

Aion Economics Overview - Introduction of Unity

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Abstract

This document provides a high-level overview of the changes to Aion's economic design as part of the introduction of the Unity protocol.

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1 Introduction

Unity is an eventual consistency protocol merging the Proof of Work (PoW) and Proof of Stake (PoS) into a coherent stochastic process. It encompasses hardware and economic security without sacrificing availability, unpredictability and decentralization. Empirical results indicate that the proposed protocol is fair and scalable to an arbitrary number of miners and stakers. There are two types of block production that occur, PoS and PoW. These types of block production alternate, resulting in an equal balance between production types. PoW blocks are produced by miners through the existing Equihash2109 implementation that has been running on the network since mainnet launch in April, 2018. PoS blocks are produced by validators, whether that be commercial staking pools or private solo pools. Each type of block production has unique actors, technology, capital and operating requirements. This paper will provide an overview as to the reward structures for each type of block production, overall Aion issuance, PoS delegation structure and security implications.

This document follows the overall terminology introduced in [Sha19].

2 TLDR;

There are two types of alternating block production in Unity; PoS and PoW. Both PoW and PoS block types are based on a fixed block reward. Post-Unity upgrade, block times will continue to target 10 seconds (≈ 8640 blocks/day)

Network Parameter	Value
PoS Block Reward	4.5
PoS Annual Issuance % (Year 1)	1.51%
PoS Annual Rate of Return @ 30% of Total Aion Supply	5.0%
PoW Block Reward	4.5
PoW Annual Issuance % (Year 1)	1.51%
Total Aion Issuance % (Year 1)	3.01%

3 Aion Issuance

At a high-level the security of a public blockchain network is the product of how much compensation is provided to the participants - whomever is providing the supply into the market (ex: Miners, Validators). In the case of The Open Application Network, this compensation is in the form of block rewards and transaction fees paid to Miners (PoW Blocks) and Validators (PoS Blocks). In this market structure, participants will continue to join and operate the network until their $cost = compensation$. Costs being server infrastructure, self-bonds, engineering salaries..etc. If $cost > compensation$, the activity is no longer economically rational. If $cost < compensation$,

participants will continue to join the market until a profitability equilibrium is reached or *costs = compensation*. As a result, if overall compensation is increased, security will increase as the *market* equilibrium is raised, providing more capacity for participants while maintaining the same return. In many networks, like The Open Application Network (OAN), there has been *pro-social* participation that supports the network at a financial loss. This behavior is important to understand and monitor, however must not become the exclusive outcome. The economic model of the network must support economically rational participation to support long-term sustainability.

There are two components that make up the compensation in this market model; block rewards and transaction fees. Block rewards are provided in the form of newly issued Aion (increasing the total supply) while transaction fees are paid in existing Aion. As such, block rewards have an inflationary impact of the supply of Aion. For the majority of networks today, the Block reward represents the vast majority of the compensation provided to participants as very few networks have developed a mature fee market driven by adoption. Stagnating adoption poses a downward pressure to asset value of networks that rely on large block rewards - and therefore high inflation to compensate their network operations. Given these market dynamics, Aion issuance is designed to maintain low annual inflation, and driving transaction fee revenue, while balancing The OAN current security needs.

With a focus on driving short-term adoption onto the network, resulting in an increased share of the overall compensation coming from transaction fees, Aion's issuance overtime reduces its reliance on inflationary block rewards. This is achieved through a fixed block reward. As a result, Aion issuance as a % of total supply reduces over-time. This decline of issuance as a % of total supply relies on increasing the transaction-fee market to scale the compensation provided to network participants over time.

4 PoW Block Production

4.1 Proof of Work Economic Objective

Since the mainnet launched in April, 2018 miners have produced over 4,500,000 blocks on The OAN. The mining community includes participants from all over the world including home rigs, farms and commercial pools. The economics driving block production has been based on a 1% annual issuance structure. On an annual basis a snapshot of the total supply is taken and 1% of that total is utilized as the amount to be distributed for block rewards during the upcoming year. As of October, 2019 this is ≈ 1.51379 Aion per block (r_{block}). Total compensation value provided to PoW miners is based on,

$$(r_{block} + r_{fee}) \cdot price \tag{1}$$

As a result of the overall downturn of the crypto market during the past year and a half, hash rate of The OAN has decreased due to lower total compensation value. This has resulted in the

majority of current Aion hashrate behaving as *pro-social* participants. This indicates the need to increase compensation to PoW miners and drive demand for Aion.

In launching Unity our objective is to increase the security of the network through the introduction of a stake based block type and maintaining work based block production to create a unique hybrid security model. This involves increasing the block reward compensation provided to PoW miners in order to increase the hash-rate of the network to a higher cost level. This increase provides a higher equilibrium for mining participants, moving from *pro-social* behavior to economically rational, thereby increasing the amount of participants.

4.2 Proof of Work Reward Issuance

In Unity, the introduction of hybrid block production results in 50% less blocks annually produced and rewarded to PoW miners. However, miners are still running their operations at the similar capacity as pre-Unity. This requires that PoW block rewards increase to not only support current hash-rate but to increase hash-rate towards higher overall security. As a result, PoW block rewards will increase to 4.5 Aion - adjusting for the reduction in annual PoW blocks and increasing the compensation to grow participation.

