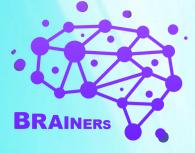
BRAINPAPER

An incentivized, blockchain-based, decentralized intelligence exchange.





Abstract

BRAINERS combines concepts from social and publishing platforms with knowledge learned from building blockchain projects, cryptocurrencies, and their communities. An important key is to inspire participation in a peer reviewed intelligence provider community, it's currency and a decentralized market in a fair accounting system that consistently reflects each contribution and participation.

BRAIN is the first crypto token that provides access to a transparent and peer reviewed intelligence platform, where it rewards an unbounded number of individuals who make subjective and scientific contributions to this system. BRAINERS attempts to build the very first decentralized intelligence exchange system, where it combines the ground-breaking elements of decentralized finance (DeFi) and the true value of the global news, information, knowledge and scientific research market.





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Collectively, user-generated content has created billions of dollars worth of value for the shareholders of social media companies, such as Reddit, Facebook, Twitter and Steemit. BRAIN aims to support information providers with contributions from platform users rewarding them with cryptocurrency through staking them, and through this process create a currency that is able to reach a broad market, including people who have yet to participate in any cryptocurrency economy.

There are some key principles that have been used to guide the design of BRAINERS. The most important principle is that every user who would like to access a content will have to stake into this content to gain pro-rota ownership, the content may also sell to a single buyer where the co-owners of the content would be able to claim their part from the purchase. This principle is the same principle that is applied to digital ownership's percentage of liquidity pools as it allocates shares at it's creation and during subsequent liquidity providing events. However, the reward of providing such a pool for the provider and the creator will switch places. The creator provides access to their content for those who provide equal value to the pool as their reward and the provider's yield is awarded to the creator.

The second principle is that all forms of information that are created on the platform are equally valuable. This means that those who contribute their scarce time and knowledge toward producing and curating content for others are just as valuable as those who contribute their scarce assets in cryptocurrency. This is the sweat equity principle and is a concept that prior cryptocurrencies have often had trouble providing to more than a few dozen individuals.

The third principle is that the community produces products to serve its members. This principle is exemplified by credit unions, social educational programs, and health sharing plans, which serve the members of their community rather than sell products or services to people outside the community.



The Brainers community provides the following services to its members:

- 1. A source of curated news, intelligence reports, educating materials and scientific research.
- 2. A means to get high quality information without paywalls, censorship and manipulation.
- 3. A cryptocurrency to provide governance for peer reviews.
- 4. Payments for content creators in exchange for knowledge.
- 5. Jobs providing above services to oncoming members.

Brain's purposeful realignment of economic incentives has the potential to produce fairer and more inclusive results for everyone involved than the existing media and cryptocurrency platforms that have gone before it. This paper will explore the existing economic incentives and demonstrate how Brain's incentives may result in better outcomes for most participants.



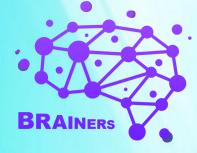


Reinventing Contribution

Brainers was designed from the ground up to address the major barriers to adoption and monetization of an information based economy. Our thesis is that the same techniques that were used to grow major intelligence platforms can be used to bootstrap a successful cryptocurrency, but without the enrichment of a single entity, it distributes it's revenue among the decentralized content creating community. Social and economic incentives enabled by cryptocurrency and decentralized finance technology can dramatically increase the growth of a new information distributing platform. It is the synergy between decentralized finance and quality information that we believe may give Brain Network a powerful advantage in this outdated market space.

The challenge faced by Brainers is deriving an algorithm for scoring individual contributions that most community members consider to be a fair assessment of the subjective value of each contribution. In a perfect world, community members would cooperate to rate each other's contribution to the community and derive fair compensation. In the real world, algorithms must be designed in such a manner that they are resistant to intentional manipulation for profit. Any widespread abuse of the scoring system could cause community members to lose faith in the perceived fairness of the economic system. This is why the Brainers developers created the Brain Power governance token, which will operate with such a smart contract to prevent exploitations of the revenue system.

Existing platforms operate on a one-user, one-vote principle. This creates an environment where rankings can be manipulated by sybil attacks and the service providers must proactively identify and block abusers. People already attempt to manipulate Reddit, Facebook, and Twitter scoring algorithms when the only reward is web traffic or censorship. The incentive to manipulate and abuse a system where there is monetary reward included is expected to be even higher.



The fundamental unit of account on the Brainers is \$BRAIN a cryptocurrency token and \$BP (Brain Power), a crypto governance token. \$BRAIN is the main tool to gain access to the Brainers, where owners could stake their token in various ways to access different levels of content types. These stake pools act as a subscription payment to a given information category or type, that stakers get rewarded by when they join any type of content pool. The yield reward of these pools will be given to the content creators who provide valuable content within these content categories or types. Brain Network also operates on the basis of one \$BP, one vote system, and these governance tokens are received when the community members provide \$BRAIN in stake pools. The more \$BRAIN someone stakes, the more \$BP they receive. Under this model, individuals who have contributed the most to the platform, as measured by their account balance, have the most influence over how contributions are scored. They provide peer review to the community. Furthermore, Brain Network only allows members to vote with SBP when it is committed to a \$BRAIN vesting schedule. Under this model, members have a financial incentive to vote in a way that maximises the long term value of their tokens.

