

# Nebulas:

## Decentralized Search Framework

Nebulas is a decentralized platform which provides a search framework for all blockchains.

Non-technical White Paper

PLEASE SEE IMPORTANT INFORMATION AT THE END OF THIS WHITE PAPER

### Summary

Bitcoin brings "decentralized currency" to the world of blockchains, while Ethereum system showcases "smart contract". Blockchain has already gained significant development and prosperity in the past three years. However, we find the existing technology far from being perfect. Blockchain starts to face more and more challenges in its integration with current business and user requirements.

This white paper mainly focuses on three concepts: value rank of blockchains, the positive feedback ecosystem, and the self-evolving blockchain system. Based on these, we present Nebulas' idea and solutions, which consists of Nebulas Rank (the measure of value for blockchains) and Nebulas Force (a fundamental self-evolving mechanism for blockchains). We will also elaborate on the mechanism of our innovation in consensus: PoD (Proof of Devotion) and DIP (Developer Incentive Protocol).

The ultimate mission of the Nebulas Blockchain is to build a self-evolving blockchain system based on value incentive, which will also be the most important development direction in the world of blockchains hereafter. As commonly known in the current industry, core components such as smart contracts, domain name systems, developer toolkits, wallets, etc., are being provided as part of the launch of the Nebulas platform.

- 1 Background.....3
- 2 Opportunities and Challenges .....4
- 3 Why Nebulas? .....7
- 4 Technical Features.....10
- 5 Use Cases .....16
- 6 Team .....18
- 7 Roadmap .....19
- 8 NAS Allocation Summary.....20
- IMPORTANT INFORMATION FOR POTENTIAL CONTRIBUTORS.....24

# 1 Background

On 31st Oct 2008, Satoshi Nakamoto released a white paper titled: "Bitcoin: A Peer-to-Peer Electronic Cash System", which marked the birth of blockchain in our world.

As the blockchain's primordial application, Bitcoin puts its ideal as "a decentralized digital currency system" into practice, as well as presents the world blockchains' gigantic value and potential. Gradually, more and more people start to follow, study, and devote to blockchains, which promotes sustainable development in the blockchain infrastructure. In doing so, the blockchain community contributes to creating more connection between our real world and its application data, opening up brand-new frontier constantly.

It is worthy to state that blockchain itself is not an entirely new technology but a new model of collaboration based on a combination of technologies (including P2P network, cryptology, blockchain data structure, etc.). Blockchain essentially is an autonomous system that is decentralized, with the foundation in the game theory, the real charm of which is **its open collaboration model based on consensus mechanism under the ideology of decentralization.**

We are happy to see that blockchain's function is transforming from monotone simplicity to diversity, and it's still experimenting and making breakthroughs. Bitcoin is a decentralized cash system, while the second generation blockchain system represented by Ethereum brings up the concept of "smart contract" with Turing completeness, which enables the blockchain with logical judgment and processing capability. Meanwhile, some other blockchain systems propose grander concepts like "cross-chain interoperability", "blockchain operating system", etc. These endeavors all pushes blockchain **evolving from dots to a plane in 2 dimensions, eventually to a space of higher dimensionality.**

## 2 Opportunities and Challenges

We believe that a decentralized, autonomous system represented by blockchains is the coming trend, which has excited more and more attention and study. Meanwhile, various blockchain projects are developing at tremendous speed, and crypto assets' value is increasing at an exponential rate.

By one estimate, the global blockchain technology market is expected to be worth US\$ 20 bn by the end of 2024 as compared to US\$ 315.9 mn in 2015. By the end of 2017, the global crypto asset overall market cap has reached US\$ 610 bn, as compared to US\$ 18 bn in 2016. At the same time, the user population in blockchains and digital assets is increasing at high speed. At the beginning of 2013, the global users in the industry were 2 million, and by the beginning of 2018, the number had grown to 20 million. We believe that **around 2020, the global users of blockchains/digital assets shall reach or exceed 200 million, and around the year of 2025, this number is expected to reach 1 billion.** Based on this estimation, blockchain innovation currently faces an unprecedented window of golden opportunity.

Meanwhile, the blockchain also faces many challenges, such as the interaction of information on blockchains, protocol's upgrade, blockchain applications & smart contracts' effectiveness and relevance judgment, etc.

**The problem of interaction of information on blockchains** is actually caused by lack of interoperability among different blockchain networks. We have reached a consensus in the industry on this problem, but by now, there exists no perfect solution. The crucial matter here rests on interactions of data/assets on chains, off-chain, and as well as on cross chains. That has significantly restricted the full potential of blockchain technology, which has caused the so-called "information silos" on chain and off-chain. More and more blockchain projects are trying to make breakthroughs on this issue, but, for now, there are no unified

protocols and standards for data/ assets on different blockchains, which causes interoperability deficiency, both internally within, and externally between, blockchains.

