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Orange Paper: Nebulas Governance

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Contents

1   Introduction

Keywords: Governance Decentralized Collaboration Incentive Self-evolving Autonomous

Nebulas is an open-source, public blockchain focused on creating a true **Autonomous Metanet** [1]. Nebulas' focus utilizing on-chain data for users interactions and collaboration. Our core principal is **Let everyone get values from decentralized collaboration fairly through technical ways such as blockchain.** [2]

This *Orange Paper* will introduce how Nebulas uses its innovative technology to realize its vision of creating a **collaboration model with the help of unique innovative technologies to manage on-chain public assets and to realize the Decentralized Autonomous Organization (DAO) [3] which will provide positive incentives and self-evolution**. Nebulas governance has been designed with the following three aspects which will be explained one by one:

1. **Organization and supervision**: Nebulas Community Groups which operate independently and constrain one-another: Nebulas Council, Nebulas Foundation, Nebulas Technical Committee; detailing their member composition, power, and obligations.

2. **On-chain collaboration**: The process of community collaboration and system upgrade via **NAT On-chain Voting** (5.4).

3. **Economy and incentive**: The economy of NAT On-chain Voting, the process of Nebulas governance and how this economy model provides positive incentives to each member within the community.

2   Background

The goal of Nebulas governance is to achieve the vision of Nebulas and its focuses of creating decentralized collaboration. Before introducing the details of Nebulas governance, first you need to understand the difficulty of collaboration and the issues that Nebulas wants to solve.

Humans are social creatures and are not strangers to **Collaboration**. Even Robinson Crusoe on the island had a set of entities to collaborate with including Friday [4]. Collaboration itself does not have any absolute advantages or disadvantages and even in different situations, one or more collaboration methods may be suitable. With the development of science and technology, current collaboration methods has gone from face-to-face cooperation to a global collaboration network across locations and within organizations. The goal of collaboration has also become more unique with requirements changing from physical to virtual and operation periods become more flexible.

Nebulas does not want to subvert other forms of collaboration nor exclude multiple ways of collaborating. Instead, Nebulas is trying to find a more appropriate way to collaborate and to complement others in new situations. The new collaboration structure has the following features:

- **Information interaction is changing from simple to complex.**

  The birth of the digital and decentralized cryptocurrency such as Bitcoin allows blockchain to record transaction information. The second-generation blockchain system, such as Ethereum introduced smart contracts with Turing completeness which allowed blockchain to become programmable. From there, more and more data and asset interaction result in new problems and unique situations such as handling on-chain, off-chain, and cross-chain interaction.

- **Users roles are increasing.**

  In the early Bitcoin community, there were only miners and token-holders. Ethereum added new groups to blockchain ecosystems such as developers and decentralized application users. As more people learn about blockchain, it becomes a challenge to distribute power and responsibilities to different users based on their unique roles.

Some of the current problems are:

1. **Centralized governance cannot cope with new and complex situations.**

   Blockchain is essentially a decentralized, trust-less, game-based autonomous system. It's true appeal is the open collaboration model based on consensus mechanism under the ideology of decentralization [5]. However, some blockchain projects simply do the opposite and use centralization as way to govern; such as directly arbitrating hackers through the core arbitration court. The legitimacy and fairness of this approach is difficult to guarantee. Faced with complex data interaction patterns and expanded user roles, the centralization of

a single evaluation criteria is difficult to achieve which causes community members to rebel. For example, on January 11, 2019, the EOS Authority initiated a vote on whether to terminate the ECAF (The EOSIO Core Arbitration Forum); the percentage of support was as high as 98% [6].

2. **Existing decentralized governance rules are not uniform.**

   In the Bitcoin community, users with different roles such as miners and holders have differing rules and it's not clear who should follow what rule. Such decentralized governance methods are likely to cause unclear community development goals which makes it difficult to effectively organize and execute a upgrade.

3. **Traditional decentralized collaboration is commonly a tragedy [7].**

   Traditional decentralized collaborative projects, such as a large number of open source communities, have unclear benefit models and their funding source is often based on donation. Upgrades and improvements rely too much on the developers interests and there are frequent problems with slow evolution of the ecosystem due to differing opinions. Today, there are more people using public resources (such as open source code) but fewer people contributing. Many open source projects now rely on large corporations for donations and and often motivated to continue development in the direction warranted by the large donors rather than their opinions - in essence, they become part of the corporation.

   Tokens that exist within a blockchain ecosystem give us the opportunity to solve the basic dilemma of decentralized collaboration by providing sustainable incentives to build a prosperous economy.

4. **Early blockchain project consensus mechanism incentives are not comprehensive and community participation is low.**

   The Proof of Work (PoW [8]) system used by Bitcoin only focuses on incentives for the miners; this single incentive system cannot cope with the enrichment of all users regardless of their role. Ethereum with its decentralized nature has been repeatedly criticized for its slow upgrade process due to all proposed improvements requiring approval by the majority of the community and execution by node operators. This shows how difficult it is to unify the opinions of an entire ecosystem. The phenomenon of "doing nothing" has led to a low participation rate with Ethereum upgrade proposals resulting in delayed implementation and damage to its ecological development.

There is currently no perfect solution to solve the above problems and we realize that in the new world with unprecedented complexity, the creation of new technology is expected.

3 Overview

In Nebulas governance, **the core is on-chain governance, the main governance object is on-chain assets, and the on-chain interaction is the basic coordination method**; thus to solve the governance dilemma under the above listed scenarios and designs a better decentralized collaboration model to realize the Nebulas vision.

3.1 Technology

The open source, public blockchain project Nebulas was designed in 2017 to provided the technical framework for Nebulas governance to achieve it's vision.

Nebulas is an autonomous metanet which utilizes hyper-mapped metadata to solve complex data and interaction problems. It has the core ability to measure the value of on-chain data (via Nebulas Rank, NR); uses new consensus mechanism and upgrade capability to solve complex collaboration problems; provides lasting positive incentive (via Nebulas Incentive, NI) for its users; has the ability to upgrade without a hard-fork (via Nebulas Force, NF). Nebulas uses technology to reduce the friction and governance costs that are often present in human governance, to change collaborative relationships and to promote healthy development of communities. For details of Nebulas' technology, please refer to the *Nebulas Technical Whitepaper* [9].

