UON
The Native Cryptocurrency of the Unova Network

Bart Broothaerts, Armen Harutyunyan, and Madhura Mansukh (2022)

1. Introduction

Unova is a native blockchain network designed to tackle various challenges in supply chain management. Gaps in supply chain monitoring create vulnerabilities due to a lack of data distribution infrastructure. This causes supply chain management risks resulting in large overhead, compliance, audit, and error costs. This can be illustrated by numerous traceability issues and recalls causing: large amounts of waste, reduced consumer trust in products, and demand for increased transparency. In addition, food fraud and counterfeiting results in millions of people becoming ill and even the loss of lives in addition to immense economic losses. Other well-known issues in many supply chains include inventory management and demand prediction difficulties, resulting in excess working capital requirements. Legacy systems are focused on optimizing the internal operations of a company but fail to encompass the supply chain as a whole. This by default rules out the possibility of implementing solutions that require coordination and data sharing among the relevant stakeholders.

Unova proposes a novel approach for supply chain data distribution, coordination, and innovation based on web3. It is a trustless infrastructure leveraging smart contracts and blockchain technology, allowing for cutting-edge applications built on decentralized web software protocols. More specifically, Unova is a blockchain network for supply chain management using a protocol that leverages privacy-enabled data distribution, cross-cluster distribution, and a multi-layered architecture. Unova has developed a native blockchain network based on extensive input from companies who are dealing with globally connected supply chains and factored in their specific needs into the design. An important distinction is that blockchain is not solely used for immutability but as an enabler for the various smart contracts running the infrastructure. Contrary to incumbent solutions, the applications, databases, and APIs are hosted by the users of the network who keep full control resulting in a web3 solution. For a more extensive and technical overview of the Unova network, we would like to refer to the Unova website[1].

Instead of a token running on an existing blockchain (e.g., ERC-20 tokens based on the Ethereum network), UON is a native token of the Unova network. This means that the utility of UON will go beyond the boundaries of the applications and the smart contracts built and deployed by Unova. Unova acts as the development company behind the network and provides vital operational support for its growth and business development. Unova will nurture cutting-edge applications built on decentralized web software protocols, grow a community of supply chain innovators; Unova will fuel growth and adoption of the technology. In the future, a smart contract deployed by any developer or company on Unova

[1] www.unova.io

Mainnet will require UON to be used. International payments between companies or the automatic execution of payments upon delivery is also possible by executing financial transactions. Moreover, the network allows for the creation of NFTs which are transacted in UON. To have a fully decentralized public network, one of the important factors is the cryptoeconomic model designed to incentivize node operators to host a node, provide hashing power, and manage the blockchain along with its smart contracts. An essential part of any web3 solution is the democratization of the infrastructure and its currency. Through its decentralized nature the community, external developers, or innovative companies will become stakeholders and contributors to the network. New business models can be created, supply chain financing (e.g., trade finance), and payment solutions provided in addition to any service or solution that may benefit global trade and supply chain operations. The end goal: Unova becoming the world's supply chain network.

2. Token Distribution

To fuel the adoption of the Unova network and grow a community of supply chain innovators, UON will be distributed to various stakeholders. This section describes the different stages from the initial token distribution towards early stakeholders to the initial exchange offering (IEO) with benchmark allocations of UON, which are subject to change, among relevant stakeholders.

2.1. Initial Token Distribution

Figure 1 shows the initial distribution of the total supply of 281 250 000 UON among Unova, founders, key employees, and advisors. The majority is owned by Unova and will be used for accommodating future development in technology, commercial activities, and community growth. In addition, a large portion will be distributed or sold to other stakeholders in the following rounds.