Unlike common software version iterations connected with the rollout of software updates, **upgrading a blockchain network protocol** often triggers "hard forks" or "soft forks". A hard fork is when a single cryptocurrency splits in two. It occurs when a cryptocurrency's existing code is changed, resulting in both an old and new version. Meanwhile a soft fork is essentially the same thing, but the idea is that only one blockchain (and thus one coin) will remain valid as users adopt the update. So both fork types create a split, but a hard fork is meant to create two blockchain/coins and a soft fork is meant to result in one.

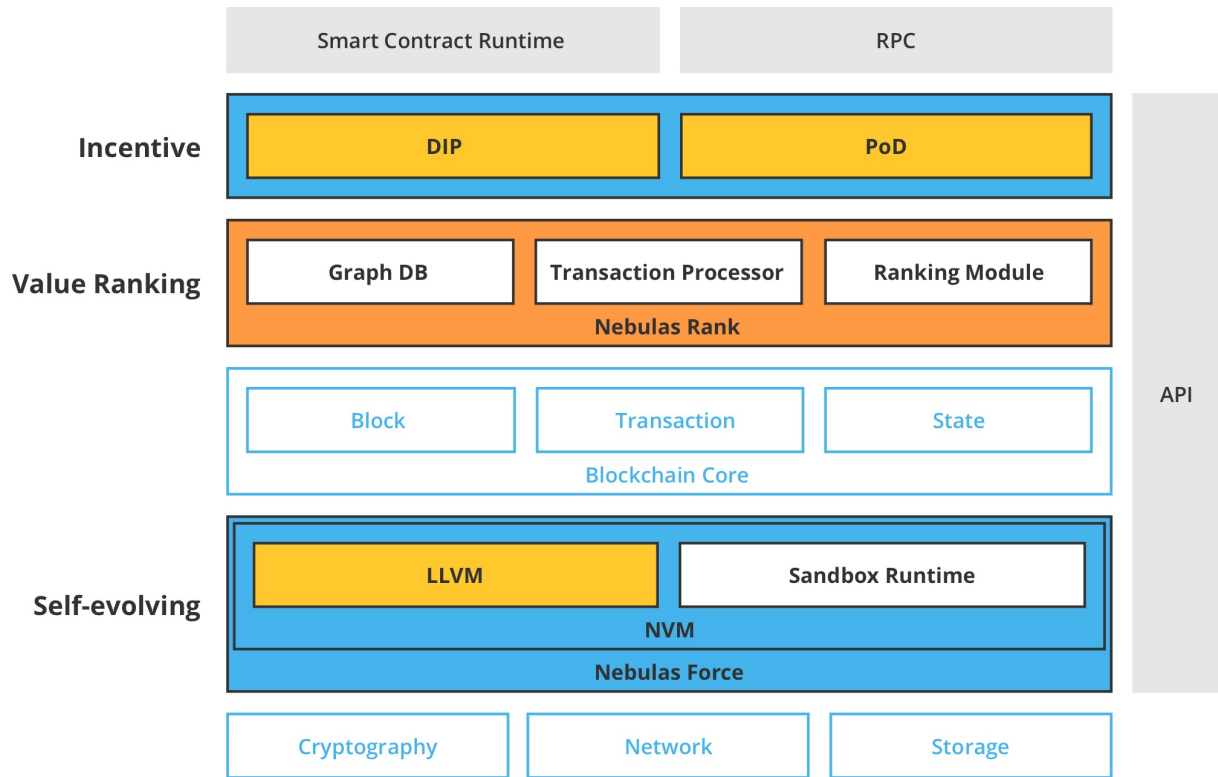
Bitcoin, for example, experienced a hard fork in August 2017 due to scalability issues. The bitcoin scalability problem is a consequence of the fact that blocks in the blockchain are limited to one megabyte in size. Bitcoin miner fees for processing bitcoin transactions is estimated to have risen to above \$25 per transaction in 2017, making small payments uneconomical. Bitcoin's blocks include the transactions on the bitcoin network. In contrast to Visa's peak of 24,000 transactions per second, the bitcoin network's theoretical maximum capacity with the 1MB block size limit sits between 3.3 to 7 transactions per second. Due to block capacity's severe insufficiency, there had been incident in which almost 1 million transactions are pending in the transaction pool to be recorded on blocks. Under current circumstances, there exists tremendous uncertainty on Bitcoin's transfer time, and users have to pay extra high "transaction expediting fee", which injures user experiences.

Ethereum has also experienced hard forks. In 2016, as a result of the collapse of The DAO project, Ethereum was split into two separate blockchains: the new separate version became Ethereum (ETH), and the original continued as Ethereum Classic (ETC). Despite solving the problem temporarily, the fork still

produced "double assets" of ETH & ETC, as well as community division as a "side effect".

