Alacris Utility Token Staking and Reward Economics
Part I: Mutual Knowledge Base Nodes

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Abstract

Alacris Utility Token (AUT) is used to stake the Mutual Knowledge Base (MKB) nodes. These stakes ensure the initial incentive to startup the data availability in the MKB nodes and rewards for the MKB service. We describe the economic model and reward pool as well as considerations for stakers and Node operators regarding platform functionality and purpose.

1 Introduction and Motivation

Alacris is launching a network of nodes to support scaling of Layer 1 blockchains, supporting the Alacrity developer tools and enabling a new class of DApps. In order to launch the network, we need to review the staking needs, rewards and fees to ensure that our system of staking and reward economics achieves the following:

- Ensure stakers rewards are proportional to the time they stake
- Ensure stakers are rewarded proportionally to how much they stake
- Make it easy for stakers to restake their reward to compound rewards.
- Ensure stakers are rewarded positively for higher uptime.
- Ensure stakers are rewarded based on their performance, both positively and negatively.

All of these are taken into consideration when modeling the reward pool and economics.

2 Rewards and Transaction fees

During the initial launch of the network, we anticipate the transaction demand will be low and therefore the transaction fees will be low. In order to incentivize the stake by individual node operators, a *reward pool* will be allocated to MKB node operators.

Note on *Reward Pool vs. Inflation*: *Often in tokenomics, the term "inflation" is used to mean "amount of new tokens generated each block and given out as reward to token holders for various actions (mining, staking, etc)" – but in fact, this is more of a reward pool and we will be using the term "reward pool" throughout.*

Rewards will be released every block by a formula taking into account, the total amount of tokens staked, the mean-time commitment of the entire stake (from 1 month to 12 months).

For individual stakers, there are several options and considerations. One is the staked time commitment in months, ranging from 1 month to 12 months. By staking your tokens for a longer time, you receive higher reward allocation.

As the transactions occur, the reward pool is allocated pro-rata based on the total amount of tokens that are staking all nodes. Once this is sent to each MKB node, the nodes divide the reward according to the percentages they set for those who have staked their tokens to them.

The same formula will be used to allocate transaction fees, initially viewed to be a lower percentage of the overall reward than the reward pool, but growing as network usage increases.

3 Design considerations

Review of previous Proof-of-Stake (PoS) coins such as DASH[2], Cosmos[4], Matic[1], NuCypher[5], LivePeer[6] and Tezos[3] others were considered when designing Alacris. DASH has set the stage for PoS systems and is the leading volume in rewards paid, however the minimum 1000 DASH required to setup a masternode is high by comparison. Cosmos, Matic, NuCypher are applying ambitious plans to create more comprehensive rewards for staking. And LivePeer is executing on its staking reward strategy, with as much as 160% or more for its video transcoding decentralized service. Finally Tezos outlines some original work on Delegated Proof-of-Stake.

One critical factor in design is the selection of the initial reward rate, or R_0, which was chosen to be between 40% - 80% annual reward in order to provide a competitive environment and attract early MKB node operators. Reviewing other staking coins, the reward rates vary from 1% to over 180%. The variation has to do with a) how risky the new system is b) how much technical competence is required to operate a node and c) how large the underlying network is. Given the early-nature of Alacris and the ease of operating a node, we have selected a competitive range of rates.

4 Model for Reward Pool

In building out the model, we will start with a Total Supply of Tokens: S_0. There will be a percentage of those staked and therefore non-circulating, we will use $\lambda = 40\%$ as an initial setting. So the total available circulating supply: $S_0(1-\lambda)$. These are the starting conditions for the reward pool and from here we can build out the model for rate and decay and distribution of rewards.

4.1 Initial Reward Rate and Decaying Time Constant

Initial reward rate will be R_0. The rate at which the rewards are granted follows an exponential decay curve, and we have selected the halfing period (τ) to be 2 years. The equation for the reward rate over time is:

$$R(t) = R_0 * 2^{\frac{-t}{\tau}} \tag{1}$$

Where: R_0 is the initial reward rate (%) τ is the time constant or halfing period.