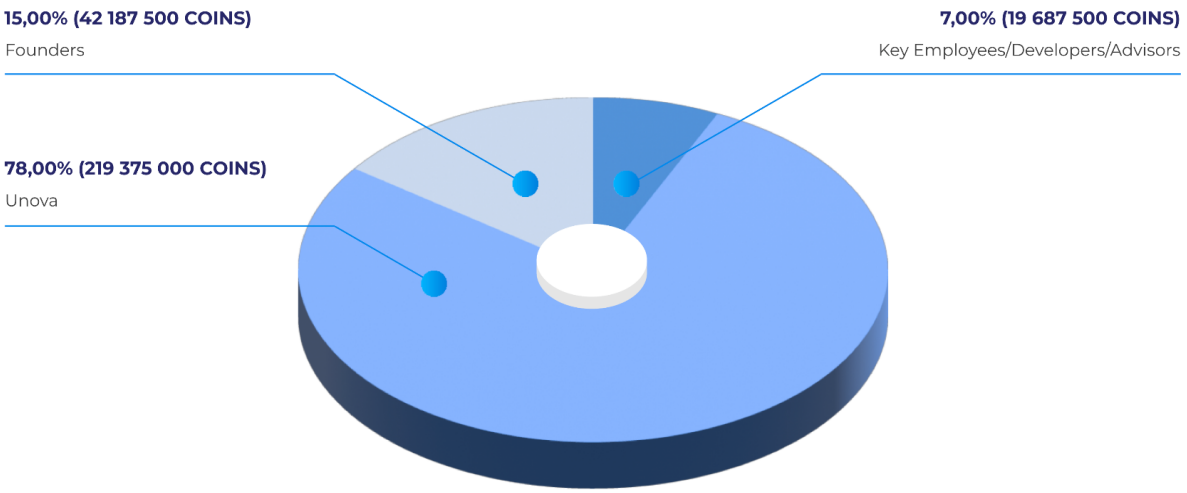

Figure 1: Initial Token Distribution

2.2. Private, Enterprise & Validator Sales

Financing will be raised through a private token sale which will be used for commercial activities, community development, and R&D activities. The list of commercial activities includes fueling business development through pilot validation and demonstration projects, establishing growth through blitzscaling marketing and sales expenses. Furthermore, Unova will capitalize on the community by a combination of content sharing through the appropriate communication channels and presenting at conferences. Finally, The R&D activities include increasing smart contract and decentralized application (DApp) availability, increasing privacy granularity options, and proof of stake beta testing on live Testnet.

Next, the enterprise sales to early adopters who will leverage the utility of UON are expected to take place. This will be fueled by both the current users switching from Unova's Testnet to Mainnet, as well as the new users connecting to the ecosystem as a result of the commercial activities mentioned above. The network effect inherently present in Unova's infrastructure design should not be underestimated.

Finally, Unova has foreseen a portion for airdrops to create more awareness and validator sales for decentralization and fueling innovation. The latter will happen at a discounted price as validators are essential in building a web3 solution and maintaining the security of the network and its transactions. In addition, Unova wants to incentivize the true supply chain innovators and influencers to gain ownership of their efforts. Figure 2 shows expected allocations for all stakeholders mentioned.