Pre-Unity PoW BR	Post-Unity PoW BR
1.51379	4.5

Pre-Unity Daily PoW Blocks	Post-Unity Daily PoW Blocks
8640	4320

5 PoS Block Production

5.1 Proof of Stake Economic Objective

At a high-level the security of stake based block production, relies on the participation of Aion holders locking-up their Aion to validate blocks and the value of Aion. As these two functions increase, the cost of an economic attack of the network increases. As such, the PoS compensation must drive sufficient participant to meet the security needs of The OAN, while balancing overall issuance.

Based on the current distribution demographics of Aion (ex: Individuals, Grant Recipients, Foundation, Funds, Exchanges) that are eligible to stake, we are targeting a participation objective of 30% of Aion total supply (Nov, 2019) in staking. This target provides a benchmark to determine issuance, but does not serve as a cap or limit in any way. With a fixed block reward, participation will find an equilibrium based on the compensation and the desired rate of return. Unlike other

networks whose security is driven exclusively through PoS, the hybrid design of Unity does not require the vast majority (ex: 80%+) of Aion to be locked in staking. In addition, it is important for digital assets like Aion to have liquidity. Liquidity is critical for accessibility to the network's computation, price discovery and managing volatility. The hybrid nature of Unity enables The OAN to meet its security needs, while maintaining liquidity and low inflation of Aion.

5.2 Proof of Stake Reward Issuance

PoS blocks will have a fixed block reward of 4.5 Aion. This block reward translates to a 5.0% Annual Rate of Return (without Aion price input) (ARR) at 30% participation of total Aion supply or 141,404,717 Aion staked. As a fixed block reward, the ARR will increase and decrease with participation. The ARR at the targeted participation rate provides participants with a comparable return to the market (other staking networks, Decentralised Finance (DeFi), etc) and providing a return over the incurred costs. Using a fixed block reward we can establish a definitive annual issuance for Aion. The issuance table below is based on total Aion supply of 471,349,057 Aion (projected Nov'19).

Participation Rate	Aion Staked	ARR	Aion PoS Issuance
5%	23,567,453	30.1%	7,095,600
10%	47,134,906	15.1%	7,095,600
15%	70,702,359	10.0%	7,095,600
30%	141,404,717	5.0%	7,095,600
40%	188,539,623	3.8%	7,095,600
60%	282,809,434	2.5%	7,095,600

5.2.1 PoS & PoW Fixed Annual Issuance

The table below summarizes the fixed annual issuance to PoS and PoW block rewards.

Annual PoS	Aion PoW	Total Annual Issuance	Year 1 Issuance %
7,095,600	7,095,600	14,191,200	3.01%

5.2.2 Aion Issuance % Over Time

The table below summarizes annual Aion issuance over time as a percentage of total supply

Year 2 Issuance	Year 3 Issuance	Year 4 Issuance	Year 5 Issuance
2.92%	2.84%	2.76%	2.69%

5.3 Minimum Staking Amount

As a way of constraining the communications and space considerations in the network (so as not to bloat the staker registry), there is a minimum amount of Aion required for all stakers (AKA; Validators, Pools) in the network of 1,000 Aion. Delegators have no such minimum requirement. Failing to meet this requirement means said staker is not able to produce blocks [Sha19].

5.4 Self Bond Ratio

The Self Bond Ratio specifies the ratio at which pools can receive stake relative to it's own bond. It is currently set to 100 [Sha19]. Therefore we can represent a pools voting power as,

$$v = s_{pool} + \min(\sum s_{delegates}, 100 \cdot s_{pool}) \quad (2)$$

This mechanism enables a form of sybil resistance for pools which increases the cost of attack to the network. The minimum staking amount mentioned in §5.3 counts towards this ratio. As an example, every staking pool on Unity must have 1,000 Aion in minimum stake which enables them to receive up to 100,000 Aion in delegation. In order to receive additional delegation, the pool will need to increase their self-bond. Further information on the functionality of this mechanism can be found in [Sha19].

5.5 Maximum Stake Softcap

To assist in voting practices for delegation participants, the Aion Staking interface (web client where Aion holders can delegate) implements a ranking algorithm that biases towards high performing (uptime) pools while also maintaining a level of randomness in selection. This ensures that performing pools are rewarded for their contributions while maintaining a level of fairness. In the future we expect to make updates to this algorithm to include additional input variables.

6 Collaboration with Prysm Group

The Open Foundation has been engaged with Prysm Group (www.prysmgroup.io) and their Founding Economists to collaborate on the development and formal audit of Aion's economic model.

References

- [Sha19] Ali Sharif. Engineering design and incentive specification for aion-unity. Aug 2019. <https://github.com/aionnetwork/unity-engineering-spec/blob/64516f23f9bffc3ee50b67d278f3551d54cd6d2/unity-engineering-spec.pdf>.

Abbreviations

ARR Annual Rate of Return (without Aion price input). 6

DeFi Decentralised Finance. 6

OAN The Open Application Network. 4-6

PoS Proof of Stake. 3, 5, 6

PoW Proof of Work. 3