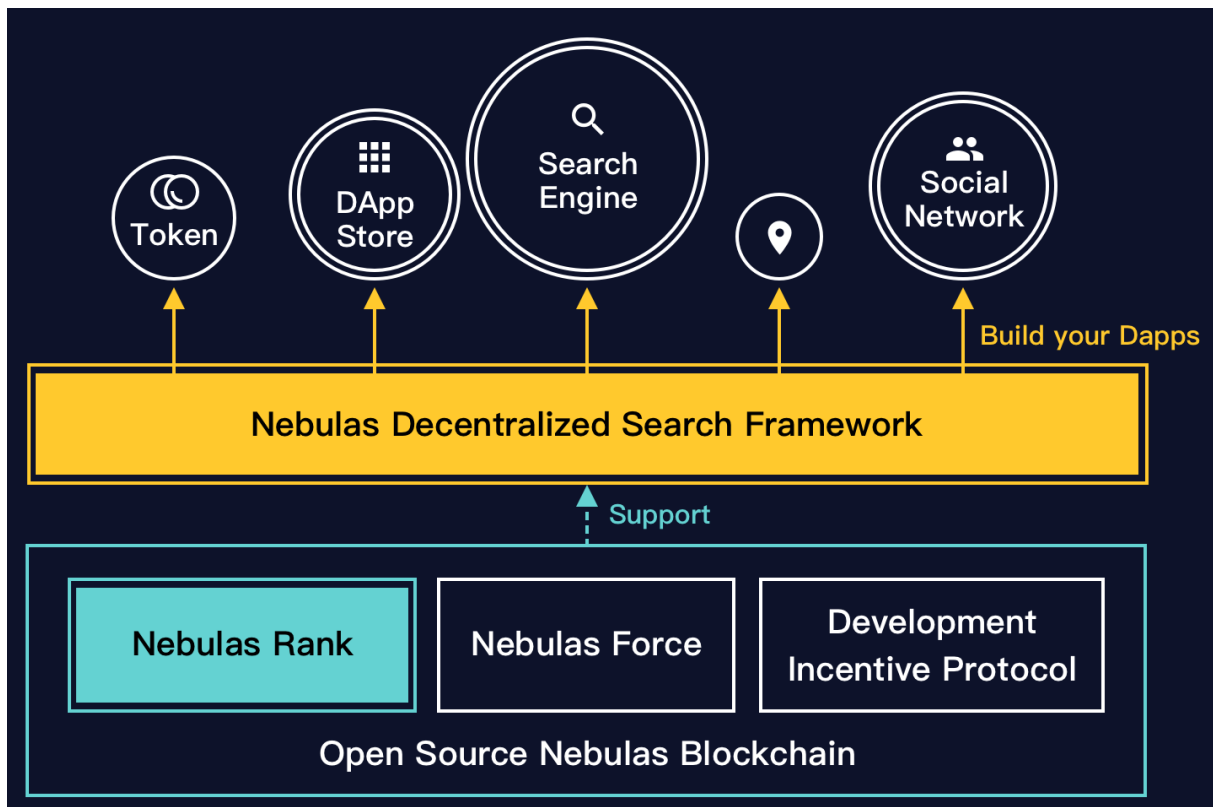
With the rapid growth of distributed applications (DApps), **an efficient search engine for blockchain applications and smart contracts** become one of blockchain's biggest challenges. Now there are hundreds of DApps based on Ethereum. If one day the number of DApps on blockchains reaches the same scale of the App Store, it will be a big problem to search and find right DApps for users. From this point of view, **the blockchain world lacks a measure for more dimensions of information and rank value, which will facilitate discovering the wonderland of blockchains for users.**

# 3 Why Nebulas?



**Nebulas Architecture**

Facing the opportunity and challenge described above, we aim to create a self-evolving blockchain system based on value incentive.



## Nebulas World

More specifically, our targets are:

- **Defining Rank Value**

We believe that world of blockchains needs a standard of value to measure the value of blockchain's underlying data so as to explore information's higher dimension, which serves to discover and uncover more value of blockchains.

- **Building Positive Feedback for Community Ecosystem**

We believe that to build a prosperous decentralized application ecosystem, a developer-friendly positive feedback mechanism is a fundamental requirement. Only this kind of application ecosystem can empower the blockchain system with stronger vitality.