Brainers is designed around a relatively simple concept: everyone's meaningful contribution to the community should be recognized for the value it adds, and the value should reflect the time, knowledge and effort that has been put into the contribution. When people are recognized for their contributions, they continue contributing and the creator community grows. When the content and it's quality grows, so will the digesting community increase. Any imbalance in the give and take within a community is unsustainable. Eventually the givers grow tired of supporting the takers and disengage from the community. Hence Brainers will actively balance the givers and takers to satisfy each group by creating an optimal environment for both to become a lucrative and truly decentralized information exchange.



The challenge is creating a system capable of identifying what contributions are needed and their relative worth in a way that can scale to an unbounded number of people.

A proven system for evaluating and rewarding contributions is the free market. The free market can be viewed as a single community where everyone trades with one another and rewards are allocated by profit and loss. The market system rewards those who provide value to others and punishes those who consume more value than they produce. The free market supports many different currencies and money is simply a commodity that everyone finds easy to exchange. Brain Network aims to create such an exchange where money and intelligence - both as a commodity - can be exchanged with enough liquidity to support both content creators and value providers equally.

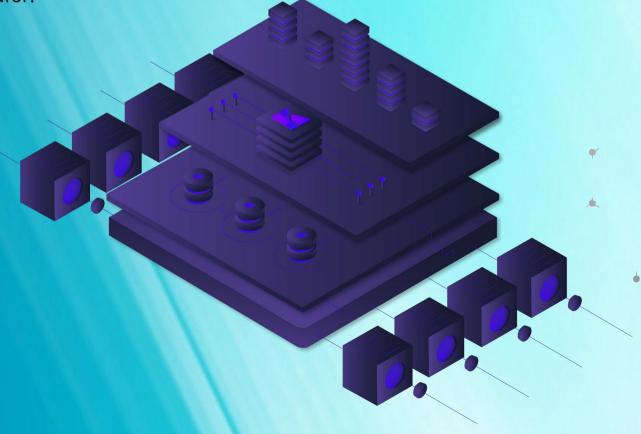
Since the free market is a proven system, it is tempting to try to create a free market like system where content consumers support content producers through a DeFi system, since direct payment is inefficient and not really viable for content creation and curation. In direct payment systems the value of most content is so low relative to the cognitive, financial, and opportunity costs associated with making a payment that few readers choose to tip. The abundance of free alternatives also means that enforcing a 'paywall' will drive readers elsewhere. There have been several attempts to implement per-article micropayments from readers to authors, but none have become widespread.





Brainers is designed to enable effective payments for all kinds of contributions by changing the economic equation. Readers no longer have to decide whether or not they want to pay someone from their own pocket, instead they can stake their tokens in a given content and Brain Network will use their staked assets to determine individual rewards and voting power. This means that people are given a familiar and widely used interface and no longer face the cognitive, financial, and opportunity costs associated with traditional micropayment and tipping platforms.

Voting input from community members is critical for Brainers to accurately allocate payments to contributors. Voting can therefore be viewed as a crucial contribution and worthy of rewards on its own. Some platforms, such as Slashdot, use meta-moderation as a way to rank and reward honest moderators. Brainers chooses to reward those who contribute the most to the total value of a piece of content and rewards the voters proportionally to the ultimate value paid to the content creator.





This section outlines the ideas behind Brainers and its rewards for people who provide meaningful and measurable contributions to the Brainers community.

Capital Contributions

There are two items a community can offer to attract capital: debt and ownership. Those who buy ownership profit when the community grows, but lose if the community shrinks. Those who buy debt are guaranteed a certain amount of interest, but do not get to participate in any profits realized by the growth of the community. Both types of capital contributions are valuable to the growth of the community and value of its currency. Additionally there are two ways ownership can be held: liquid and vesting. Vesting ownership makes a long-term commitment and cannot be sold for a minimum period of time. The Brain Network network calls these different asset classes Brain (\$BRAIN), Brain Power (\$BP).

Brain (\$BRAIN)

Brain is the fundamental unit of account on the Brain blockchain. Brain Power tokens derive their value from the value of \$BRAIN. Brain is a liquid currency, and therefore can be bought or sold on exchanges, as well as transferred to other users as a form of payment.





Brain Power (\$BP)

Start up companies require long-term capital commitment. Those who invest their money in a startup expect to wait years before they can sell their shares and realize their profits. Without long-term commitment, a startup seeking to raise additional capital through the sale of additional shares would be competing with existing shareholders looking to exit. Savvy investors want their capital contributions to grow the company, but growth cannot happen if the new capital is given away to those looking to exit.

There is significant value to having long-term commitment because it enables communities to make long-term plans. Long term commitment of stakeholders also causes them to vote for long-term growth rather than short-term pumps.

In the cryptocurrency space, speculators jump from cryptocurrency to cryptocurrency based mostly on which one is expected to have short-term growth. Brainers wants to build a community that is mostly owned and entirely controlled by those with a long-term perspective.

Users are able to commit their \$BRAIN to various staking/vesting pools, providing them with access to content within the platform. The \$BRAIN that has been committed to a given staked/vested schedule is called Brain Power (\$BP). \$BP balances are non-transferable and non-divisible except via the automatically recurring conversion requests. This means that Brain Power cannot be easily traded on cryptocurrency exchanges.