3.2 Three basic rights

All complex systems begin with the development of basic rules that follow logical steps. Since the basic component of blockchain assets is an **address** this is also the basic unit of the Nebulas community governance. Therefore, we formally propose three basic rights for each Nebulas address:

1. The right to own and utilize assets on Nebulas.

2. The right to initiate a proposal.

3. The right to vote.

Nebulas strongly believes that each address has the above listed fundamental rights within the system and will not be infringed upon under any circumstance. Any user who has access to a Nebulas address via their unique private key has the **right** to control their assets. Without any absolute centralized organization or individuals, each and every member of the Nebulas community has the freedom to use the main-net and participate in the decision making process. Members can also participate in the production and construction of community approved projects.

Nebulas governance is based on these three rights. Simply put, anyone can create a proposal, share it with the community, and ultimately, have the community approve their proposal via an on-chain voting system. This means that the future of Nebulas is in the hands of every participating community member!

3.3 Governance scope

The public assets primarily controlled by Nebulas governance include:

1. Intellectual property, including public, open source code (such as Nebulas Main-net upgrades and other related codes that affect the public interest of Nebulas).

2. Community public assets according to the *Nebulas Non-technical Whitepaper* (B).

In general, blockchain is a network that tracks collaboration relationships as well as a network that tracks **assets** of incentive cooperation. In a system that is absent of any centralized power, public assets should be managed by all community members.

At the same time, the scope of Nebulas governance is limited to Nebulas public assets and Nebulas governance provides the basic governance tools for the Nebulas community. Organizations within the Nebulas community (such as DApp project parties, exchanges, etc.) can use the Nebulas governance tools (such as NAT on-chain voting) to promote the ecological development of their projects; however, the Nebulas Community Group Will not **take up** the role of judge. With off-chain events, Nebulas community members should comply with local laws and regulations. The previous chapter (2) described different situations that should adopt a matching governance model; Nebulas governance will not violate the original intention of the design to blindly expand it's governance range.

3.4 Features

There are three primary features of Nebulas governance:

1. **The same rules for all, open and transparent.**

   Everyone co-exists and develops under standardized rules. At the same time, any new requirements are defined by the initial base rules.

2. **The decentralized collaboration of a prospering economy.**

   (a) **Decentralize the process of community collaboration:** On-chain governance is the core of Nebulas governance and allows for community oversight of the process.

   (b) **Decentralize the governance of public assets:** As a decentralized community with asset attributes:

   - The Nebulas Community Groups will ensure the legitimacy of the governance process and the mutual restriction of power; no organization or individual has absolute power and no organization or individual can directly use public assets.
   - Provides technical support for asset governance and security through the original Proof of Devotion (PoD) consensus mechanism.

3. **Incentivized community for a high participation rates.**

   Lasting positive incentives are the core of community organizations and the cornerstone of autonomy.

   The Core Nebulas Rank can be combined with a variety of parameters to determine the contribution of an address within the entire ecosystem [10]. Based on this, not only miners and currency users, but also developers, active users and others in different roles can be a source of relatively regular, quantitative contribution to the entire ecosystem. All users can also be compared with one another and in return, Nebulas can inspire everyone in the ecosystem according to their contributions.

   Moreover, by utilizing the **asset-based** Nebulas Rank and actively participating in on-chain governance (such as on-chain voting), users can receive NAT incentives by contributing to the community and ecosystem. The NAT token is the native incentive of the Nebulas Rank algorithm which is implemented through technical capabilities rather than personal intervention which reduce the likelihood of individual manipulation on the network.

   Three basic perceptions about ecosystem motivation:

(a) Positive incentives are the basis for ensuring benefits for everyone. Incorrect or uneven distribution of incentives can lead to bad money driving out good money.

(b) Incentives should be continuous; short-lived incentives can cause irreversible, negative results.

(c) The scale of incentives should be appropriate.

Nebulas always regards incentives as an essential part in designing the technical features of the Nebulas economy. Positive incentives are expected to benefit community members more equitably and significantly increase community engagement.

4. **Inclusive and efficient collaboration.**

Since Nebulas is a true autonomous metanet, there is capacity to achieve self-evolving without hard forks. Within the Nebulas community, once a proposal is approved via on-chain voting, an upgrade can be completed and iterated immediately. If a problem arises on the network, improvements can be quickly be released to the entire network. Future problems on Nebulas will not be like those on existing public chains such as Ethereum which is bound by its immature technologies and strategies.

While technically efficient, Nebulas governance also offers a transparent and straightforward process (5.1) to improve collaboration efficiency.

4 Organization and Supervision: Nebulas Community Group

In order to achieve the goal of ecological development as well as asset management and to support Nebulas' goal of creating the Autonomous Metanet, the founding team will form the **Nebulas Community Group** together with the community. During the formation process, each organization's source of legitimacy, power, and boundaries will be strictly stipulated and constrained by one another. The three major organizations that comprise the Nebulas Community Group are:

1. **Nebulas Council**: Oversees the legitimacy of the Nebulas governance process and the use of public assets within the Nebulas community; providing scaling advantages for the ecological development of Nebulas.

2. **Nebulas Foundation**: Manage the Nebulas Foundation's public assets, pool available resources and use the capital to offer efficiency advantages to the Nebulas ecosystem.

3. **Nebulas Technical Committee**: Entrusted by the Nebulas Council; responsible for the productivity and quality verification of development projects as well as providing technical guidance and support to the community.

To ensure the independence of the Nebulas Community Group and to maintain checks and balances between them, there are two fundamental requirements:

1. **The restraint of personal power**: All organizations are open to participants within the Nebulas community; however, a community member cannot hold a position in more than two organizations at the same time.

2. **The restraint of organization power**: No single organization has the power to make independent decisions and to use public assets without the oversight of the other organizations.

If it's necessary to introduce new principles, the three organizations must always be guaranteed independent operation and to be constrained by one another.

4.1   Nebulas Council

The Nebulas Council oversees the Nebulas governance process and the use of public assets of the Nebulas community to provide scale advantages for further ecological development of Nebulas.

4.1.1   Directors

The first directors of the Nebulas Council will comprise of 7 seats; of which, 3 seats will be nominated by the Nebulas Foundation and 4 seats will be elected via on-chain public voting within the community.

The numbers of nominations from the Nebulas Foundation are reduced by at least one seat every two years. After 6 years, the Nebulas Foundation can no longer nominate seats.

4.1.2 Power

1. The Nebulas Council has the power to submit a proposal for a **second vote** (5.7.1).

2. Appoint organizations such as the Nebulas Technical Committee or individuals to handle public affairs for the Nebulas community.

4.1.3 Obligations

1. Supervise the governance process.

2. Supervise the safety of public assets such as community reserve funds.

The Nebulas Council should ensure that the governance processes and the use of community public property are open and transparent. These methods include but are not limited to:

1. Regularly updated asset use and community development via quarterly reports and other disclosure materials to the communities.