- **Achieving Self-evolution**

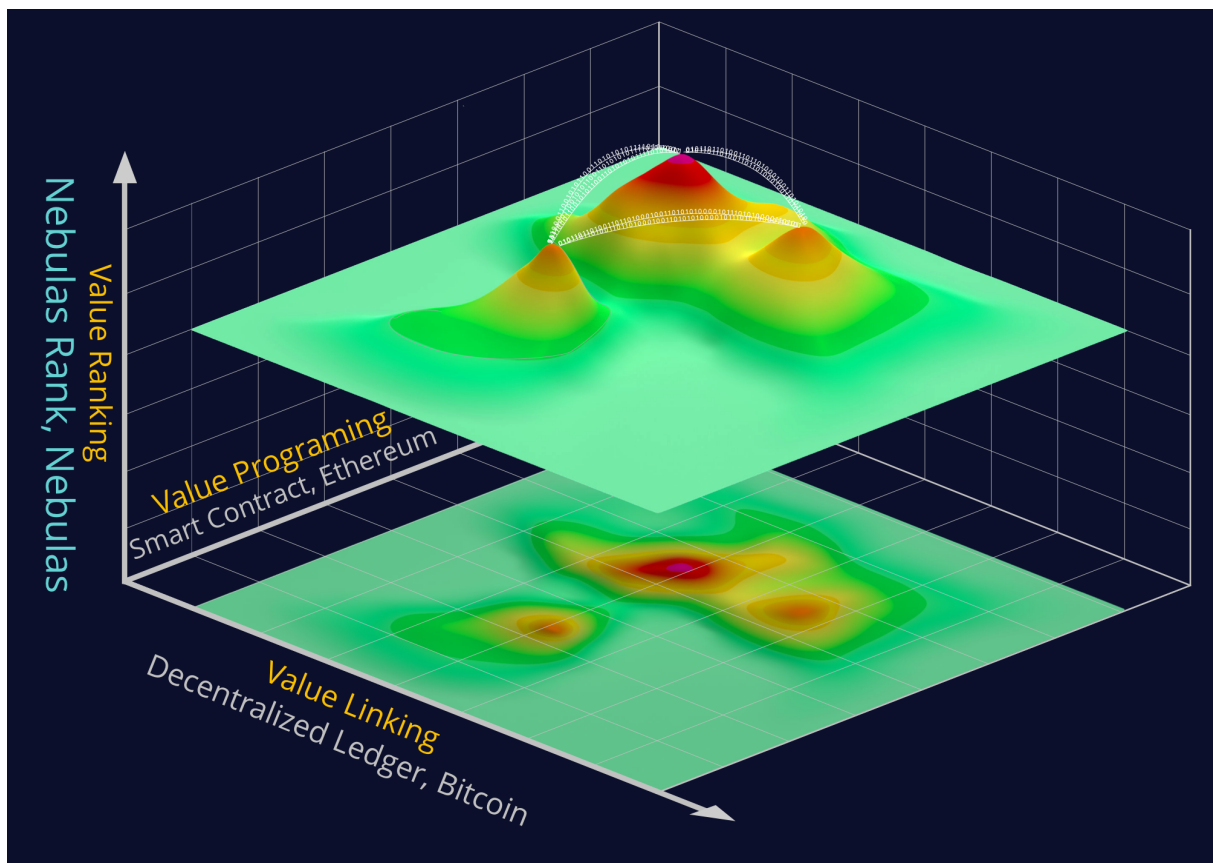


We believe that a blockchain system endowed with a self-evolution mechanism can evolve automatically. With little external intervention, the system will provide faster computing, more powerful systems and better user experiences.

# 4 Technical Features

## Nebulas Rank (NR)

Nebulas Rank (NR) is our core ranking algorithm and is the measure of value in the world of blockchains. It is pen sourced. The algorithm is based on liquidity, propagation of users' assets, and the interactivity between users. NR is used to rank addresses, smart contracts, distributed applications (DApps) and other entities on the blockchain.



## Nebulas Rank (NR)

In Nebulas, we measure value regarding:

- Liquidity

Finance essentially is the social activity that optimizes social resources via capital liquidity and promotes economic development. Blockchains establish a value network in which financial assets can flow. Daily volume of Bitcoin and Ethereum, which are most familiar to us, already exceeds \$1 billion. From these data, we can see that the more transaction volume and transaction scale, the higher liquidity. In turn, higher liquidity will increase the quantity of transaction and enhance the value. That will further strengthen financial assets' value, creating a complete positive feedback mechanism. Therefore liquidity, i.e. transaction frequency and scale, is the first dimension that NR measures.

- **Propagation**

Social platforms like WeChat and Facebook have almost 3 billion active users per month. Social platforms' rapid user growth is a result of the reflection of existing social networks and stronger viral growth. In particular, viral transmission, i.e. speed, scope, depth of information transmission and linkage, is the key index to monitor the quality and user growth of social networks. In the blockchain world, we can see the same pattern. Powerful viral propagation indicates scope and depth of asset liquidity, which can promote the blockchain world's asset quality and asset scale. Thus, viral transmission, i.e. scope and depth of asset liquidity, is the second dimension that NR measures.

- **Interoperability**

At the Internet's early stage, there were only basic websites and private information. Now, information on different platforms can be forwarded on the network, and isolated data silos are gradually being broken. This trend is the process of identifying higher dimensional information. In our point of view, the world of blockchains will follow a similar pattern, but its speed will be faster. The information on users, assets, smart contracts, and DApps will become richer, and the interaction of higher dimensional information will be more frequent. As a result, better interoperability will become more and more important. Therefore, NR's third measure dimension is interoperability.

Based on above-stated dimensions, we start to construct Nebulas' NR system by drawing from richer data, building a better model, digging up more diversified value dimensions, and establishing a measure of value in blockchain world.