4.2 Rewards are scaled by staking time commitment

We are seeking stakers who will commit to the network. To ensure solid operation and watching over the node operators; and to destake from a poorly run node operator.

Our platform is also designed to reward stakers based on the length of time their tokens are staked. When staking, the token holder can select any time between 1 month and 1 year of lockup. The reward scales linearly with committed time where a commitment of 1 month provides 54% of the potential staking reward and 1 year provides 100% of the potential staking reward.

$$\kappa = 0.5 + 0.5\left(\frac{T_c}{12}\right) \tag{2}$$

Where: T_c is the staking commitment time (months) from 1-12

4.3 Combining all elements into one Model

Reviewing Mining and staking papers, we note the background work in NuCypher's paper[5] and start with equation 13:

Overall Supply of Tokens $S(t)$:

$$S(t) = S_0\left[1 + R_0\frac{\kappa * \tau}{\ln 2} * \left(1 - 2^{-\frac{t}{\tau}}\right)\right] \tag{3}$$

Where:
$S(t)$ is the Token supply over time
S_0 is the initial supply at mainnet launch
R_0 is the initial reward rate (approx 40% - 80%)
κ^* is the mean-time of staking factor for all stakers
τ is the exponential decay half-time (2 years)

4.3.1 Overall rewards for stakers

The overall reward for a staker can now be modeled as two different equations, depending first on if staker wants to extract an income stream while staking, or if they wish to restake all rewards (compounded):

Staker Strategy 1: Income Stream
First the income stream (from[5], equation 15):

$$rr(t) = l \frac{\kappa}{\kappa^* \lambda} \ln \frac{S(t)}{S_0} \tag{4}$$

Where:
$rr(t)$ is the rate of return over time
l is the amount of tokens staked by individual
$S(t)$ is the Token supply over time
S_0 is the initial supply at mainnet launch
κ^* is the mean-time of staking factor for all stakers
κ is the time commitment factor of the individual staker

Staker Strategy 2: Restake to Compound rewards
The Second is to restake rewards to compound your stake

A staker has another choice as well, which is to restake their rewards and fees into their staking pool. This has a compounding effect, increasing their overall reward.

$$sr(t) = \left(\frac{S(t)}{S_0} \right)^{\frac{\kappa}{\kappa^* \lambda}} \tag{5}$$

Where:
$S(t)$ Token supply over time, eqn:3
S_0 Initial supply at mainnet launch
κ^* Mean-time of staking factor for all stakers
κ Time commitment factor of the individual staker
λ Percentage of tokens staked

5 Model Specifics for Alacris Utility Token

Given the above set of equations to define how the staking reward pool will operate, how it will decay and how the stakers' choices affect their overall rewards, we can run specific cases for Alacris Utility Tokens and highlight some common choices for stakers to maximize their rewards.

5.1 Metrics for AUT Supply, Reward Pool, Initial Rates

For Alacris launch, we have selected the following parameters:

- S_0 = 100,000,000 AUT
- $R_0 \approx 40\% - 80\%$
- τ = 24 months
- λ = 40%

5.2 Assumptions about network metrics once launched

In order to model scenarios, we need to estimate an average time commitment factor. Given the opportunity for higher rewards associated with committing for 12 months, and the need for some stakers to need access to their tokens, we estimate a mean-time of staking across all stakers:

- κ^* to be ≈ 0.90

NOTE: this is subject to changes with market conditions.

6 Conclusions

In this paper we have shown a model for staking rewards for the Alacris Network of MKB Nodes. We have described how the reward pool will be allocated and opportunities for stakers to add to their rewards by helping the network maintain integrity and availability. This will allow Alacris and grow its network of DApps to enable any layer 1 blockchains to scale with the next wave of popular DApps.

References

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