2. Any technical upgrade, project application rejection, re-voting, etc. should be announced in a timely manner.

3. All personnel elections and appointments should be announced on time.

4.1.4 Term of office

The directors of the Nebulas Council have a term of two years and can be re-elected once their term is over.

Community members have full oversight of the Nebulas Council. The directors of the Nebulas Council must comprise a report of their duties for their full term. The community will conduct a mid-term vote based on the submitted report to determine whether each Nebulas Council director will continue to serve.

If the director of the Nebulas Council fails to pass the midterm vote, the Nebulas Technical Committee will organize and supervise the election of a replacement Nebulas Council director. The directors who passed the mid-term review will temporarily complete the daily affairs of any directors who were removed until the election of the new Nebulas Council director is completed.

4.1.5   Election method

Except for the directors of the Nebulas Council nominated by the Nebulas Foundation, the directors of the Nebulas Council are elected through public on-chain voting. All members of the community who control at least one address on the Nebulas mainnet have the right to vote and to run for a seat on the council.

The first Nebulas Council election program has been proposed and will be supervised by the Nebulas Foundation. Future changes and iterations of the process must be performed through public, on-chain voting.

4.1.6   Income

Total revenue

10,000 NAS distributed over the 2-year term as described below.

Income distribution

The revenue will be issued once every six months (four times in two years). The amount of each distribution every 6 months in order is: 1,500 NAS, 2,000 NAS, 3,000 NAS, 3,500 NAS (totaling 10,000 NAS). If the mid-term vote is not passed, the latter two payment will not be released.

Financial requirements

To ensure the best interests of the economy and the continuity of the Nebulas Council, directors of the Nebulas Council must deposit 100,000 NAS into collateral for the initial 6 months of their term.

4.2   Nebulas Foundation

The Nebulas founding team was formed in June of 2017; later, the Nebulas Foundation was established to take charge of the Nebulas team, their financial options, to ensure the normal operation of the project and to realize the development roadmap as promised in the *Nebulas Non-technical Whitepaper*.

After all the technical points in the Nebulas Non-technicaal Whitepaper are fully completed, the Nebulas Foundation will manage the Foundation's assets, pool resources, and use the capital to provide efficiency advantages for the ecological development of Nebulas.

4.2.1 Members composition

The managing directors of the Nebulas Foundation have no less than 5 seats including one chairman of the Nebulas foundation and one chief secretary.

4.2.2 Power

1. Participate in the election of the chairman as well as the right to be elected.

2. Participate in decision making in items such as foundation development and investment.

4.2.3 Obligations

1. Manage the assets and pool resources of the Nebulas Foundation.

2. According to the needs of Nebulas, ensure the research and development of Nebulas and complete the technical features as promised in the Nebulas non-technical Whitepaper on time.

3. Once a year, Nebulas Foundation directors will report to the Nebulas Council and continue to serve the Nebulas ecosystem.

4.2.4 Term in office

The members of the Nebulas Foundation are appointed for a one year term. Afterwards, they are eligible for re-election.

4.2.5 Inclusion method

Inclusion method

The Nebulas Foundation adopts a capital-based entry system and all who receive the financial option reward to a certain amount are automatically eligible to become a Foundation Managing Director. Subsequently, all eligible members have the option to waive becoming a Foundation Managing Director. If there are less than 5 members within the Board of Managing Directors, they will be ranked according to their financial option reward size.

Chairman of the Nebulas Foundation

The chairman of the Nebulas Foundation is elected among the current members of the Nebulas Foundation. Each member of the Nebulas Foundation has the right to vote and to be elected.

To become the chairman of the Nebulas Foundation, a member must receive a minimum of 50% of all casted votes. During voting and none of the directors receive 50% of the votes, those with either no votes or the minimum amount of votes are eliminated and voting will be restarted until a member receives an approval rating of 50% or greater.

Chief Secretary of the Nebulas Foundation

The Chief Secretary of the Nebulas Foundation is appointed by the Chairman of the Nebulas Foundation among current members of the Nebulas Foundation.

Managing Director of the Nebulas Foundation

The Managing Director of the Nebulas Foundation is appointed by the Chairman among current members of the Nebulas Foundation.

Recall

The Nebulas Foundation can remove any member of the Nebulas Foundation through internal resolutions and the results must be disclosed to the community.

The removed member(s) of the Nebulas Foundation has the right to address to the community publicly and call for a public, on-chain vote to request a re-vote for reinstatement to the Foundation.

4.2.6 Income

Total revenue

1. Nebulas Foundation Salary and relevant option reward.

2. Enjoy the benefits of investing within the Nebulas Foundation's eco-investment, etc.

Financial requirements

To ensure the best interests of the economy and the continuity of the Nebulas Foundation, official entry requires 50,000 NAS collateral deposit which is unlocked after 6 months.

4.3   Nebulas Technical Committee

The Nebulas Technical Committee was established September, 2018. Since its establishment, the Nebulas Technical Committee has adhered to the spirit of openness, sharing and transparency. The Nebulas Technical Committee is committed to promoting the decentralization and community collaboration of research and development of Nebulas technology.

Since the establishment of the Nebulas Council, the Nebulas Technical Committee, composed initially of core members of the Nebulas team will complete its historical mission and will transform into a community-based organization. Entrusted by the Nebulas Council, the Nebulas Technical Committee is responsible for the productivity and quality verification of the Nebulas project, providing technical guidance and support to the community.

4.3.1   Members composition

The number of Nebulas Technical Committee members is not limited.

4.3.2   Power

1. The power to initiate and review of community proposals.

2. Enjoy the honor of being included with a team of experts pertaining to Nebulas technology.

Obligations

1. Quality supervision of community proposals.

2. Issue relevant test and technical rating reports.

4.3.3   Term in office

Members of the Nebulas Technical Committee will serve a one year term and may be re-elected afterwards.

4.3.4   Inclusion method

The Nebulas Technical Committee adopts a combination of self-recommendation and community recommendation which is publicly reported to the community. The appointment will be organized by the Nebulas Council.

4.3.5   Income

Total revenue

- Commission (issued monthly).

- Consulting fee for project review and supervision.

Financial requirements

To ensure the consist interests of the economy and the continuity of the Nebulas Technical Committee policy, members of the committee require 25,000 NAS in collateral when they formally join the committee. The collateral is returned 3 months after dismissal from the Nebulas Technical Committee.

5   On-chain voting and incentive

Nebulas is dedicated to on-chain governance and is committed to using blockchain technology to provide a more open and collaborative environment.