### **Proof-of-Devotion (PoD)**

Based on Nebulas' NR system, we will adopt PoD (Proof-of-Devotion) consensus algorithm. PoD gives an "influential" user on the Nebulas blockchain an opportunity to become a bookkeeper and receive Nebulas block rewards and transaction fee as revenue, which will encourage them to contribute to the stability and security of the Nebulas blockchain on a continuous basis.

PoD algorithm's core concept:

users with NR values higher than a specified threshold may take part in the bookkeeper selection procedure by paying a security deposit;

through virtual mining, each bookkeeper candidate competes to earn bookkeeping rights;

users with bookkeeping right are responsible for block generation, and in return receive block reward and transaction fee as revenue; and

if any user behaves in an inappropriate fashion, the user's security deposit will be confiscated and reassigned to other bookkeeper candidates.

### **Developer Incentive Protocol (DIP)**

For the Nebulas blockchain, we are proposing the concept of DIP (Developer Incentive Protocol) for developers of smart contracts and DApps.

DIP's core concepts:

in pre-specified block intervals, for those developers whose smart contracts and DApps deploy online in the most recent interval with an NR value higher than a specified threshold, DIP will reward them corresponding developer incentives, and these incentives shall be recorded on blocks by bookkeepers, and with DIP's positive incentive mechanism, more and more developers will get incentives to create valuable smart contracts and DApps, which will, in turn, help to build a positive feedback ecosystem for the developers community.

### **Nebulas Force (NF)**

A series of basic protocols such as NR, PoD, DIP will become a part of the Nebulous blockchain data. With the growth of data on the Nebulas blockchain these basic protocols will upgrade. We call this fundamental capability of the Nebulas blockchain "Nebulas Force" (NF). NF provides the Nebulas blockchain and its distributed applications built on top of it, the capability to self evolve. With NF developers are able to make changes, incorporate new technologies, and fix bugs without needing to hard fork.

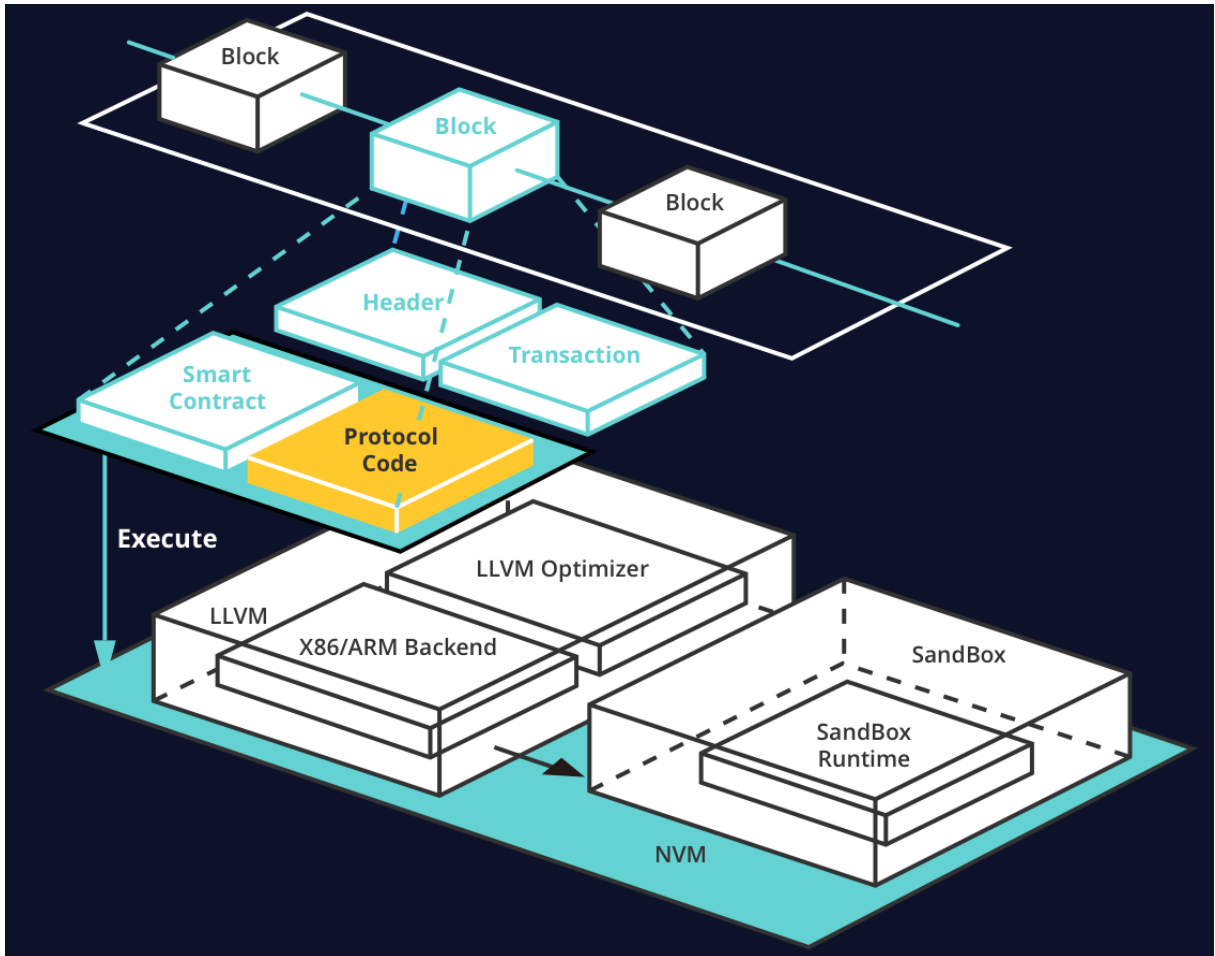
As the Nebulas community grows, NF and update ability for protocols will be opened to the community. According to the NR weight of users and by using the community voting mechanism, the community will be able to determine the evolution and direction of the Nebulas blockchain and its update objectives. With the help of NF's core technology and its openness, Nebulas will have ever growing and infinitely evolving potential.

