Gridcoin

1 Mission

As humanity has evolved, data has become increasingly woven into our way of life. From discovery to production to the ways we view our society and our history, access to data and the unraveling of its secrets only increases understanding and accuracy. It is under this axiom that Gridcoin seeks to develop an open source, open access, blockchain based distributed computing network powered by the idle processing potential of existing hardware.

2 Introduction

Gridcoin is an open source blockchain algorithm that rewards people for offering their Idle Processing Potential (IPP) to data driven analysis and scientific discovery through a distributed computing network. The Gridcoin Network monitors IPP contributions and rewards participants through the Gridcoin Blockchain. Reward is distributed in the form of the blockchain incentive, GRC, and is earned through Proof of Stake participation and participation in the distributed computing infrastructure, BOINC. BOINC, the Berkeley Open Infrastructure for Network Computing, hosts major citizen escience computing projects such as IBMs World Community Grid, SETI, and the LHC, alongside projects developed by students, enthusiasts, mathematicians, researchers, and citizen scientists.

3 Idle Processing Potential

Any technologically advanced society produces a certain amount of unused processing power as a waste product of its hardware. Gridcoin aims to use this idle processing power to run its network, maximizing the use of resources in already existing processors. Idle Processing Potential, or IPP, can be measured as the unused processing power of a cpu over time. It is difficult to quantify the Idle Processing Potential which exists in the world today, as research on the subject is sparse. It is possible, however to get a feel of the enormous potential presented by an IPP driven network. Every phone, every computer, every gaming system, every car, refrigerator, toy and object that houses a CPU is potentially part of this network.

To explore the potential of an IPP driven network, let us try to find the approximate IPP of all smartphones in circulation today and compare the smartphone networks IPP with BOINC and Bitcoin. We will have to guess for some variables as the data is not readily available.

BOINC currently hosts 18 petaflops on its network with 171,457 active volunteers. In comparison, the Bitcoin network hosts more than 80 exaflops. This is about 100 times more powerful than the top 500 centralized supercomputers combined, which sit at a modest 748.4 petaflops as of June 2017. An iPhone 6, on the other hand, offers up to 7 gigaflops. There are approaching 2.5 billion smartphones in circulation. Assuming 7 gigaflops as an average, the processing

potential of all smartphones in circulation would then be 2.5 billion multiplied by 7 gigaflops, or 17.5 exaflops. Let us say that smartphones are idle at least 50 percent of the time, when the user is asleep. The IPP of the smartphone network would then be at least 8.75 exaflops. Better data is clearly required to eliminate assumptions in these calculations and determine the true IPP of the smartphone network. Directing this and the IPP currently wasted by other CPU enabled hardware toward scientific, social, and economic endeavors presents truly inconceivable possibilities in the realms of social understanding, science, and equality.

4 BOINC

The Gridcoin blockchain rewards users offering their IPP to approved projects hosted on BOINC, the Berkeley Open Infrastructure for Network Computing. BOINC is an open source distributed computing infrastructure which provides anyone with a means to host data to be processed. Developed out of the SETI project in 2002, BOINC has been used to identify pulsars, create patient specific cancer treatments, expand on our knowledge of efficient molecular combinations for solar panels, and has completed countless other scientific and mathematical computational tasks. While BOINC has been used primarily for science and math, it can host data from any field so long as the data can be formatted for BOINCs processes. Examples of projects include tasks on engineering, rendering, weather and climate prediction, and social, market, and resource analytics. Any endeavor with the appropriately formatted data to process and a server on which it can be hosted can use BOINCs processes.

5 Gridcoin

Under Development

6 Financial

A blockchain based financial system generated by the open and accessible analyzation of data would help redefine societys value structures while simultaneously advancing scientific, medicinal, mathematical, and social practices. The decentralized nature of blockchain technology paired with the rapid spread of processing power to individuals creates an ideal environment in which everyone has the opportunity to participate in the generation of this systems currency. Such a system would ultimately prioritize the pragmatic and democratized advancement of data based research in opposition to a system where advancements are chosen by the financial and social elite.

6.1 Value

Any contemporary blockchain holds value with relation to three major sources:

1. Exchange: Its ability to rapidly and inexpensively exchange information through a decentralized and immutable mechanism.

2. Information: The information contained in the blockchain.

3. Currency Generation: The generation and distribution mechanisms of the blockchains currency.

Gridcoin is no exception.

1. Exchange

   In its current state, Gridcoin does not seek to revolutionize the way information is exchanged between participants of the blockchain. The process is largely based off of Bitcoin protocols which have been comprehensively tested and secured. As such, its value of exchange is directly related to the Bitcoin blockchain.

2. Information

   A second point of value of the Gridcoin blockchain and network is through the value society places on information in the blocks and superblocks of the blockchain. This perceived value is translated into exchangeable value through the currency generated by the blockchain, GRC.

   A Gridcoin block contains information pertaining to the transfer of information between users participating in the Gridcoin blockchain. In addition to these standard blocks, Gridcoin has developed a statistics collection tool which compiles individual user statistics into what we call a Superblock. Superblocks maintain all the qualities of standard blocks including immutability based on consensus. Currently, Superblocks contain information related to Credits earned on the BOINC computing management platform. Credits are information meant to represent the value given to completed Work Units. Work Units are sets of data analyzed by processing power. Each Superblock, it would follow, contains unique user information regarding the processing power that user contributes to BOINC projects. Superblocks have the potential to collect statistics from a theoretically infinite array of sources.