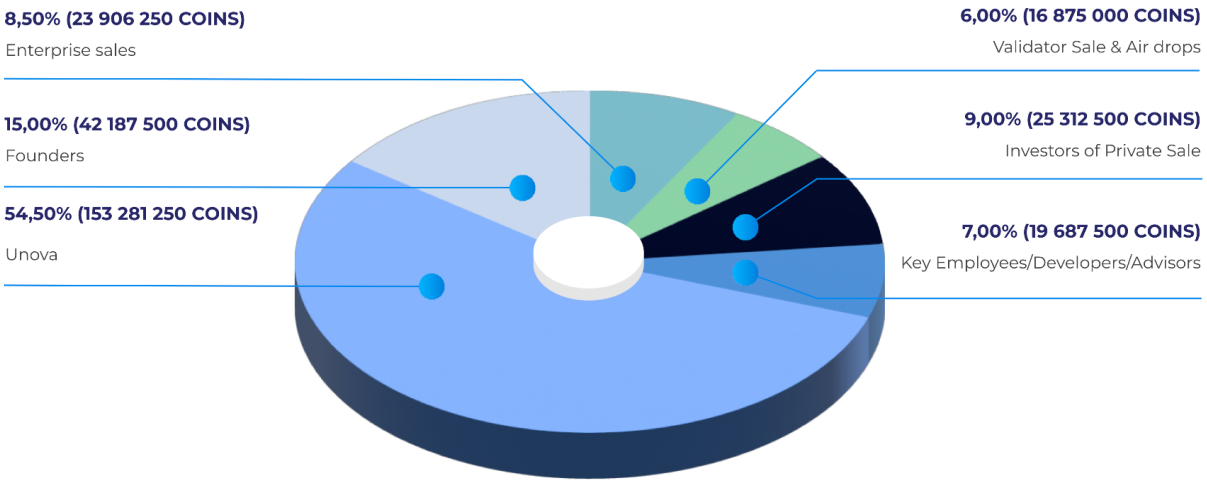

Figure 2: Private, Enterprise & Validator sale Token Distribution

2.3. Initial Exchange Offering

Finally, an initial exchange offering (IEO) will take place where UON can be distributed to the broader public and traded on various exchanges. This IEO would ensure necessary liquidity for various stakeholders (investors, miners, enterprises etc.) to be able to sell and purchase the token without needing to buy it from Unova (otherwise serving as a gatekeeper). The IEO is an integral part of web3, decentralization, and the vision of global impact while at the same time raising funds for Unova to grow the network and its adoption. Figure 3 shows a benchmark distribution after the IEO.

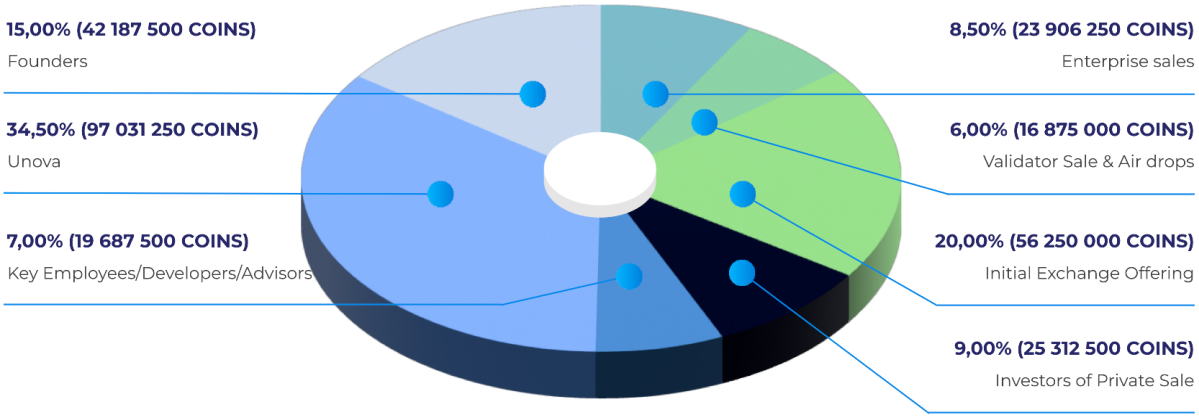

Figure 3: IEO Token Distribution

The funds raised during this stage are planned to be allocated for expanding commercial activities, community growth, and R&D activities in support of the Unova ecosystem & application hub. This includes setting up Unova's development challenges, support and grant programs, transition to proof of stake on Unova Mainnet, and implementation of automated supply chain regulatory compliance monitoring, to mention a few.

3. Tokenomics

The value of the UON token will be driven by demand and supply dynamics, due to its utility within the Unova ecosystem. Initially, the demand side will be fueled by companies that use the DApps, and therefore need UON for bundle creation and distribution. At this stage, the supply side will be covered by Unova selling coins to companies.

In the next stage, more companies will join the network and Unova will expand towards different industries, beyond the ones initially targeted in the go-to-market. Additionally, different business models are likely to be built on the Unova infrastructure resulting in a rise

in the demand for UON to facilitate financial transactions, deployment, and execution of new smart contracts, and whitelisting of type 1 nodes.

All the above will result in a shift of the demand curve, while the (circulating) supply side will not be affected as the Base fee (part of the transaction fee) is initially credited to the Unova wallet. This is further elaborated on in the next section on transaction fees.

Moving forward, the aforementioned demand-side effects would continue shifting the demand curve. This effect is strengthened by the implementation of the proof-of-stake (POS) consensus mechanism that allows earning rewards by staking UON. The implementation of a deflationary burning mechanism through the Base fee would result in the circulating supply curve shifting in the opposite direction. Moreover, the size of the shift will be proportional to the number of transactions as a result of the Base fee mechanism.

In doing so, there will be an increasing scarcity of the available UON. For companies, however, it is essential that they have predictable pricing (in fiat currency) for data distribution, to leverage the smart contracts and applications within the network. Companies will not introduce a new technology to their business if they cannot predict the price of this technology for the coming years. As mentioned before, the UON token acts as the means of transaction within the Unova network, and the price predictability of the transaction fees is an important consideration. So, what happens if the price of the token increases over time or becomes volatile due to ever-changing market conditions?