Additionally, Nebulas is also developing a forward-looking mechanism of Nebulas Cluster Polymorphous Evolution. On the premise that data and assets on the main blockchain are safe, through an inborn Nebulas Excitation Protocol, one or several side chains will be created to verify core technical innovation

solutions, such as new consensus algorithm, lightning network, etc. At the same time, through the Nebulas Wormhole, data and assets can be exchanged across side chains as well as between side chains and the main blockchain, as well as interoperability among DApps.

In this process, users on the main Nebulas blockchain can invest on side chains to test newly offered NAS using side chain technology. (See Section 8 below for a discussion regarding potential future distributions of NAS.) They can also keep their assets on the Nebulas blockchain while benefiting from evolutionary advancements as the main Nebulas blockchain update smoothly. For example, as optimized performance increases earnings for users, Nebulas can upgrade its core architecture safely, in an economical way, thus giving Nebulas unprecedented vitality and scalability.

For those side chain technical innovations that haven't been accepted by the Nebulas blockchain, it is possible to let those side chain innovations continue to develop. Using the Nebulas Wormhole, side chain activity can still take advantage of exchanges of data and assets across side chains, as well as DApp Interoperability. Imagine, for example if blockchain systems like Bitcoin, Litecoin, ETH and ETC had the native ability built in for data and asset exchanges, we would immediately face many more dimensions of technical possibilities.



## Nebulas Force (NF)

# 5 Use Cases

Since the generation of Bitcoin's genesis block in 2009, the community has come to a consensus as to the objective of most of the existing public blockchains: create an infrastructure for building a DApp ecosystem which is developer-friendly and features a complete incentive mechanism. However, due to various historical restrictions, to date there is still not such a systematic and efficient mechanism.

So, from the beginning, Nebulas is striving to build an open and transparent positive feedback ecosystem for the developers community.

Compared with current Internet industry, any platform that can attract the most diversified developers is the most valuable. For example, the Apple App Store has opened entirely new prospects for mobile applications by establishing an application ecosystem that creates tremendous social value and business returns. Unfortunately, even in this case, there still exist many flaws on its dividend model for contributors who develop applications for the platform. For example, developers on the platform cannot share in the growing valuation bonus of the App Store platform (due to the increasing number of applications).

Can we establish a more inclusive developer incentive mechanism guaranteed by blockchain technology? In such a world, every DApp developer would have the chance to share the ecosystem benefits based on their contribution to the blockchain world.

In the Nebulas blockchain, we make this possible through the DIP protocol. Outstanding developers in the community will be able to receive NAS from DIP offering. Those developers who make contributions to the community ecosystem growth will be rewarded, which will create a positive feedback mechanism offering to community developers.



Through NR, PoD and DIP, the Nebulas blockchain could put an end to the current venture capital incubation model that is comparatively centralized, inefficient, opaque, and unfriendly, by creating a way to motivate the creativity and vitality of developers. Let's imagine, for example, that every App development team creating apps for the Apple App Store could get considerable incentives from Apple based on their contributions to App Store. In this paradigm, the app ecosystem would likely enter a new era with quality and quantity explosion. Nebulas' vision is to institutionalize a decentralized ecosystem for developer application incubation through DIP incentives. We believe that the decentralized and incentivized world created by the Nebulas blockchain will result in the emergence of a significant number of new blockchain DApps.

The blockchain world is developing at an ever-accelerating speed. Every day we see more and more DApp developers join the blockchain community and connect more and more information on blockchains. How to present information to users simply and efficiently will become more and more important.

We hope to further extend NR's functionality, i.e., by making information indexes for blockchains. Combining NR with a "keywords" mechanism, we can sort and manage information in a relevant way. In doing so, users of blockchains will be able to access more relevant and high-value data (including information, assets, smart contracts, DApps, etc.). Compared to the Google search engine in the Internet world, with continuously explosive and tremendous information growth of blockchains, an information index and search engine for blockchains becomes an indispensable and necessary requirement. It will be an essential tool and the starting point for many users to explore the world of blockchains. With the power of information index and searching, as well as combining the Internet's mature business model, Nebulas hopes to open up unprecedented business potential.