5.1   On-chain governance process

The general process of Nebulas' on-chain governance is as followed 1:

1. **Proposal Period**: A project publicly submits a proposal to the community. Once submitted and if the proposal receives enough votes via the NAT on-chain voting, the project will be established;

2. **Develop Period**: Once established, the project creator or a community member approved by the creator will execute and complete the project as proposed;

3. **Testing Period**: Once the project is completed, the creator submits the final results so the community may review and/or test the project. If approved by the community via NAT on-chain voting, the project will enter the next stage;

4. **NBRE Period**: When the project passed the second vote, the Nebulas Technical Committee's will conduct a final review. If the community has no further objection, the project is completed.

On-chain governance utilizes two components:

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The general process of Nebulas' on-chain governance

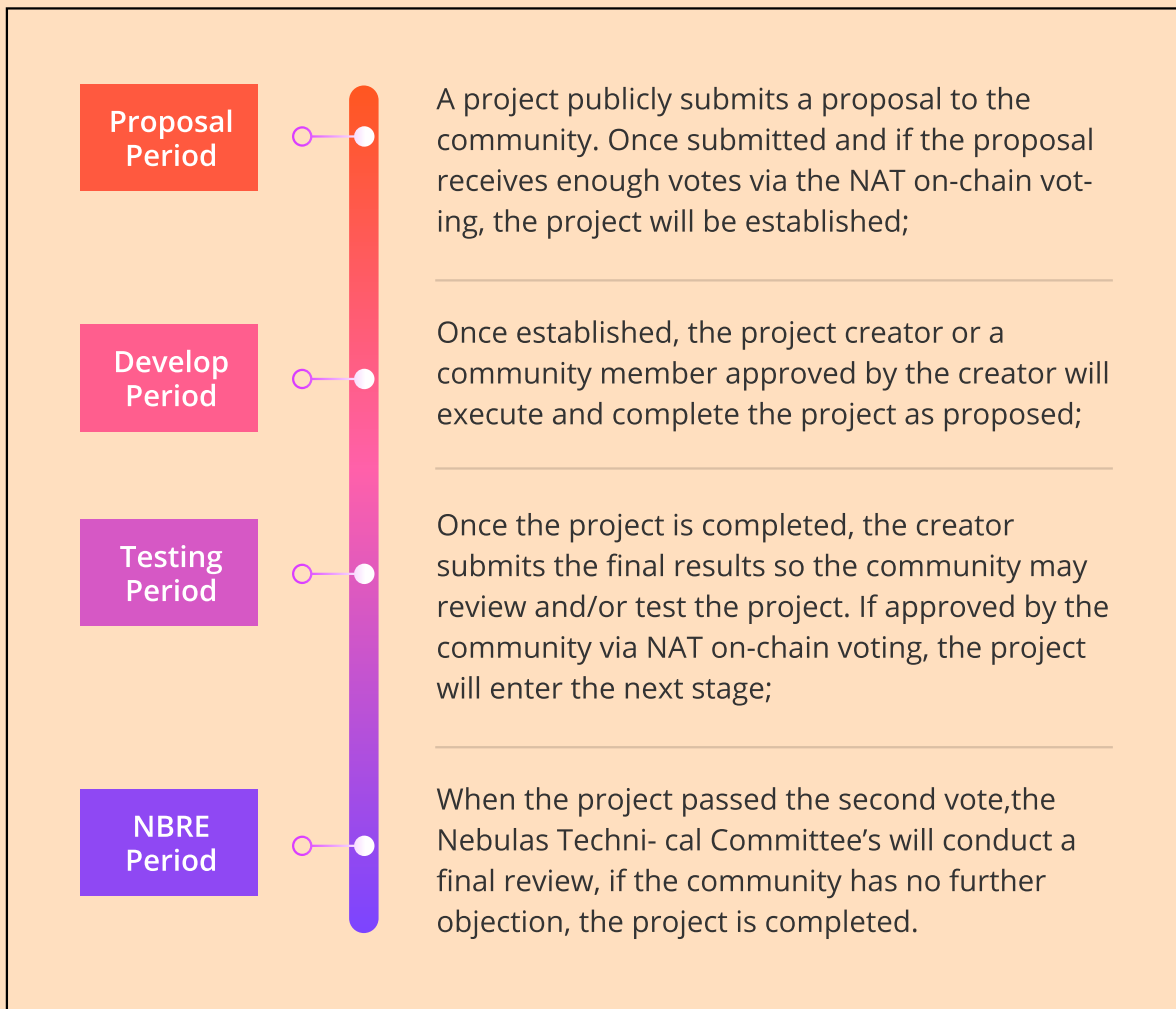|	
Proposal Period	A project publicly submits a proposal to the community. Once submitted and if the proposal receives enough votes via the NAT on-chain voting, the project will be established;
Develop Period	Once established, the project creator or a community member approved by the creator will execute and complete the project as proposed;
Testing Period	Once the project is completed, the creator submits the final results so the community may review and/or test the project. If approved by the community via NAT on-chain voting, the project will enter the next stage;
NBRE Period	When the project passed the second vote,the Nebulas Techni- cal Committee's will conduct a final review, if the community has no further objection, the project is completed.

Figure 1: Nebulas on-chain governance process

1. Voting utilizes the NAT governance token and its underlying algorithms.

2. The voting process is trust-less via blockchain technology.

This Orange Paper will introduce the on-chain governance mainly.

5.2   Basic principles of voting

The Nebulas ecosystem integrates voting with its mainnet. Every vote cast by community members is transparent and visible for all to see. Within Nebulas, voting will utilize the following basic principles:

1. The most basic unit of voting is a Nebulas mainnet address.

2. The votes weight will refer to the address' Nebulas Rank score.

3. Users positive contribution to the system should be rewarded with more voting rights. We believe that voting is a positive contribution to the Nebulas ecosystem and users should be motivated by receiving more voting rights.

5.3   Voting method

Voting will be operated through a voting smart contract on the mainnet of the Nebulas blockchain. Each address can choose one of three options: For, Against or Abstain. Users can also choose not to vote.

5.4   The utilized voting medium: NAT

5.4.1   Overview

- **Name**: Nebulas Autonomous Token

- **Ticker Symbol**: NAT

- **Form**: NRC20 token

The Nebulas Autonomous Token (NAT) is a NRC-20 token and will serve as the voting medium within the Nebulas governance ecosystem.

What is Nebulas Rank? Nebulas Rank (NR) is the first on-chain, native, multidimensional value measurement mechanism for blockchain data.