When users vote on content with \$BP, their influence over the distribution of the rewards pool is directly proportional to the amount of \$BP that they have. Users with more \$BP have more influence on the distribution of rewards. This means that \$BP is a governance token that grants its holders exclusive powers within the Brainers.

Token holders are also paid interest on the balance when their tokens remain vested in the platform itself. 10% of the yearly inflation is paid to holders as interest. The amount of the interest that they receive is directly proportional to the amount of tokens they hold relative to the total amount of vested tokens across all users.

Transferring from \$BRAIN to \$BP is referred to as "powering up", while transferring from \$BP to \$BRAIN is referred to as "powering down." \$BP that is powered down is returned to the user over a period of a given schedule, via these scheduled payments, starting one week after the power down is initiated.





Subjective Contributions

Subjective Proof of Work presents an alternative approach to distributing a currency that improves upon fully objective Proof of Work systems such as mining. The applications of a currency implementing subjective proof of work are far wider than any objective proof of work system because they can be applied to build a community around any concept that has a sufficiently defined purpose. When individuals join a community they buy into a particular set of beliefs and can vote to reinforce the community values or purpose.

In effect, the criteria by which work is evaluated is completely subjective and its definition lives outside the source code itself. One community may wish to reward news, reports, and other intel providers. While other communities may choose to reward educational causes or help advance scientific research.

The value each currency achieves depends upon the demand for influence within a particular community and how large the market believes each community can get. Unlike prior systems, subjective proof of work enables a community to collectively fund the development of whatever it finds valuable and enables the monetization of previously non-monetizable time.



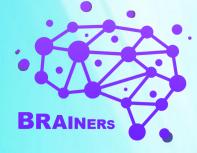


Distributing Currency

There are two ways people can get involved with a cryptocurrency community: they can buy in, or they can work in. In both cases users are adding value to the Network, however, the vast majority of people have more free time than they have spare money. Imagine the goal of bootstrapping a currency in a poor community with no actual money but plenty of time. If people can earn money by working for one another then they will bootstrap value through mutual exchange facilitated by a fair accounting/currency system.

Distributing a currency to as many people as possible in a manner that is generally perceived as fair is a challenging task. The tasks that can be entirely evaluated by an objective computer algorithm are limited in nature and generally speaking have limited positive external benefits. In the case of Bitcoin-style mining, it can result in the production of specialized hardware and cause people to invest time developing more efficient algorithms. It may even help find prime numbers, but none of these things provide meaningful value to society or the currency holding community at large. More importantly, economies of scale and market forces will end up excluding everyone but experts from participating in this kind of distribution. Ultimately, computation-based mining is just another way of buying in because it requires money to pay the electric bill or the development of hardware necessary to do the work.

In order to give everyone an equal opportunity to get involved and earn the currency, people must be given an opportunity to work. The challenge is how to judge the relative quality and quantity of work that individuals provide and to do so in a way that efficiently allocates rewards to millions of users. This requires the introduction of a scalable voting process. In particular it requires that authority to allocate funds must be as distributed and decentralized as possible.



The first step in rewarding millions of users is to commit to distributing a fixed amount of currency regardless of how much work is actually done or how users vote. This changes the question from being "Should we pay?" to "Whom should we pay?" and signals to the market that money is being distributed and is being auctioned off to whoever "bids" the most work. This is similar to Bitcoin committing to award 50 BTC to whoever finds the most difficult hashes. Like Bitcoin, all work must be done prior-to payout and nothing should be paid speculatively on the promise to do work in the future.

The next step is to reward everyone who does anything even remotely positive with something. This is accomplished by ranking all work done and distributing proportionally to its value. The more competitive the market becomes, the more difficult (higher quality or quantity) it becomes to earn the same payout.





Voting on Distribution of Currency

Assume there is a fixed amount of money to distribute, and that those who have a long-term stake/vest interest in the future value and utility of the currency are the ones who must decide how to allocate it. Every staking/vesting user casts their votes on who did the best work and at the end of the day the available money for that day is divided proportional to the creators such that everyone with even one net positive vote gives something.

The naive voting process creates a N-Person Prisoner's Dilemma whereby each individual voter has incentive to vote for themselves at the expense of the larger community goal. If every voter defects by voting for themselves then no currency will end up distributed and the currency as a whole will fail to gain network effect. On the other hand, if only one voter defects then that voter would win undeserved profits while having minimal effect on the overall value of the currency.





Voting Abuse

Regardless of how much money any individual has, there are always many other individuals with similar wealth. Even the wealthiest individual rarely has much more than the next couple wealthiest combined. Furthermore, those who have a large investment in a community also have the most to lose by attempting to game the voting system for themselves. It would be like the CEO of a company deciding to stop paying salaries so he could pocket all of the profits. Everyone would leave to work for other companies and the company would become worthless, leaving the CEO bankrupt rather than wealthy.

Fortunately, any work that is getting a large concentration of votes is also gaining the most scrutiny (publicity). Through the addition of negative-voting it is possible for many smaller stakeholders to nullify the voting power of collusive groups or defecting large stakeholders. Furthermore, large-stakeholders have more to lose if the currency falls in value due to abuse than they might gain by voting for themselves. In fact, honest large stakeholders are likely to be more effective by policing abuse and using negative voting than they would be by voting for smaller contributions.

The use of negative-voting to keep people from abusing the system leverages the crab mentality that many people have when it is perceived that one individual is profiting at the expense of everyone else. While crab mentality normally refers to short-sighted people keeping good people down, it is also what allows good people to keep bad people down. The only "problem" with crab mentality is when people wrongly believe someone is profiting at everyone else's expense.