# 6 Team

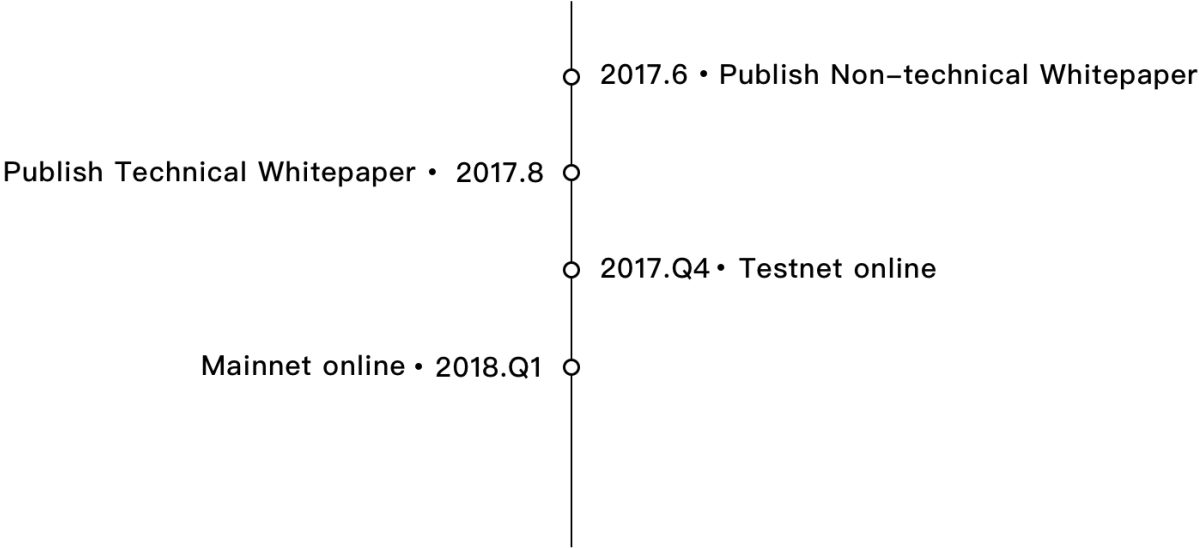
## Founders

**Hitters Xu**, Nebulas & Antshares (NEO) founder, former founding leader of Ant Financial's Blockchain Platform, ex-Googler in Search & Anti-Fraud team, and graduated from Tongji University in Computer Science and Technology. First blockchain pioneer in China. Since 2013, he has founded BitsClub (the first Blockchain/ Bitcoin innovation community in China), Antshares (the first Blockchain in China), FBG (the first fund dedicated to Blockchain in China), Gempay (the first Bitcoin/Blockchain cross-border payment platform in China). In 2014, he founded the first international blockchain summit in China with series of influential international blockchain summits.

**Robin Zhong**, Nebulas co-founder, former architect of Ant Financial's Blockchain Platform, former senior development director of Dolphin Browser and leader of the Game division. Graduated from Huazhong University of Science and Technology. He is also the founder of Tongxinclub, the first Blockchain mutual support platform in China.

**Guan Wang**, Nebulas & Antshares (NEO) co-founder, initiator of OpenIP & IP Community, a serial entrepreneur in blockchain industry. Graduated from Southeast University.

# 7 Roadmap



Roadmap

# 8 NAS Allocation Summary

Initially, there will be a finite supply of NAS Tokens (100,000,000) that are intended to circulate among users and within the Nebulas Platform continuously. It is not expected that NAS will be ‘burned’ and/or cancelled on the blockchain, and they will therefore operate primarily as (i) reusable ‘in-app currency’; and (ii) as a means for operating the Nebulas Platform. In the future, Nebulas may create additional NAS in connection with ongoing operations and functionality of the Nebulas Platform as set forth below.

The intention is to create an internal economy within the Nebulas Platform, whereby NAS will be an integral part which drives this ecosystem. NAS will therefore continuously circulate within the Nebulas ecosystem and the Nebulas Platform, passing from one user to another as a means of consideration for performance of the roles vital to the functioning of the Nebulas Platform.

As discussed, the Nebulas Platform will include “Nebulas Rank” or “NR”, a core ranking algorithm used to measure the value in blockchain data and applications. NR will be used to rank addresses, smart contracts, distributed applications and other entities on the blockchain. Based on the NR system, as also discussed, Nebulas also intends to adopt a “Proof of Devotion” or “PoD” consensus algorithm. PoD gives influential user on the Nebulas Platform an opportunity to become bookkeepers and receive Nebulas block rewards and transaction fee as revenue, which will encourage them to contribute to the stability and security of the Nebulas blockchain on a continuous basis.

