. In this case, a sports team is searching for fans that are interested in purchasing team jerseys. Advertising is a large market powering many internet business, but it is merely a means to customer acquisition. If we can solve and essentially "commodify customer acquisition," the best products and services in the economy would rise to the top.

nCent works well with use cases that involve tribal or cult-like brand affiliation where a motivated community can form. Brand activation revenue alone reached $595bn in United States in 2016[3]. Examples of tribal brands and influencers include:

- **Sports:** Teams and players
- **Celebrities:** Musicians (Dead Heads), Actors (Friends), Reality TV (Kardashians), Influencers (Youtube/Instagram/vloggers/Twitch)
- **Cult brands**: Subaru, Southwest, LaCroix, In-n-Out, Ikea, Trader Joe's, Apple, Starbucks, Lululemon

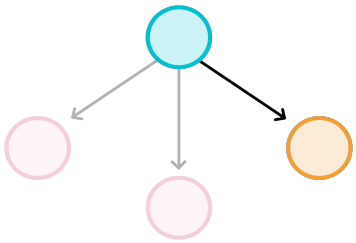
SEARCHING FOR THE DEVELOPER HIRE

Our second launch case is a specialized version of customer search we built for ourselves. It involves a recruiting game based on DARPA's Red Balloon Challenge, where the hire is now the red balloon. In our case, we are utilizing recursive incentives to propagate referrals from the outside and from current employees to find the most suitable candidates for hire. We are actively "dogfooding" this application and leveraging it for our own internal recruiting efforts, and may decide to open it up for outside consumption. The worldwide recruitment market alone was roughly $200B in 2017[4].

3 https://www.forbes.com/sites/joshbersin/2017/05/26/google-for-jobs-potential-to-disrupt-the-200-billion-recruiting-industry/#642764c04d1f
4 https://www.statista.com/statistics/650998/brand-activation-marketing-spending-usa/

Example 1: sportCent.io

This is a launch use case for nCent to facilitate enterprise adoption. Cultivating a loyal fan base is an existential challenge for any sports or fan-based brand.



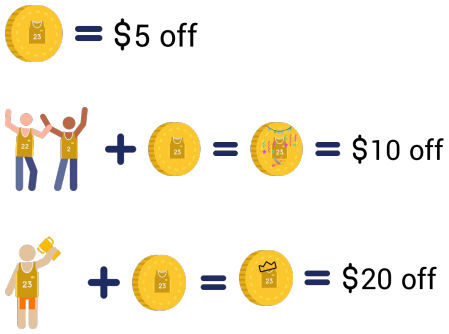
Search

User:
The Hometeam
A professional sports team moving to Las Vegas (LV)

Needs To:
1. Stay engaged with their existing fan base in Oakland
2. Acquire and retain new fans in LV and LA markets
3. Reach key millennial demographic
4. Maximize engagement, merchandising & concessions
5. Market the team cost effectively

Solution:
Hometeam's ad agency acquires NCNT and stamps them to create FanCents. These FanCents are a novel, nCent-based coupon and engagement program as an application on the nCent network. Hometeam emails FanCent to its fan list. Alice gets a FanCent; she can:

1. Redeem it right away for $5 off a team jersey, *or*
2. If Hometeam wins, Alice can use the FanCent to get $10 off a team jersey, *or*
3. If the star player scores, Alice can use the FanCent to get $20 off the his jersey, *or*
4. If Alice is not interested in buying a jersey, Alice can send her FanCent to Bob who buys a "star" jersey. Bob gets $20 off the jersey; Alice gets $10 for doing the referral.
    - If Bob instead sends the FanCent to Carol, who buys a "star" jersey, then Carol gets $20 off the jersey, Bob gets $10 and Alice gets $5. Hometeam knew up front that their discounts/referral fees would total to under $40 and designed the program based on that budget.