Eliminating "abuse" is not possible and shouldn't be the goal. Even those who are attempting to "abuse" the system are still doing work. Any compensation they get for their successful attempts at abuse or collusion is at least as valuable for the purpose of distributing the currency as the make-work system employed by traditional Bitcoin mining or the collusive mining done via mining pools. All that is necessary is to ensure that abuse isn't so rampant that it undermines the incentive to do real work in support of the community and its currency.

The goal of building a community currency is to get more "crabs in the bucket". Going to extreme measures to eliminate all abuse is like attempting to put a lid on the bucket to prevent a few crabs from escaping and comes at the expense of making it harder to add new crabs to the bucket. It is sufficient to make the walls slippery and give the other crabs sufficient power to prevent others from escaping.

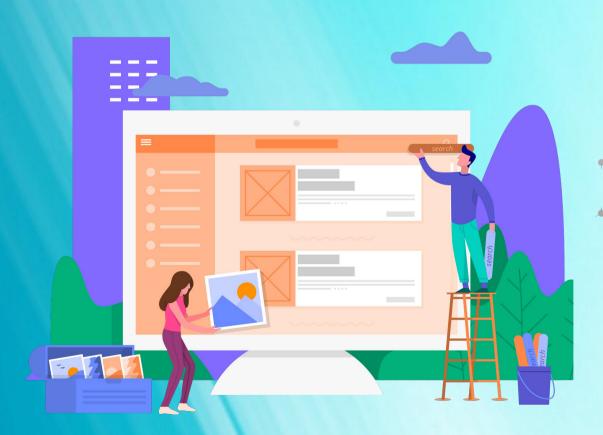




Rate Limited Voting

A major part of minimizing abuse is the rate-limiting of voting. Individual users can only read and evaluate so many work items per day. Any attempt to vote more frequently than this is a sign of automation and potential abuse. Through rate limiting, stakeholders who vote more frequently have each vote count for less than stakeholders who vote less frequently. Attempts to divide tokens among multiple accounts also divides influence and therefore does not result in a net increase in influence nor bypass the rate-limit imposed on voting.

Users are allotted a fixed amount of voting power. Voting power is multiplied by a user's staking/vesting tokens to determine how much share in the reward pool should be allocated to a given work item. Every vote that is cast uses a percentage of remaining voting power. Users can vote for more posts, but each vote will be worth less, and it will take longer to reach full voting power again. Voting power recharges at a fixed linear rate of 20% per day.





Payout Distribution

One of the primary goals of Brain Network's reward system is to produce the best intelligence on the internet. Each and every year 75% of the yearly inflation is distributed to users submitting, voting on, and discussing content. At the size of Bitcoin this could be several million dollars per day being given to the top contributors.

The actual distribution will depend upon the voting patterns of users, but we suspect that the vast majority of the rewards will be distributed to the most popular content.

Zipf's Law is one of those empirical rules that characterize a surprising range of real-world phenomena remarkably well. It says that if we order some large collection by size or popularity, the second element in the collection will be about half the measure of the first one, the third one will be about one-third the measure of the first one, and so on. In general, the kth-ranked item will measure about 1/k of the first one.





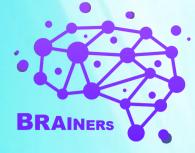
Taking popularity as a rough measure of value, then the value of each individual item is given by Zipf's Law. That is, if we have a million items, then the most popular 100 will contribute a third of the total value, the next 10,000 another third, and the remaining 989,900 the final third. The value of the collection of n items is proportional to log(n).



The impact of this voting and payout distribution is to offer large bounties for good content while still rewarding smaller players for their long-tail contribution.

The economic effect of this is similar to a lottery where people overestimate their probability of getting votes and thus do more work than the expected value of their reward and thereby maximize the total amount of work performed in service of the community. The fact that everyone "wins something" plays on the same psychology that casinos use to keep people gambling. In other words, small rewards help reinforce the idea that it is possible to earn bigger rewards.





Payouts

When a content creator receives the yield payout it takes the form of the currency of the pool's fee and a percentage of the \$BP proportional to what was casted as a vote to the creators content in the given category. The Brain Power gives the user increased voting and transaction power while the currency of the fee - be it \$ETH, \$BNB or other preferred cryptocurrencies that are set - give the user an immediate benefit in a major currency. As we've already discussed at length, \$BP is designed to encourage long-term holding rather than short-term selling. This encourages more users to have a staked/vested interest in the long-term success of the platform.

Creators also have the option to be paid in 100% \$BP, as well as decline payout on content. When a creator declines payout, the money that would have been paid to them remains in the rewards pool, to be distributed to other creators in the given content category.





Brainers goes to great lengths to reward people for contributing to the network. It would be counterproductive to turn around and charge people every time they attempt to interact with the community.

Blockchain technology currently depends upon transaction fees to prevent spam. These fees suffer all of the known problems with microtransactions and prevent blockchains from being used for low-value transactions. Truly decentralized applications must offer users the appearance of free transactions if they wish to compete with their centralized alternatives. This paper outlines the approach used by Brainers to eliminate the need for frequent use of fees and thereby enable a wide range of previously untenable decentralized applications.