Within the Nebulas economy, the basic unit of governance is an *address* (3.2). Nebulas Rank quantifies the contribution of each *individual* to the economic accumulation via mathematical expression of the contribution to each address. Nebulas Rank is divided into *Core Nebulas Rank* and *Extended Nebulas Rank*. Core Nebulas Rank primarily reflects two factors:

1. The median value of the account within a certain period of time.

2. The degree of asset utilization of the account over a period of time.

At the macro level, the relationship between the number of currencies, value of money, rate of circulation, and productivity within the blockchain is described by the classical equation of the quantity of money in economics. The Nebulas Rank of the entire network can reflect the overall liquidity of the Nebulas ecosystem and its activity.

NAT and NR The release of NAT mainly refers to the *Core Nebulas Rank*. NAT issuance will review the calculated Nebulas Rank weekly with reference to the median and the degree of utilization of the assets within the week. For more information on the Nebulas Rank Score, please refer to the *Yellow Paper - Nebulas Rank* published by the Nebulas Research Institute in June, 2018.

How to check your Nebulas Rank? Nebulas Rank via Nebulas NOVA [11] received its first upgrade on May 6, 2019. This upgrade utilized the Nebulas Blockchain Runtime Environment (NBRE) for autonomous and instant upgrades. The Nebulas Rank algorithm is open-sourced and can be checked online [12].

5.4.2 Use cases of the Nebulas Autonomous Token (NAT)

NAT is the voting medium within Nebulas. Community members can vote on-chain via the NAT token to decide the direction of the Nebulas ecosystem. These decisions include but are not limited to: the election of Nebulas Council members, adjustments to the Nebulas Protocol Representation(NPR) via the Nebulas Blockchain Executable Environment (NBRE), establish, vote and review community proposals.

5.4.3 Release

The distribution method of NAT is similar to that of Bitcoin with the premise that there is an upper limit on the total supply and the distributed supply is decremented weekly.

The supply upper limit of NAT tokens is related to the Nebulas Rank score of the entire Nebulas mainnet. The release amount is decremented weekly and the attenuation coefficient is λ. The initial value of λ is 0.997; this means that by week 180, the circulation is decremented to 58% of the first week.

The initial circulation of NAT is based on the status of Nebulas NOVA mainnet after the completion of it's first voting upgrade on May 6th, 2019. Based on the current Nebulas Rank of the entire network and initial parameters, the upper limit of the total amount of NAT to ever exist will be 100 billion.

5.4.4 Managing NAT

Users can manage their NAT via NAS nano Pro [13] and other wallets that support Nebulas NRC20 [14] tokens. Users can view NAT transactions and circulation on blockchain explorers [15] that support the Nebulas mainnet.

5.5 Obtaining NAT

All users who control Nebulas mainnet addresses (with the exception of black listed address) have the opportunity to receive NAT. Address holders can obtain NAT via three ways: improve the Nebulas Rank score of the address, participate in Nebulas on-chain voting and by pleading NAS.

NAT blacklisted addresses During the NAT distribution process, any address that conflicts with any of Nebulas *address* basic rights (3.2) will be classified as a black-listed address.

Blacklist addresses can only obtain partial NAT based on their rights. For example, the address of a centralized exchange is classified as a blacklist address. According to the first basic right of Nebulas address owners, the address has the right to own and operate their assets on Nebulas; in return, the exchange address can obtain NAT under the same conditions according to the Nebulas Rank of the address. However, the collected property (NAT) of the exchange should be distributed to the corresponding exchange user. According to the second and third basic rights Nebulas address ownership, the exchanges collection address does not have the right to initiate a proposal or to participate in proposal vote before the exchange proves that the collection address fully represents the corresponding custody asset user proposal and voting willingness. Therefore, blacklisted addresses cannot obtain a NAT incentive by participating in the voting.

5.5.1 Receive NAT by improving the Nebulas Rank score of an address

NAT tokens will be distributed to Nebulas mainnet address which have a positive NR score on a weekly basis. The number of NAT tokens distributed will be based on the weekly Nebulas Rank of the address and the Nebulas Rank of the entire mainnet.

The number of distributed tokens will be decremented weekly. The attenuation coefficient is λ. Initially $\lambda = 0.997$.

In the ith week, the ratio is:

$$1\,\mathrm{NR} = z(x_{ne}, x_e, \mu) \times \lambda^i \,\mathrm{NAT} \tag{1}$$

Above Formula breakdown:

- λ: attenuation coefficient.

- μ: incentive parameters for voting behavior.

- x_{ne}: the sum of the NR score of non-exchange address on the entire mainnet.

- x_e: NR sum of the entire mainnet.

- $z(x_{ne}, x_e, \mu)$: function with x_{ne}, x_e and μ as variables, Nebulas Rank and NAT redemption proportion.

5.5.2 Pledging NAS to receive NAT

Starting May 6, 2019, users of Nebulas mainnet can choose to obtain NAT by *pledging* Nebulas native coin NAS via a smart contract.

Users of the Pledge NAS smart contract will receive NAT beginning the second week after pledging begins (May 13, 2019). If users cancel their pledge, NAT distribution will cease.

The number of distributed tokens per week will be decremented. The attenuation coefficient is λ. Initially $\lambda = 0.997$.

The ratio of pledge NAS to NAT during the ith week:

$$x \, \text{NAS} \rightarrow \alpha \times z(x_{ne}, x_e, \mu) \times g(x) \times \lambda^i \, \text{NAT} \qquad (2)$$

Above Formula breakdown:

- x: the number of pledged NAS.

- α: the pledge coefficient, $\alpha=5$ in the initial state.

- $z(x_{ne}, x_e, \mu)$: function with x_{ne}, x_e, and μ as variables, the exchange ratio of NR and NAT.

- $g(x)$: A function associated with x that simulates the Nebulas Rank obtained by the NAS with a x value on the Nebulas mainnet.

How to start pledging? To begin a pledge, users will need to send a transaction to the voting smart contract via their Nebulas wallet such as NAS nano Pro or other wallets that support the Nebulas mainnet. In return, the pledged NAS will be locked in the smart contract until the pledge is canceled by the user.

In order to guarantee the acquisition of NAT, the user must send their NAS to the Pledge smart contract address via a user controlled address which they hold the private key to. Users must not send NAS to the pledge smart contract directly from an exchange or address you do not fully control.

How to cancel pledging? If a user wants to cancel their pledge and unlock their NAS, NAS nano Pro or other supported wallets can interact with the smart contract to cancel the pledge. After canceling, the pledged NAS will be unlocked and will become available to the user.