Each organization has a different degree of utility of the technology. This will result in different configurations while using the solution, by comparing willingness to pay per unit of data[2] distribution (or per transaction for other smart contracts) with the price of a unit of data distribution (or the price for a general transaction to execute the smart contract). To understand the choices to be made, specifically with respect to the configuration of the data distribution aspect, the transaction price per unit of data P_u can be defined as

$$P_u = \frac{G_u\left(B_f + P_f\right) + A_f}{B_s} \tag{1}$$

$$B_s = U_d T_p \, min\{x \in \mathbb{N} \mid x \, U_d T_p \geq M_{Bs}\} \tag{2}$$

where, G_u represents the Gas used for a transaction, B_f represents the Base fee of a transaction, P_f represents the Priority fee of a transaction, A_f represents the application fee, B_s represents the bundle size, i.e number of units of data put inside a bundle that is hashed (bundleID) and put inside a transaction. U_d represents units of data creation per second, T_p

[2] a unit of data could be a supply chain asset (e.g. a piece of meat) or event (e.g. an inbound transport)

represents the time period chosen between bundle creations in seconds, and M_{Bs} represents the minimum bundle size chosen.

Hence, the configuration decision to be made by organizations, in order to receive the needed utility relative to P_u[3], will be with respect to the distribution timing ($B_f + P_f$), T_p, and M_{Bs}. The timing of distribution chosen determines whether the creation of the bundles happens when the network is congested (or blocks are full). Creating bundles when the network is less congested results, ceteris paribus, in lower ($B_f + P_f$) in the competitive market for transactions and thus a lower P_u, as can be seen in Eq.(1). The configured T_p determines how often the protocol checks if M_{Bs} has been reached. Choosing a larger T_p results, ceteris paribus, in larger bundles distributed less frequently (as can be seen in Eq.(2).) and thus a lower P_u (as can be seen by substitution of Eq.(2). in Eq.(1).). Under the assumption that U_d results in the number of units of data created in T_p, being smaller than M_{Bs}, reducing M_{Bs} would, ceteris paribus, result in more frequent and smaller bundles (as can be seen in Eq.(2).) and thus a higher P_u (as can be seen by substitution of Eq.(2). in Eq.(1).).

Organizations with lower utility needs could decide to make larger bundles and distribute less frequently at times when the network is less congested, for a given production and distribution need. Post making this decision, an organization can determine the time duration for which they wish to set this fixed price (by purchasing x number of UON at once). This dynamic enables companies to take into account potential volatility in UON price, expressed in fiat, by covering their need for a certain period and de facto experiencing a stable transaction price. The respective time duration and number of UON purchased by each organization will depend on the level of belief in the utility of the Unova network. There is an early mover advantage, but over time the utility of the solution will also increase as more organizations adopt the technology. Each organization will have a different perception about this, leading to early adopters vs late adopters, with the former expecting to have cheaper prices and the opportunity to fix their price for a long duration, by purchasing large amounts of UON. After the covered time period has passed, the same exercise as explained above will repeat after which organizations potentially choose a different configuration.

Early movers or investors of UON have additional benefits. Even if they don't end up being users of the system, they can still contribute to growing the ecosystem and could potentially benefit from monetary gains. Organizations expanding on the offering (initially for themselves) could also benefit from sharing their newly created Dapps or smart contracts with their business partners or other organizations leading to new revenue streams.

[3] Please note that only the companies for which this is possible will join the system

4. Unova Transaction Fees

First of all, it should be noted that Unova has used the Ethereum Network as inspiration for the pricing and transaction fee model, and proper credit is hereby given to the Ethereum community. Similar to Ethereum, the Unova network uses the concepts of Gas and Gas price for the execution of transactions. Gas refers to the unit that measures the amount of computational effort required to execute specific operations on the network. Since transactions on the Unova network require computational resources for execution, a fee is charged as a means of fair compensation for these computational services. The amount of Gas of a transaction impacts the required fee to execute a transaction on the Unova network. For example, a standard financial transaction requires 21000 Gas whereas the execution of more computationally heavy transactions, such as smart contracts, would require more Gas depending on the complexity. The transaction fee to be paid for a blockchain transaction is then equal to Gas * Gas price. Gas price (the price for each unit of Gas) is denoted in Gwei (10^{-9} UON).