The Problem With Fees

Blockchains are decentralized networks where all transactions are broadcast to all peers. Every so often a block is produced that includes some or all of the pending transactions. All blockchains must find a solution to prevent malicious users from consuming all of the available network capacity with worthless transactions. These worthless transactions can prevent other valuable transactions from being processed and ultimately destroy the network. The solution adopted by most blockchains thus far is to charge a minimum transaction fee. A fee worth just a few cents is enough to make attacking the network expensive and unprofitable. While this approach solves the spam problem, it introduces new problems. Imagine solving the email spam problem by introducing a small fee on every email; people wouldn't use email.





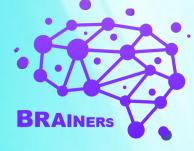
Micropayments Don't Work

The fundamental problem with charging transaction fees is that micropayments don't work, especially for low-value user actions. When a fee is charged on every transaction, it limits the types of transactions that a decentralized network can process. Regardless of how rational the argument for the necessity of fees, users still hate the experience of being nickeled and dimed for everything that they do.

Imagine if the websites we use everyday charged us a fee every time we modify our accounts by changing the password. Users expect certain things to be free. Requiring users to make a decision on whether or not an action is worth a small fee creates anxiety that causes users to leave.

In the world of financial payments, small fees are acceptable because the value of the transaction is extremely high relative to the fee charged, and the buyer has already made a decision to buy. The world of potential blockchain applications is far greater than just financial payments and includes many necessary transactions for which fees are simply unacceptable to users.

Systems like BitShares, Nxt, Ripple, Counter Party and Stellar all allow users to place limit orders on the blockchain and all of them charge users a small fee to perform this action. Later if the user wishes to cancel their order, another fee is charged. Systems like Ethereum take micropayments to a whole new level: charging per calculation. All of these systems struggle to attract new mainstream users for the same reasons that a decentralized search engine would struggle to attract users from Google if it charged a small fee for every search. It doesn't matter how good the service is, people expect certain things to be free. This is true even if a user ends up paying more overall under a different fee structure.



Fees are a Barrier to Entry

Any fee creates a barrier to entry for new users. Before someone can experiment with Ethereum they must acquire some ETH tokens. Anyone wanting to build a decentralized application on Ethereum must pass on the cost to their customers. Buying a crypto currency is not an easy task and rarely makes sense for amounts less than \$10. This means that new users wanting to try out a new decentralized application must first be convinced to part with \$10.





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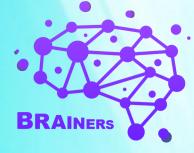
Changing Fees

Over time a network must adjust fees. This can happen either due to an increase in the value of the token or due to a surge in capacity. Users like predictable fees and guaranteed service. While it is possible to dynamically adjust fees during times of heavy use, the result is a poor user experience.

Sybil Attacks

Centralized websites prevent spam through rate limiting and some form of ID verification. Even something as simple as reCAPTCHA is sufficient to limit the creation of fake accounts. If someone abuses their account then centralized websites are free to block the account.

In a decentralized system there is no direct way to ban users nor centralized providers able to host a reCAPTCHA and enforce rate limiting of accounts. In fact, the inability to censor users is one of the main selling points of blockchain technology.

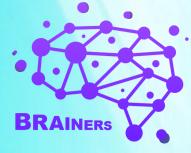


Full Reserve vs Fractional Reserve

Let's view a blockchain like an Internet Service Provider (ISP) co-op which owns all of the cables in the town and has a maximum amount of bandwidth that it can provide at any time. People living in the town can buy shares in the ISP and in exchange they are entitled to utilize a portion of the available bandwidth.

The ISP has two choices, run a "full reserve" or "fractional reserve" system. Under a full reserve system each user is only allowed a fraction of the maximum bandwidth proportional to her shares. Because not everyone uses the Internet at the same time, the town's network would be significantly underutilized.

Under a fractional reserve system the individual users could utilize more bandwidth than they are entitled to at any given point in time so long as not everyone uses the Internet at the same time. The problem with operating a fractional reserve is that congestion occurs anytime too many people wish to use the network at the same time. The ISP needs a way to prioritize bandwidth during congested periods. In the most extreme case, a fully congested network must revert to a full reserve system. The challenge is setting the proper fractional reserve ratio.



Bandwidth Instead of Micropayment Channels

The solution to the problems with micropayments is in implementing dynamic fractional reserves. Under this model the blockchain will automatically adjust the reserve ratio for the network during times of congestion. The blockchain will set a target utilization that leaves enough headroom for short term surges in demand. Any time the surges are sustained the blockchain reduces the maximum bandwidth-per-share.

When a surge is over and there is surplus capacity the blockchain can slowly increase the bandwidth-per-share.

Bandwidth used by an individual user should be measured over a suitably long period of time to allow that user to time-shift their usage. Users tend to login, do many things at once, then logout. This means that their bandwidth over a short period of time may appear much higher than if viewed over a longer period of time. If the time window is stretched too far then the reserve ratio will not adjust fast enough to respond to short-term surges, if the window is too short then clustering usage will have too big of an impact on normal users.

In our estimate it should be sufficient to measure the average weekly bandwidth usage of users. Every time a user signs a transaction, that transaction is factored into their own individual moving average. Any time a user's moving average exceeds the current network limit their transaction is delayed until their average falls below the limit.