5.5.3 Receive NAT through Nebulas on-chain voting

The NAT will be conducted at the beginning of every week on the Nebulas mainnet. Once addresses obtain NAT, they can choose to vote on various proposals and

elections. Available voting options are *For*, *Against,* or *Abstain*; each choice is a valid option to receive incentives. If a user does not participate in any voting during the weekly cycle, they will not receive any additional incentives the following week.

Proportion of incentives   The distribution and proportion of incentives should be fair and not used maliciously. To assist with these standards, the weekly NAT will look at the following:

1. The number of NAT the address utilized for voting during the week.

2. The amount of NAT tokens to be received this week based on the addresses' Nebulas Rank score from the previous week.

   If a person votes the amount of NAT that is smaller than or equal to the NAT that is distributed based on its NR, the voted NAT will be counted in the incentive algorithm, if a person votes the NAT that is larger than the NAT that is distributed based on its NR, this part will not be considered by the incentive algorithm.

   During the ith week, NAT incentive distribution on the maninet address, the following formula will be used:

$$\mu \times \min\{N_v, N_{nr}\} \times \lambda^i \tag{3}$$

Above Formula breakdown:

- μ: the incentive parameters, μ=10 under the initial parameters.

- λ: attenuation coefficient, initial value λ=0.997.

- N_v: the amount of NAT that is voted by the address during this week.

- N_{nr}: how much NAT the address will receive this week based on the previous week's Nebulas Rank score.

When N_v (sent by the address in the week) is less than or equal to N_{nr}, the number of incentive NAT obtained will be $\mu \times N_v$. When the N_v of the address is greater than N_{nr}, the amount incentive obtained will be $\mu \times N_{nr}$.

For example An address obtains 10 NAT based on its NR score from the previous week and there is a total of 1,000 NAT held within the address.

This week, the address votes 5 NAT which is less than the 10 NAT received based on its NR score from the previous week, and in return, will receive $10 \times 5 = 50$ NAT voting incentive.

If the address votes 1,000 NAT which is more than received the past week (10 NAT) and in return will receive $10 \times 10 = 100$ NAT voting incentive.

Similar to the weekly NAT and the NAS pledge program, the distribution of the NAT voting incentive is also decremented weekly by the same coefficient. Under the initial parameters, λ, the attenuation coefficient is λ=0.997.

5.6 Voting rules

5.6.1 Voting fee

Each vote will be charged θ% NAT as a voting fee which is authorized by the Nebulas Council to be managed by the Nebulas Foundation as a special operating fund for the NAT project. The project team will not use the collected fee directly for voting. The initial voting fee value is θ=3.

5.6.2 Voting and NAT Destruction

During each weekly release cycle, the NAT that users utilize on the Nebulas mainnet via the voting smart contract will be immediately destroyed. NAT tokens will however be distributed every week via the above listed methods to reduce the overall network destruction rate. The proportion of destruction will be decremented according to the cycle. The deceleration rate is consistent with the issuance rate of NAT. The NAT destroyed during each cycle will be calculated according to the NAT destruction rate function as shown in the appendix refburn.

5.6.3 Voting approval requirements

For a proposal to be approved, the votes must meet two criterias: the degree of participation in voting and the proportion of votes in favor.

1. **Voting engagement:**

For proposals involving the use of public asset support, voting should not be less than the proportion of assets asked for by the proposal to account for assets in circulation across the network.

If a proposal requires the use of X NAS, the NAS in circulation on the mainnet (any NAS that is not in the lock/pledge state and are available for immediate transfer on the mainnet) is Y.

Then the proposal must reach a voting participation rate not lower than X/Y, which is converted into NAT; the ratio of the NAT participating in the voting shall not be lower than X/Y.

For proposals that do not involve the use of public asset support, voting participation is determined jointly by the community. Such proposals include but are not limited to: the adjustment of the mainnet parameters, the NPR to be performed by NBRE, etc...

2. **The proportion of votes in favor:**

   In addition to meeting the minimum voting participation, the proportion of votes required for a particular vote to be met must not be less than 51%. That is, assuming that a proposal receives a total of N votes, of which the affirmative vote is Y, the negative vote is N and the abstention is A, the proposal is considered to have been approved on only when $Y/(Y + N + A) \geq 51\%$.

5.7   Voting supervision and management

5.7.1   Voting process supervision

The Nebulas Technical Committee is appointed by the Nebulas Council to oversee the governance process and to ensure that the entire process is open and transparent. Public voting on Nebulas' public chain is organized and managed by the Nebulas Technology Committee.

Public voting accepts supervision from all members of the community. For proposals that violate any basic rights of any Nebulas address, the Nebulas Technical Committee may request a retrial of the proposal to the Nebulas Council. As the supervisor of the legitimacy of the governance process within the Nebulas ecosystem, the Nebulas Council has the right to file one and only one request for a **second vote**.

When the Board makes a request for a *second vote*, the proposal is deemed to have entered a new voting cycleand the results of the first voting process are not executed.

The NAT voted in the initial cycle will not be returned and will be burned according to the burn rate of the cycle.

The voting participation of the second vote must be greater than the participation of the first vote. That is to say, if the participation degree of the first vote is X/Y, the participation degree of the second vote should be greater than X/Y, and the proportion of the votes in favor must not be less than 51%.

5.7.2 NAT parameter adjustment

The NAT distribution process involves the following factors:

1. α: pledge coefficient, initial value $\alpha=5$

2. μ: voting reward factor, initial value $\mu=10$

3. λ: attenuation coefficient, initial value $\lambda=0.997$

4. θ: voting fee, initial value $\theta=3$

Adjustment of the coefficient must go through the governance voting process; the Nebulas Foundation or NAT project team has no right to adjust the coefficients without authorization.

The NEBULAS logo header

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Appendix A   Nebulas Autonomous Token NAT issuance algorithm

The issuance of NAT is based on each user's Nebulas Rank, voting behavior, and pledge amount.

A.1   Overview

The issuance of NAT is performed according to the weekly calculation cycle of Nebulas Rank (note: voting periods and Nebulas Rank calculations utilize the same weekly period). Based on these weekly cycles, NAT distribution is executed for each address on Nebulas looking at voting behavior, pledging and the previous week Nebulas Rank score.