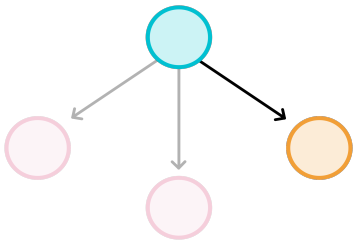
nCent fan engagement incentives can depend on game events

Discussion:
Unlike coupons, this nCent-based campaign is cost-effective to run (ex-merchandise discounts), can scale in multiple geographies, and speaks to millennials through its viral potential. FanCent boosts fan engagement by incentivizing a vested interest in Hometeam winning. Hometeam can effectively find and acquire new fans, by enlisting an *ad hoc* recursive affiliate network to sell jerseys. All network users, fans or not, contribute to the Hometeam community.

As an added incentive, the Hometeam drops geotagged FanCents onto certain seats in the stadium and TV screens for home viewers at halftime. Then, fans use their augmented-reality (AR) wallet apps to discover and pick up the FanCent. Furthermore, the Hometeam establishes an incentive: if 100 fans buy jerseys during halftime, everyone gets a free hat! The incentive structure can accommodate features such as an expiration date, limit on number of FanCent held by each fan, and different geolocation-dependent redemption policies.

Example 2: jobCent.io

This is a launch use case for nCent to facilitate internal recruiting goals. Recruiting talent is a difficult but important challenge for almost any business.



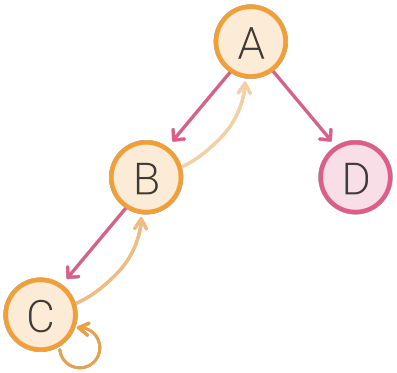
Search

User:
Startup Co.
A startup eager to hire 10 developers to implement its new deep-learning vision network for self-driving cars

Needs To:
1. Hire quickly and meet quota
2. Can't exceed fixed budget for a referral program
3. Recruit a diverse group of the highest-quality candidates
4. Avoid being buried in unsuitable resumes
5. Leverage an external network because startup does not have the critical mass to rely on internal referrals

Solution:
Startup Co. buys NCNT and stamps them to create 100 DevCents. NCNT distributes the DevCents to select CS seniors at Dev University. Alice gets a few of the seed DevCents since she is part of the Dev U Computer Club. Depending on what Alice wants, this can then play out in a few ways:

1. Alice applies to Startup Co. If she is hired, she gets a 10k NCNT signing bonus.
2. Alice could instead send the DevCent to Bob. If Bob gets hired by Startup Co., Bob gets 10k NCNT bonus and Alice gets a 5k NCNT bonus as the direct referrer.
    - Or if Bob passes the DevCent along to Carol and Carol gets hired by Startup Co., Carol gets a 10k NCNT bonus, Bob gets a 5k NCNT bonus and Alice gets a 2.5k NCNT bonus.
3. Within 2 weeks, if Alice does not send DevCent to someone else or apply for the job position, the DevCent expires and Startup Co. will reseed it elsewhere. Once all 10 positions are filled, the tokens expire.



nCent promotes better recruiting through indirect referrals

Discussion
Startup Co.'s DevCent recruiting strategy incentivizes people to either apply for the job or to refer the DevCent to a friend who is a good fit. If the friend gets hired, the original person gets rewarded for finding that successful candidate. Since there are a limited number of DevCents, people must choose their referrals wisely. This forces people to think carefully about their referrals and also to only refer the best matches for the job. Since there are only 100 DevCents, at maximum Startup Co. would receive a limited number of job applications at a time. After Startup Co. hires their desired 10 developers, there will be no more DevCents, ending the recruiting campaign. The DevCents also expire after 3 months. Due to the transparency and safeguards of the system, Startup Co. ensures that it would not exceed its fixed budget.

Contact Us

Email: kk@ncnt.io

 @kk_ncnt

 t.me/ncent

 angel.co/ncent

 KK & Steve Jurvetson