Impact of Capacity
Blockchain capacity isn't necessarily capped. It is well within the technological capability of internet infrastructure to increase the Bitcoin block size to 10MB which in turn will reduce the minimum required balance by a factor of 10. While Bitcoin currently supports about 3 transactions per second, alternative implementations are capable of over 1000 transactions per second.

Comparison to Fees

If we assume a user with \$25 dollars worth of BTC transacts once per week and pays a \$0.04 cent fee each time then they would pay over \$2.00 in fees per year. A user would have to earn a 8% rate of return on their \$25 dollars just to break even with paying fees. Chances are that users were going to hold their money on the blockchain anyway, so this user with \$25 worth of BTC just saved \$2 over the course of a year by adopting a rate-limiting approach rather than a fee-based approach. With just \$175 they could transact every single day and save \$14 per year.





Account Creation

Brainers account-based system with publicly known balances simplifies the implementation of the bandwidth-based rate limiting algorithm. Any account with a balance below the minimum required to transact once per week would be unable to transact. This implies that all new accounts should be funded with at least this minimum balance. It also implies that users wishing to transact in smaller amounts can, so long as they hold a larger balance and reuse the account.

It is possible for a low-balance account created during a time of low usage to become inaccessible if the network usage picks up. The funds could be recovered at any time by temporarily delegating a larger balance to the account.

In order to maintain a reasonable user experience with a minimum number of hung accounts, all new accounts should start out with a balance 10 times the minimum required to transact weekly. This way even if demand increases by a factor of 10 the account will remain viable.

Any initial account balance would have to come from the user creating the account and not from token creation due to the potential for sybil attacks.



Justifying Minimum Balances

The concept of forcing users to maintain a minimum balance flows naturally from the value of a user. Anyone running a business knows that every single user has significant value. Businesses spend anywhere from \$30 to \$200 to acquire a user. Sometimes they pay users directly, other times they pay for advertising, and still other times entire companies are bought just for their user base. After a company acquires a user they often give them many free services just to keep them around long enough to monetize them through some other means.

Ripple uses a minimum balance that scales with account resource use and requires that new accounts get funded with at least this minimum balance. Currently this minimum balance is about \$0.15 which is greater than the \$0.10 we estimated would allow someone to transact freely at least once per week.

A blockchain can enforce a minimum value per user through the simple process of requiring a minimum balance. Any business that wishes to bring a new customer to the blockchain can pre-fund that user's account with the minimum balance that would allow them to transact. Requiring a relatively large fee (\$1.00) to sign up new users will naturally force anyone offering free accounts to vet the quality and uniqueness of each account before registering them with the blockchain.



Maintaining a minimum balance is effectively the same as making users pay transaction fees with the interest they could have earned on their balance. The minimum balance is simply the balance required to earn enough interest to pay a fee in a relatively short period of time.

Fortunately, the minimum balance required can be as low as a dollar and this is something users can understand and appreciate. The opportunity cost of lost interest doesn't incur the cognitive cost of a micro-fee and is far more acceptable to users.

The \$BRAIN used to pre-fund an account is Powered Up in the new account (i.e., converted to Brain Power). A portion of the \$BP used to fund a new account may be delegated from the creator of the account. When a user is delegated \$BP, they may use the \$BP for voting and bandwidth purposes as if it were their own, but the ownership of the \$BP remains with the user who delegated it. A user may remove the delegation at any time. After a cool-down period, the \$BP is returned to their account.





Effectiveness Relative to Fees

To compare the effectiveness of rate limiting to fees we must consider how the two systems react to intentional network flooding by an attacker. Under Bitcoin an attacker with \$10,000 dollars could disrupt service for an entire day by filling every single block. The same attacker would be unable to disrupt service for even a single block under the dynamic fractional reserve rate limiting approach.

If we go to a more extreme case and assume the attacker holds 1% of all coins then we presume an attacker with \$60 million dollars. Such an attacker could deny the Bitcoin blockchain service for 16 years unless the miners increased fees or capacity. Even if fees were raised to \$15 per transaction, the attacker could still keep the network flooded for 16 days.

Under the rate limiting approach, someone who holds 1% of all coins with an intent to flood the network would achieve their goal in less than 30 seconds.





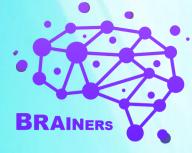
Renting vs. Buying vs. Time Sharing

When someone owns a house they expect the right to use the house for free. If a group of people buy a house together then each can expect the right to use the house proportional to their percentage ownership in the house. A fee based blockchain is like renting the house from its owners, whereas rate limiting is like a timeshare among owners.

If a house is owned by multiple people then those individuals must decide how they wish to timeshare the house. Someone who owns 50% of the house but only uses it one weekend per year might expect to be paid by the individuals who take their unused time. This is the mindset of a fee based system.

On the other hand, someone who owns 50% of the house is speculating that demand for the house will increase in the future and they will be able to sell their stake for more. Any owner who owns more of a house than they use becomes a real estate speculator. With this mindset rather than collecting rent, they collect appreciation.

The value of a share is derived from how much time it can potentially grant its owner. Owning 1% of a house and getting it 1 weekend per year is the lowest value of a share. However, if half of the shareholders never use their weekend, then the value per timeshare rises to 2 weekends per year. If those inactive users instead opt to rent their unused time, then it falls back to 1 weekend per year. If those unused timeshares were sold to people who would use them then the value of a timeshare would fall by 50%. Unless the rent collected is greater than the fall in share value the timeshare owners are making an economic miscalculation.