Detailed explanation: For the period i, the new NATs $\mathcal{T}_i$ in the system is divided into three parts - the NR part: $\mathcal{A}_i$, the voting incentives part: $\mathcal{V}_i$, the pledge part: $\mathcal{D}_i$. In addition, NATs used for voting will be burned/destroyed with respect to certain percentage. Assuming that for the cycle i, the reduced amount of NATs on the network (due to voting) is $\mathcal{M}_i$, then the total amount of NATs in the system is:

$$\sum_{i=1}^{\infty}(\mathcal{A}_i + \mathcal{V}_i + \mathcal{D}_i - \mathcal{M}_i) \tag{4}$$

For convenience, all symbols used in this section and their corresponding explanations are listed below:

- $\mathcal{C}_i$: The sum of Nebulas Rank scores in the system in cycle i;

- $c_{i,j}$: User $j \in \mathcal{U}$'s Nebulas Rank Score in cycle j ;

- $d_{i,j}$: User $j \in \mathcal{U}$'s total amount of pledged NAS in cycle i;

- $v_{i,j}$: User $j \in \mathcal{U}$'s total amount of voted NATs in cycle i.

A.2   NR part

This part is related to the user's Nebulas Rank score, defined by

$$f(x) = g(x)\lambda^i \tag{5}$$

where x is the user's Nebulas Rank score; $g(x)$ is a proportional function that adjusts the relationship between NAT and the Nebulas Rank and satisfies $g(0) = 0$;λ is the attenuation coefficient, and $\lambda < 1$. Since $\lambda < 1$, it is easy to know $\lim_{i \to \infty} f(x) = 0$.

The total amount of this part in cycle i is:

$$\mathcal{A}_i = \sum_{i=1}^{\infty} f(\mathcal{C}_i). \tag{6}$$

A.3 Voting incentives part

The voting incentives part are related to users' voting behaviors and their Nebulas Ranks. For user $j \in \mathcal{U}$, the voting incentives part are defined by :

$$\mu f(x_{i-1,j}) \min\{\frac{v_{i,j}}{f(x_{i-1,j})}, 1\} \tag{7}$$

where μ is the voting incentive coefficient, $\mu > 1$, which means that the user's voting behavior is encouraged by additional rewards, which can be adjusted according to the amount of circulating NAS in the system.

A.4 Pledge part

The pledge part of NATs should be related to the NR part obtained based on the users' improved Nebulas Rank. Based on the property of Nebulas Rank, for a given amout of a user's NAS, there is an upper bound of his Nebulas Rank score $h(d_{i,j})$ [16],

So, we define the NAT obtained by the pledge part to be:

$$\mathcal{D}_i = \sum_{i=1}^{\infty} \alpha f(h(d_{i,j})) \tag{8}$$

where α is the pledge incentive coefficient.

A.5 Destroyed/Burned Part

Each time a address votes using NAT, all NAT used is immediately burned and is no longer usable. However, NAS is distributed by 3 methods; as explained earlier, they are: NR part, voting incentives part, and pledge part. Therefore, we can state that while NAT is burned, NAT is also redistributed to the network weekly and has a network burn rate. In addition, the Nebulas Council charges a fee of $\theta\%$ for each vote in order to pay for the necessary expenses of maintaining the voting services.

Therefore for each user, define the destroyed part to be

$$(1 - \theta\%) \times \beta^i \times v_{i,j} \tag{9}$$

where β is the destruction coefficient and $\beta < 1$. therefore,

$$\mathcal{M}_i = \sum_{i=1}^{\infty} (1 - \theta\%) \times \beta^i \times v_{i,j}. \tag{10}$$

A.6 Analysis

note:

- The current version tentatively agrees that there is no difference between a vote and a negative vote, that is, their return ratios are equivalent. It can then be set according to the ticket's type and multiplied by a different return coefficient μ_1;

- Considering the change of the total Nebulas Rank in the system after the vote is completed, a coefficient μ_2 can be multiplied to reflect the status of the system.

Property 1. *The algorithm satisfies the convergence of the total amount of NAT; in return, the total amount of NATs does not exceed the upper bound at any time.*

Proof. According to the details within the Nebulas Technical White Paper, the fixed total amount of NAS is 10^9 with an average weekly issuance amount (on the basis of the fixed total) of 0.2%; in return, the total amount of NAS existing on the market for the n cycle will not exceed $10^9(1 + 0.002n)$

Next, we prove that the sum of all median values of assets of all addresses in one cycle (as defined in the Nebulas Rank Yellow Paper) does not exceed the total amount of existing NAS on the market. This is because for any NAS asset with quantity y, it can appear for half of the period (three and a half days) in only one address, so it can at most contribute y to the sum of all median values of assets of all addresses.

Also according to the Nebula Rank Yellow Paper, the Nebulas Rank score of any single address can not not exceed the median value of assets of that address (for the same period; note that Nebulas Rank and NAT calculations are weekly and synchronized). That is because in the formula $\Omega(\cdot)\Psi(\cdot)$ for calculating the Nebulas Rank, the Wilbur function $\Omega(\cdot)$, whose input is the median value of the asset, satisfies $\Omega(x) \leq x$, and the value of the in-and-out function $\Psi(\cdot)$ does not exceed 1.

Combined with conclusions above, in cycle n, the sum of Nebulas Rank scores of all addresses does not exceed $10^9(1 + 0.002n)$, so that the NR part does not exceed $g(10^9(1 + 0.002n)))\lambda^n$.

Also, since the NAT of the voting incentive part does not exceed the NR part multiplied by μ, even if the returned NATs from voting is added, the total increment of NAT in voting incentive part in cycle n does not exceeds $\mu g(10^9(1+0.002n))\lambda^n$. In addition, the increment NAT from the pledge port does not exceed the total amount of NAS $g(10^9(1+0.002n))\lambda^n$.

Finally, to prove the convergence of the total amount of NAT, since NATS from the NR part, the pledge part and the incentive part are exponentially decayed with time, it is only necessary to prove the series

$$\sum_{n=1}^{\infty} \mu g(10^9(1+0.002n))\lambda^n \tag{11}$$

are convergence. Since $g(\cdot)$ is a linear function,

$$\lim_{n\to\infty} \frac{\mu g(10^9(1+0.002(n+1)))\lambda^{n+1}}{\mu g(10^9(1+0.002n))\lambda^n} = \lambda < 1 \tag{12}$$

The onvergence of the series can be obtained by the ratio test. □

The series can be convergent and verified by the comparison method.
Moreover, the above voting algorithm has the following positive properties.

1. **Anti-snowball effect:** If we always return NATs with respect to fixed ratio, a user can vote all his NAT to enjoy a return ratio greater than 1 (such as 1.1); then his total amount of NATs will be exponentially increasing, as 1.1^n

2. **Anti-bribe:** If a user with a low Nebulas Rank buys a large amount of NAT to vote, since the corresponding x_{i-1}^j are small for addresses with a low Nebulas Rank score, very few NATs are returned while most of them are burned. It causes the user loses many NATs as penalization.