3. Currency Generation

   Gridcoins protocols generate GRC through two mechanisms. First, GRC

is generated and distributed to users for participating in the Proof of Stake security of the Gridcoin blockchain. This is no different than many Proof of Stake blockchains and presents a similar point of value that relates to the value placed on the security of the blockchain. The second GRC generation mechanism is unique to Gridcoin. It uses the information compiled in superblocks. GRC is generated and distributed based on a users statistics contained in Gridcoin superblocks. This generation mechanism is as automated and transparent as other blockchain currency generation mechanisms.

6.2 Conclusion

Just as a physical resource holds an exchange value equal to its perceived worth in a society, a blockchains generated currency, such as GRC, holds an exchange value equal to a society's perceived worth of the data in the blockchain combined with the currencys generation protocol and the utility provided by the blockchain protocols.

7 Gridcoin Grants and Resource Allocation

A blockchain based financial system which prioritizes the pragmatic and democratized advancement of data based research holds the potential to revolutionize the funding process for computational science, data analysis, and simulation based research.

7.1 A Touch of General Research and Grant History

If history is our teacher, it can be said that basic research holds high value with regard to scientific endeavors and progress. Basic research is the general exploration of a subject without the quest for a final product. It is led by the innate inquisitive drive that encourages many of humanitys actions. In general, basic research leads to discoveries and creations which have connections to a wide array of subjects other than that which was intended to be explored. In other words, learning a little more about X can lead us to discover Y, Z, A, B, and C. For example, the basic research of mathematics in the 19th and early 20th century is the reason we have computers today. The research into symmetry will give us quantum computings and entirely new realms of physics. The research into the stickleback fish gave us a large portion of the evolutionary biology knowledge base which is helping to cure disease today.

It is difficult to exactly pinpoint when, but over time basic research has become less of a focus when compared to translational research. Translational research, also known as applied research, is research which can be quickly translated into a marketable product. The main effect of this transition has been a shift of funding sources from the public sector to the private sector. This in turn has had many detrimental side-effects. For example, universities are now

allowed to establish and run their own for-profit research entities. In the past, they could function only at the whim of taxpayer funding, which meant the research belonged to citizens. In the past, private corporations were barred from influencing public university researchers. Now, it would be a challenge to find a public university that does not host corporations which require professors and researchers to sign Non Disclosure Agreements.

The world of research funding has changed over the past decades. Gridcoin seeks to change it again for the coming decades.

7.2 The Current Grant System

Research is an expensive endeavor that need not guarantee results. Consider the largest research projects of the millenium, the Large Hadron Collider and ATLAS. There is no guaranteed product, marketable result, or promise other than that of discovery. Unfortunately, this mentality does not correlate into general grant based research.

In order to receive funding, a researcher must submit a grant proposal to an entity with available funds. In the past, these entities were governments. In a democracy, this means the funding came from and the science belonged to the citizens of a country. Over time, government funding was decreased and taken up by private for-profit entities. As a result, the focus of research has shifted from basic, or foundational research, to translational, or applied research. Foundational research gives us the knowledge required to build new things. Applied research tries to build new things to be sold on a market. Both are important, however foundational is required for applied to exist, and in general it is fairly difficult to monetize and own foundational research.

The shift from public grants to private grants means that most research is owned by private, for-profit entities. The for-profit nature of the entities putting up funds for grants means that researchers are encouraged to focus on the rapid and hyper-focused creation of marketable products. This structure also limits the funding available for a large swath of researchers who seek to perform foundational research as foundational research often does not result in quick to market products.

7.3 The Gridcoin Grant System

A system which allows and encourages researchers to request funding from a general population encourages the spread of knowledge and understanding. This peer-to-peer funding structure has been tested and developed in the venture capital, banking and loan, and manufacturing industries. Gridcoin seeks to bring it to computational science, data analysis, and simulation based research.

Gridcoin presents a blockchain and network which allocates funds and resources (IPP) to foundational and applied research based on the desires of the network. These desires are influenced by individual preference, external factors, and the ability of a researcher or entity to educate network participants to the usefulness of their research. For example, during times of dramatic shifts

in climate, projects with a focus on weather modeling and climate prediction might see more funding and IPP directed toward their completion. Of those projects, those best able to communicate their purpose and the benefits of their completion will likely receive the majority of these resources.

7.4 Where Do Funds Come From?

https://github.com/gridcoin-community/Gridcoin-Tasks/issues/191

8 Development

Currently, Gridcoin is developed through an open source submission process. Any individual or entity wishing to contribute to the codebase can submit changes to the Gridcoin-Research github. If the proposed changes constitute a major change in Gridcoin protocols, operation, or codebase, a client run poll will likely be required before any changes are implemented. It is possible that Gridcoin might grow to utilize the open source node structure defined with Bitcoin for accepting updates and improvements to the Gridcoin codebase.

9 Funding

Development and maintenance of the Gridcoin codebase is paid for by the Gridcoin Foundation which as of November 2nd, 2017, holds 37,077,947 GRC, or $1,328,621.53. Distribution of funds is currently based on 6 month distribution proposals, with future proposals voted on at the end of each period. Projects unrelated to code development are funded through bounty, donation, and volunteer processes.

10 Additional Resources

Under Development

11 Credits

Jringo Geebell