During the execution of a transaction, the network will determine what the actual 'Gas used' is. Therefore, a user willing to execute a transaction (or a smart contract) can use the concept of Gas limit to set a limit. As long as the Gas limit is larger or equal to the Gas used, the transaction will be executed successfully. If the Gas limit set by the user exceeds the Gas used, the remaining part will be paid back to the user. If the Gas limit is set too low, the transaction will fail and the UON could be lost.

The Gas price is constituted of a Base fee and a Priority fee. The Base fee is calculated independently of the current block, and is determined by the blocks before it, making transaction fees more predictable for users. More precisely:

$$B_f(t) = max\left\{50,\ B_f(t-1)\left(12,5\%\ \frac{G_u(t-1) - \frac{B_l(t-1)}{E}}{\frac{B_l(t-1)}{E}} + 1\right)\right\} \qquad (3)$$

where $B_f(t)$ represents the Base fee of block t (in Gwei), $G_u(t)$ represents the Gas used in block t i.e., the total amount of Gas used for all transactions in block t, $B_l(t)$ represents the Block Gas limit of block t i.e., the maximum size of the block, and E represents the Elasticity multiplier i.e., the ratio between maximum and target block size

meaning that:

I. if $G_u(t-1) < \frac{B_l(t-1)}{E}$,

$$B_f(t) = max\{50, B_f(t-1)(12,5\% a + 1)\}$$

$$with\ a < 0\ and\ min\{a\} = \frac{0 - \frac{B_l(t-1)}{E}}{\frac{B_l(t-1)}{E}} = -1$$

II. if $G_u(t-1) > \frac{B_l(t-1)}{E}$,

$$B_f(t) = B_f(t-1)(12,5\% b + 1)$$

$$with\ b > 0\ and\ max\{b\} = \frac{B_l(t-1) - \frac{B_l(t-1)}{E}}{\frac{B_l(t-1)}{E}} = E - 1$$

III. if $G_u(t-1) = \frac{B_l(t-1)}{E}$,

$$B_f(t) = B_f(t-1)$$

Hence, Eq.(3). shows that with the current parameters, $B_f(t-1)$ decreases by a maximum of 12,5% if the target block size is not met, until a minimum of 50 Gwei. $B_f(t-1)$ increases by a maximum of 12.5% if the target block size is exceeded.

This design allows for market dynamics where $B_f(t-1)$ is automatically adjusted when $G_u(t-1)$ is larger (or smaller) than its target block size to avoid congestion and long execution waiting times. The aim is to have $G_u(t)$ approach the target block size. Whenever the network gets too congested, $B_f(t-1)$ increases which incentivizes users to execute transactions when blocks are closer to their target block size (and thus at lower Base fees). If $G_u(t-1)$ is below its target block size, $B_f(t-1)$ decreases, incentivizing more users to execute their transactions at this time. These dynamics lead to transactions being spread evenly throughout the day (or between all blocks) and thus all blocks being equally utilized.

When the block is mined, this Base fee will currently be credited to the Unova wallet removing it from current circulation. This allows Unova, in an initial phase, to use these Base fees to fund development within the Unova community. Later this will change, and the Base fee will be “burned”, permanently removing it from circulation. This would create deflationary pressure on the token supply and inflationary pressure on the price of the UON token.

Next, a Priority fee (or tip) for miners can be set. If transactions need to get preferentially executed ahead of other transactions in the same block, a higher tip can be given to attempt to

outbid competing transactions. The tip also incentivizes miners to include transactions in the block and avoids the creation of empty blocks by miners. Since the user does not set the Base fee but can set a Priority fee, and the Base fee is variable between blocks, the user can set a 'Max Fee' representing the maximum total Gas price for his transaction.

The smart contracts, as part of the Unova DApps, have an additional value 'Application fee' added to the transaction fee, which is a reward for developers within the Unova ecosystem. These smart contracts are executed by the type 1 nodes and could, for example, be used for data distribution between supply chain stakeholders.

5. Block reward

The block reward is the number of UON that is rewarded each time a block is successfully mined. This creates appropriate incentives for the network to reach sufficient decentralization by rewarding miners for providing their computational service. The block reward is given regardless of the number of transactions within the block. This mechanism would incentivize miners in the initial stages when Priority fees (or competition for block space) might be lower. Therefore, the block reward is at its highest in the initial stage and practically phases out when the Unova network grows. More specifically, consider :

$$i = \left\lfloor \frac{B_n}{6311836} \right\rfloor + 1 \tag{4}$$

$$where \ \lfloor x \rfloor = max\{n \in \mathbb{Z} \mid n \leq x\}$$

then

$$B_r(i) = \frac{6}{2^i} \tag{5}$$

where i represents the reward period, B_n represents the block number, and $B_r(i)$ represents the block reward in reward period i.