3. **Anti-inflation:** The depreciation of NAT can be effectively controlled because the issuance of NATs is related to the total amount of NAT in the current market.

4. **Head-effect:** A user with a high Nebulas Rank during the early stages can have a higher total amount of NATs.

Appendix B   Nebulas Asset Supervision

As show in Figure 2, Nebulas assets include two parts: Community public assets and Nebulas Foundation assets.

B.1   Community public assets

B.1.1   Composition

- 35,000,000 NAS (35% of total circulation): community reserved assets as stated in the *Nebulas Non-technical Whitepaper*

- 8,219.1744 NAS/Day: from consensus/block generation issuance, includes:

    - 2%: Consensus/block generation issuance
    - 1%: Nebulas Council Project Development Fund reserve

- 1%(initial): Native incentive for Developer Incentive Protocol (DIP) [17], since May 13, 2019

B.1.2   Supervision

Public assets belong to the Nebulas community; they are automatically distributed and managed via the on-chain governance process and is overseen by the Nebulas Council.

B.2   Nebulas Foundation assets

B.2.1   Composition

- 20,000,000 NAS (20%): Nebulas team reserved as stated in the *Nebulas Non-technical Whitepaper*

- 5,000,000 NAS (5%): Nebulas Community Development Fund (Eco-investment Balance)

- Early private equity project development funds

- Early ecological investment income

B.2.2   Supervision

The Nebulas Foundation assets are managed by the Nebulas Foundation. The Foundation shall ensure that the use of asset information is open and transparent.

Nebulas Asset Supervision

Community public assets   Nebulas Foundation assets

40%

**Early private
equity project
development
funds**

35%

**Community
reserved**

35,000,000 NAS

5%

**Nebulas Community
Development Fund**
(Eco-investment Balance)

20%

**Nebulas team
reserved**

20,000,000 NAS

Others

- 8,219.1744 NAS/Day: from consensus/block generation issuance, includes:
  – 2%: Consensus/block generation issuance
  – 1%: Nebulas Council Project Development Fund reserve

- 1% (initial) : Native incentive for Developer Incentive Protocol (DIP)

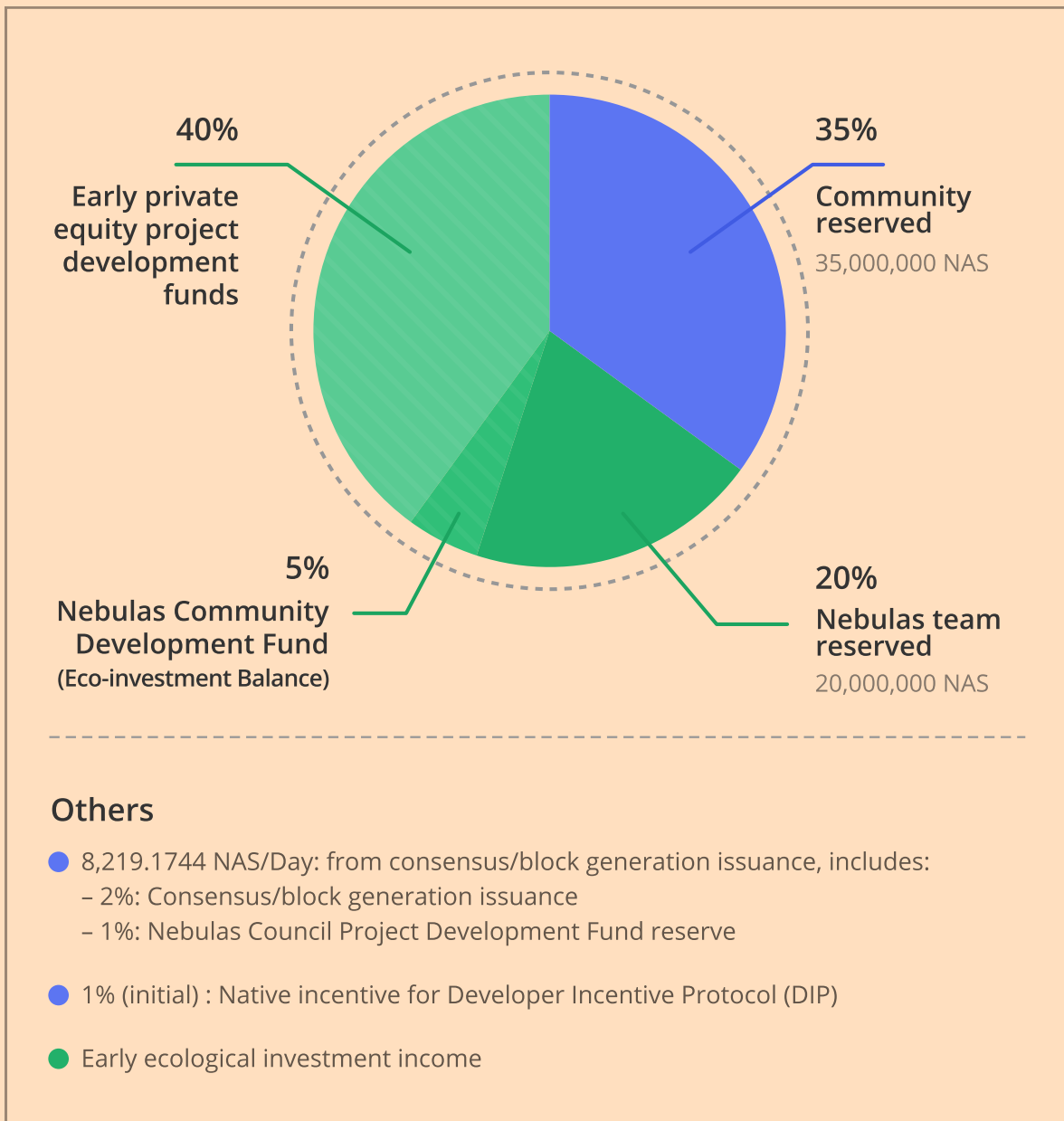- Early ecological investment income

Figure 2: Nebulas Assets Supervision

Appendix C   Change Log

- 0.0.9 Release.

- 0.1.0 Update Figures and polish.

- 0.1.1 Fix typo in Appendix A. Change

$$\mu f(x_{i,j}) \min\{\frac{v_{i,j}}{f(x_{i-1,j})}, 1\}$$

to

$$\mu f(x_{i-1,j}) \min\{\frac{v_{i,j}}{f(x_{i-1,j})}, 1\}.$$

- 0.1.2 Polish.