Using this rationale we can assume that a system based on fees will either be more expensive for its users or be less profitable for its collective owners. An individual small owner may profit by renting out his small time slice, but only at the expense of all other timeshare owners. In effect, the cost of the falling timeshare value is shared among all owners whereas the profits are centralized in the single owner who decided to rent his share.

We can conclude from this that a blockchain is best served by not using usage fees at all. If a usage fee were to be charged as an alternative to rate limiting, then it should be the equivalent of buying enough timeshares and committing to hold them long enough to gain the right to use it once.

Stated another way, a transaction fee should be equal to the minimum account balance necessary to transact once per week and it should be refunded at the end of the week. Assume the minimum account balance is \$1 and allows someone to transact once per week. If someone with a \$1 balance wishes to perform 5 transactions at once they will have to increase their balance to \$5 for a week either before or after their transactions.

In theory a market could form where users can borrow the stake required. In practice it is more efficient for users to simply buy and sell the timeshares necessary to meet their desired usage rate. In other words, the cost of negotiating micro-loans is greater than the cost of maintaining a balance suitable for your maximum weekly usage.

Decentralized rate limiting of transactions can enable new types of decentralized applications that were not viable when every use of the application required a micropayment. This new model gives application developers the ability to decide if and when to charge their users for transactions.



Performance and Scalability

The Brainers is built upon Binance Smart Chain, the same technology that powers \$BNB. Binance Smart Chain has been publicly demonstrated sustaining over thousands of transactions per second on a distributed network. BSC can easily scale to 10,000 or more transactions per second with relatively straightforward improvements to server capacity and communication protocols.

Scale

Brainers is capable of handling a large user base. To achieve this performance, Brainers has borrowed lessons learned from the similar exchanges, which were able to process millions of transactions per second. These are the following key points:

- 1. Keep everything in memory.
- 2. Keep the core business logic in a single thread.
- 3. Keep cryptographic operations (hashes and signatures) out of the core business logic.
- 4. Divide validation into state-dependent and state-independent checks.
- 5. Use an object oriented data model.

By following these simple rules, Brainers is able to process thousands of transactions per second without any significant effort devoted to optimization.

Keeping everything in memory is increasingly viable. It should be possible for commodity hardware to handle all of the business logic associated with Brainers in a single thread with all posts kept in memory for rapid indexing. Even Google keeps their index of the entire internet in RAM. The use of blockchain technology makes it trivial to replicate the database to many machines to prevent loss of data. In other words, Brain Network is designed for the architectures of the future and is designed to scale.



Brainers recognizes that the value of all user contributions is greater than the sum of the parts. A single content or vote is worth next to nothing, but millions of curated content or peer reviews are worth many millions (or possibly even billions) of dollars. A single vote provides little curation value, but billions of votes is very effective curation. Content without curation is of limited value. Given all the content of the Internet minus the links between it, Google would struggle to produce useful search results. It is the links between information that give it significant value.

Because everyone benefits, everyone should pay. In other words, no individual user should be expected to pay for anything, but instead should be paid for everything they do that brings value to the Brain Network. All we need to do is ascertain which user contributions bring a social value and which ones don't.

Collectively Reddit users vote 220 times per second and make 23 posts per second. Reddit is valued between \$500 million and \$4 billion which means that each and every upvote and post is worth between \$0.06 and \$0.50 assuming the value of Reddit is mostly within the past year's worth of activity. One could argue that most of the value of Reddit is the near-real-time discussions that have occurred within the past week which would dramatically increase the value of new activity. People go where people are today, not where people were last year.



No Micropayments, Tips Optional

Existing attempts at integrating a cryptocurrency into an information platform have focused on enabling users to pay one another. Many services have attempted to introduce tipping. The theory is that if we make tipping simple enough then more people will do it. Other services attempt to get people to pay to promote or boost their content's ranking. Still others attempt to build small prediction markets on how many tips an article will receive.

All of these approaches boil down to micropayments. They differ only in who is making the payment. They all suffer from insufficient engagement of people making the micropayments. In the search for incentivised content production entrepreneurs have been so focused on who should pay that they missed the obvious reality: everyone benefits from everyone's actions so everyone should pay or no one should pay, depending on how you look at it.

Brainers bypasses micropayments completely because when a creator makes a content it is the community that pays the bill via staking/vesting. The same amount of money will be spent whether the user votes on a content or not and the funds will not necessarily come from the voter. The mental energy associated with making an economic decision becomes a barrier to participation for most people.

Under Brainers, micropayments are paid to content producers, but those who vote for the content do not necessarily pay. Instead, the cost of the reward is paid for via yield from stake/vest pools. Someone can join the system, vote for a content, and then exit the system with more money than they started with (assuming the market valuation of the Brainers system remained constant). In other words, the micropayment solution provided by Brainers provides a user-experience similar to many widely used websites that have user-moderated content.



Solving the Cryptocurrency Onboarding Problem

It isn't easy to get into cryptocurrency. Someone who discovers Bitcoin and wants to try it out quickly learns that they will need to sign up with an exchange and fund their account with a credit card or wire transfer. What would Facebook's adoption rate have been like if you had to fork over money and two forms of ID?