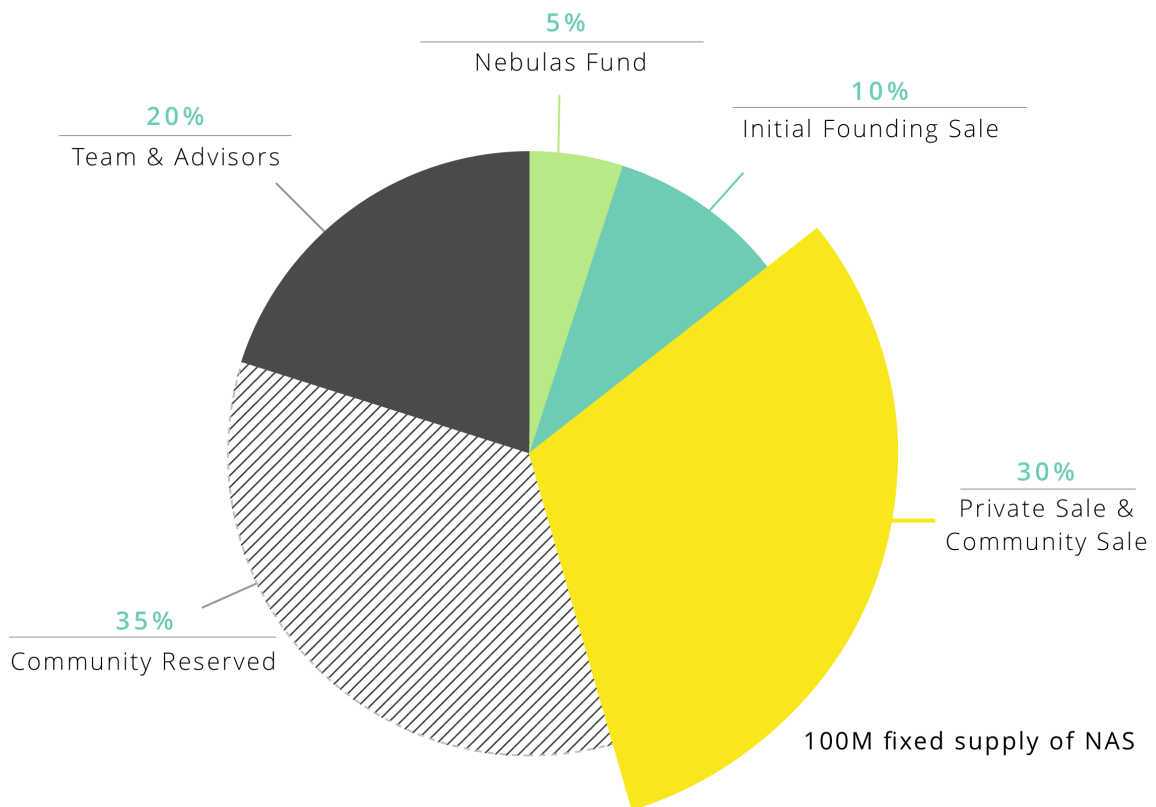
In order to support the PoD consensus process, Nebulas may from time to time generate additional NAS. Presently, Nebulas expects to generate additional NAS on an annual basis beginning at the end of 2019 at a rate of 3% of total NAS supply in connection with the PoD program.

Finally, as described above, Nebulas also intends to create a “Developer Incentive Protocol” or “DIP” for developers of smart contracts and DApps on the Nebulas Platform. The DIP process will be used by Nebulas to encourage and reward developers who develop smart contracts and applications for the Nebulas Platform.

In order to support the DIP incentive process, Nebulas may from time to time generate additional NAS. Presently, Nebulas expects to generate additional NAS on an annual basis beginning at the end of 2019 at a rate of 3% of total NAS supply in connection with the DIP program.

Notwithstanding the foregoing, no assurance can be made that any additional NAS will ever be generated in the future. In addition, existing holders of NAS will be entitled to determine on an annual basis with the incentives for the PoD and DIP programs should be greater or less than 3% of the NAS supply. Such determination could impact the number of NAS, if any, created by Nebulas in the future.

The distribution of NAS scheduled to occur at the beginning of 2018 is presently intended to be allocated as follows:



### NAS Distribution Plan

#### Community Offering

Under Nebulas Founding Team's charge, according to the project development plan and requirements, most of the NAS shall be distributed to the community in several rounds.

#### Incentive for Founders and Development Team

In Nebulas' development process, Nebulas' founders and development team in the project's organizational structure continuously contribute manpower and material resources to the technical development and ecosystem operation. Therefore, 20% NAS are reserved for founders and development teams as an incentive. Their NAS is subject to a three-year vesting and lockup period.

#### Operation and Ecosystem Construction

Apart from the above two distributions, the remaining NAS will be used to Nebulas' operational expansion and ecosystem construction, which includes but is not limited to: the DApps ecosystem incubation, developer community, business collaboration, marketing, academic studying, education, law and regulation, institutional investments.

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