Note that in the above setup, the block reward diminishes over time. More precisely, consider an average block time of 5 seconds and each year to be 31 556 926 seconds, then substitution of Eq.(4). in Eq.(5). shows that the block reward is approximately halved every year, allowing for the maximum supply of UON still to be capped at 319 118 316 (as can be seen in Eq.(6).).

$$T_u(k) = 281\,250\,000 + \sum_{i=1}^{k} 6\,311\,386 \ \frac{6}{2^i} \tag{6}$$

where $T_u(k)$ represents the total UON at the end of each kth ($k \in \mathbb{N}$) reward period.

$$Hence\ for\ k \to \infty$$

$$T_u(k) = 281\,250\,000 + 37\,868\,316 \frac{\frac{1}{2}}{1-\frac{1}{2}} = 319\,118\,316$$

$$where\ it\ is\ used\ that\ for\ |a|<1,\ \sum_{i=1}^{\infty} a^k = \frac{a}{1-a}$$

The block reward dynamics throughout time are visualized in Figure 4 below. It should be noted that the implementation of a deflationary mechanism through increased transactions could result in a lower total supply.

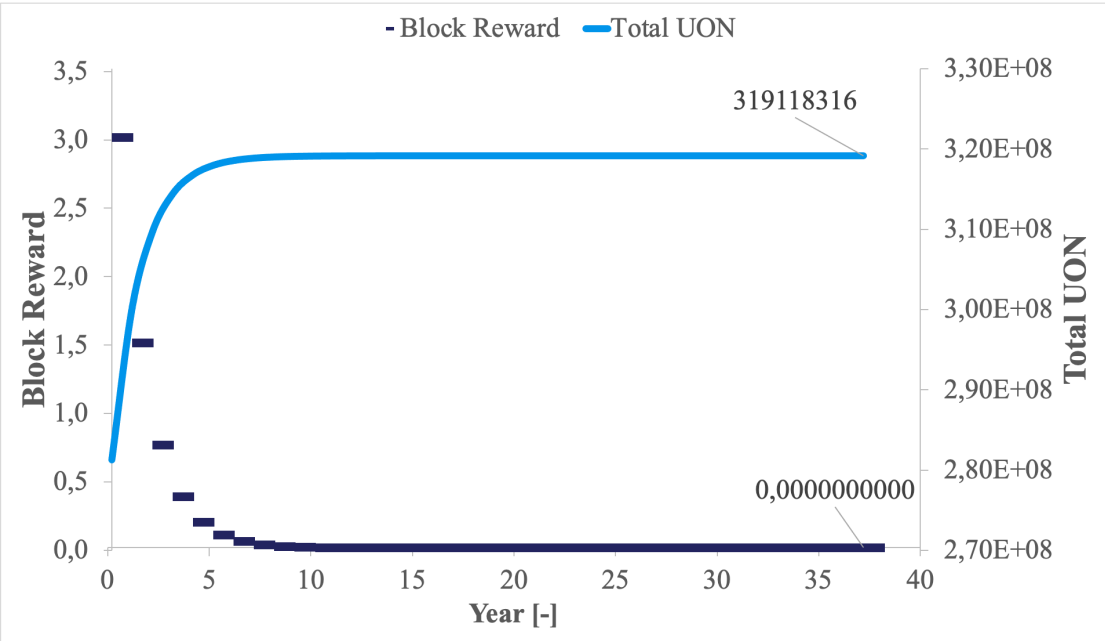

Figure 4: Block Reward Dynamics

All parameters described above are chosen to reach the desired level of decentralization by considering the cost-to-benefit ratio of the miners. Note that the used consensus mechanisms (initially POA and later POS) are relatively computationally light and thus less costly for miners to execute transactions. In addition to incentivizing decentralization, the block reward is likely to serve as a tool to guarantee sufficient market liquidity as miners are more likely to sell their block rewards as they have to Maintain their operational expenses, as opposed to investors who may hold UON token for a longer period. However, there is no way to know with sufficient certainty whether the miners receiving this block reward will hold these tokens or sell them in exchanges. Therefore, abstraction is made of the block reward in the discussions (including distribution) above.

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