Brainers solves this problem by giving everyone a way to get paid for doing simple, but valuable, tasks. This will help to widely distribute \$BRAIN tokens. This is helpful because cryptocurrencies have a network effect (i.e. more users make it more useful; for an extreme example, consider that if Satoshi had kept 100% of Bitcoin for himself, Bitcoin would be worthless.)



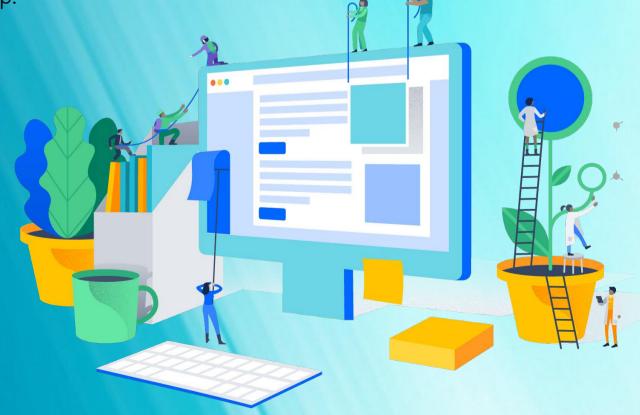


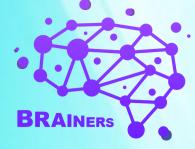
Solving the Cryptocurrency Liquidation Problem

A currency that is difficult to use or impossible to sell has little value. Someone who comes across \$1.00 worth of Bitcoin will discover that it costs more than \$1.00 to sell that Bitcoin. They have to create an account with an exchange, perform KYC validation, and pay fees. Small amounts of cryptocurrency are like small change that people are unwilling to bend over to pick up.

Brainers works with various levels of liquidity pool systems which are constantly funded by users who would like to access content on the platform. These pools of \$BRAIN provide liquidity to the exchanges, and will power the exchange within Brainers itself.

A way that people can liquidate the small amounts of cryptocurrency they receive from participating on the Brainers platform is through staking/vesting or tipping others. This is like leaving the small change as a tip for your waiter. When enough people leave small tips it adds up to a meaningful amount. You and the waiter each gain a benefit from the tip.





Censorship

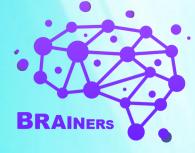
Steem is a decentralized network that is operated by witnesses in jurisdictions around the world. All user actions are publicly recorded on the blockchain, and can be publicly verified. This means that there is no single entity that can censor content that is valued by \$BRAIN holders.

Individual websites such as brainers.network may censor content on their particular site, but content published on the blockchain is inherently broadcast traffic and mirrors all around the world may continue to make it available.

Freedom of speech is the foundation of all other liberties and any infringement upon freedom of speech undermines the only peaceful means of reaching consensus, via discussion. Without free discussion voters cannot be fully informed, and uninformed voters are a greater threat to society than losing the right to vote. Censorship is a means of stealing votes through limiting public discourse. Brainers is committed to enabling free speech and building a free and decentralized society.

Solving Organic Discovery via Search Engine Optimization

Most cryptocurrencies generate little value for those who are not actively using the network. Brainers, by contrast, generates content and encourages users to share it. This content gets indexed by search engines and ultimately will bring value to a large number of passive users. This search traffic creates organic advertising for the Brainers network and grows the network's effect.



Shifting Toward Blockchain-based Attribution

The internet represents the easiest medium for distributing information in the world. With that said, it can be a frightening place for content creators who would like to own their content and have it shared with proper attribution. On current intelligence platforms, attribution is something that can be lost overnight - a posted video or image can be replicated and re-shared without consent or regard for the creator.

Under blockchain-based media, a creator or author would always be able to point to a public record and timestamp showing proof of their content origination. In a circumstance where a creator would like to address those who have re-shared without permission or attribution, blockchain-based records provide public proof that the content was posted by a particular user at a particular time. In the future, blockchain-based attribution could come to be recognized by governments for its authenticity and could hold weight in court, which would give content creators greater powers to control their work.

While a timestamping service can be built on almost any blockchain, and several efforts exist to build this kind of service on the Bitcoin network, Brainers has a useful advantage in this realm because content publishers are "first class citizens" -- the Brain blockchain is built from the ground up around the use case of content publication, which allows content creators to have the blockchain to validate their content at a certain point in time simply by writing their post using the same authoring tools used by other Brainers users.



Copyrights of Content on the Brain Network

Under Brainers, every content creator or author owns the copyright to their content, which they can license to any third parties that would purchase the rights from the creators. These purchases are in the form of NFTs. Each creator may mint their content on the blockchain and set up the copyright license fees as they wish. By doing so, they agree to provide 10% of the license fee to the Brainers for hosting their content. These licenses will act as royalties upon the third party's further transactions on the content.

Once a content was "bought out", the community members who staked/vested in the content may claim their proportional part based on their participation percentage in the content's pool. These additional revenue streams will further drive the incentive to stake/vest in content and also to share it in hopes for a possible "buyout".





Conclusion

Brainers is an experiment designed to address challenges in the cryptocurrency and the information market by combining the best aspects from both. Brainers presents earning opportunities to content creators and quality intelligence to their consumers in ways that have not existed within the Internet before. Within the Brainers, individuals earn real rewards online that are directly correlated to their contributions. Those rewards may have dollar value due to the market price and liquidity of Brain, and the people who hold Brain may have more exclusive powers than those who do not.

In short, the Brainers sees the future in rewarding intelligence.

Brainers team

