Effect Staking Protocol

Staking Mechanism with limited Stake AGE

REV-1.0

Verspeek, Laurens
laurens@effect.ai

Eisses, Jesse
jesse@effect.ai

Dawe, Chris
chris@effect.ai

April 16, 2019

Abstract

The Effect Staking Protocol improves regular staking mechanisms by introducing *Stake AGE*. Stake AGE is a factor that increases the weight of staked tokens linearly over time; The longer the tokens are staked the more reward they will give. This will incentive users to keep their tokens staked for a longer time. It also rewards early users as compared to new users. To make sure the total supply will not keep growing exponentially and to also give new users a chance to catch up, the Stake AGE is limited. The incentive for staking will be a reward in the form of *Network Tokens*. These Network Tokens will enable decentralized governance for The Effect Network [1] and might eventually pay-out network fees to the people governing the network.

Contents

1 Effect Staking Protocol

Within the world of blockchain and crypto, *staking* refers to the proof of holding tokens of a project to show confidence and support by locking tokens. These locked tokens cannot be transferred while they are being staked. To incentivize users to stake their tokens, there always is a type of reward. There are many ways in which staking can be implemented and the type of rewards also vary from project to project. The Effect Staking Protocol includes a measurement feature to track how long your stake has been active. This feature is called Stake AGE. The Stake AGE of your stake will determine a multiplier on the rewards you will receive.

In order for users to stake their tokens, there needs to be an incentive for them to stake their tokens. For example: with the consensus algorithm Proof-of-Staking (PoS) [2], the incentive is that if a node has enough tokens staked with enough coinage [3], he can produce the next block, which will give out the block reward. With the Effect Staking Protocol this incentive is a reward in the form of the Effect Network Token NFX. A simple rewards staking algorithm is a formula where the reward will grow linearly over time:

$$\begin{aligned} s &= \text{staked tokens} \\ d &= \text{number of days since previous claim} \\ f &= \text{factor} \end{aligned} \tag{1}$$

$$claimable = \frac{s * d}{f}$$

If there would be no penalty for unstaking, it would basically be the same as just holding those tokens, because as soon as the user wants to transfer the tokens, he can just unstake without any penalties, making the staking functionality the same as simply holding tokens without them being locked. In order to ensure that staking is different than holding tokens, there needs to be a penalty for

unstaking tokens. A simple penalty can be that the unstaking process will take a number of days to complete. During the unstaking period, the tokens will still be locked, but they will stop generating rewards (they are not considered as staked tokens).

1.A Stake AGE

The Effect Staking Protocol adds to the above staking algorithm by introducing *Stake AGE*. Stake AGE is a factor that increases the weight of staked tokens linearly over time; The longer the tokens are staked the more reward they will give:

$$\begin{aligned} s &= \text{staked tokens} \\ d &= \text{number of days since previous claim} \\ f &= \text{factor} \\ a &= \text{stake age of previous claim} \end{aligned} \tag{2}$$

$$\begin{aligned} a_{new} &= a + d \\ claimable &= \frac{s * d * \frac{a + a_{new}}{2}}{f} \end{aligned}$$

Stake AGE has a number of benefits over regular staking:

- Users will be incentivized to keep their tokens staked for a longer time.
- Early users are rewarded. It will be harder for new users with a lot of tokens to immediately take big rewards.
- The penalty for unstaking will be bigger as users will lose their Stake AGE for their unstaked tokens, making sure users are incentivized to keep their tokens staked.

1.B Limited Stake AGE

By having a linear increase of the reward for staked tokens over time, this means that the claimable tokens per day will grow exponentially over time. To limit this exponential growth of claimable tokens, but still keep the incentive to keep your tokens staked, we introduce a limit to the Stake AGE. By incorporating the limit, the final formula for the Effect Staking Protocol will look like this:

$$
\begin{aligned}
s &= \text{staked tokens} \\
t &= \text{time in seconds of previous claim} \\
t_{cur} &= \text{current time in seconds} \\
f &= \text{factor} \\
a &= \text{stake age of previous claim} \\
l &= \text{stake age limit} \\
\\
d &= (t_{cur} - t)/86400 \\
a_{new} &= min(a + d, l) \\
claimable &= \frac{s * d * (\frac{a+a_{new}}{2} * min(1, 1 - \frac{d-(l-a)}{d}) + a_{new} * max(0, \frac{d-(l-a)}{d}))}{f}
\end{aligned}
\tag{3}
$$

This limit will make sure that users will still experience all the benefits of Stake AGE, but after a certain period the reward will be linear instead of exponential, making sure the total supply will be limited and new users will still have a chance to catch up.

By adding a limited Stake AGE multiplier to the reward formula The Effect Staking Protocol has many improvements over regular staking algorithms. A

breakdown of the final formula:

$$d = \overbrace{(t_{cur} - t)}^{\text{time since last claim}} \; / \overbrace{86400}^{\text{in days}}$$

$$a_{new} = \overbrace{min(a + d, l)}^{\text{old stake age + days with a limit}}$$

$$claimable = \frac{\overbrace{t * d}^{\text{regular staking}} * (\overbrace{\frac{(a + a_{new})}{2} * min(1, 1 - \frac{d - (l - a)}{d}) + a_{new} * max(0, \frac{d - (l - a)}{d})}^{\text{average stake age over claimable period}})}{\underbrace{f}_{\text{factor to influence the amount of claimable tokens compared to staked tokens}}}$$

1.C Claiming

A user can claim their NFX tokens if the number of seconds since the last claim is greater than 0. After the claim based on the limited Stake AGE formula from the previous section the following values will be updated:

$$a = a_{new}$$

$$t = 0$$

A user can claim as many times as they want. A single claim would result in the same total of NFX received as compared to many claims over the same period.

1.D Adding Stake

By adding x more staked tokens there will first be a claim to get the currently claimable reward. Directly after the claim the following values will be updated in the following order:

$$a = \frac{a * s}{s + x}$$

$$s = s + x$$

The Stake AGE is recalculated and diluted to be a combination of the Stake AGE of the existing tokens + the extra tokens being added that have a Stake AGE of 0. The new token are added to the total staked tokens after the Stake AGE is recalculated.

1.E Unstaking

By removing x tokens from the currently staked tokens there will first be a claim to get the currently claimable reward. Directly after the claim the tokens are removed from the total staked tokens:

$$s = s - x$$

There is a lock period (l) for the unstaked tokens. Each time the user unstakes tokens this lock period will reset. During the lock period the user will not receive stake on the amount of unstaked tokens. The unstaked tokens will be added to your balance (b) after the lock period is over:

$$b = b + x$$

1.F Staking Protocol Implementation

When implementing the Staking Protocol proposed in this paper, there are various parameters that determine the rules of the staking. The following is an example implementation where the stake-able tokens are EFX and the reward is NFX.

Parameter	**Value**
Stake-able Tokens	650,000,000 EFX
Stake AGE Limit	200 days
Factor	1,000,000
Theoretical Max Claimable	130,000 NFX/day
Lock Period	10 days

Table 1: Effect Staking Protocol parameters example

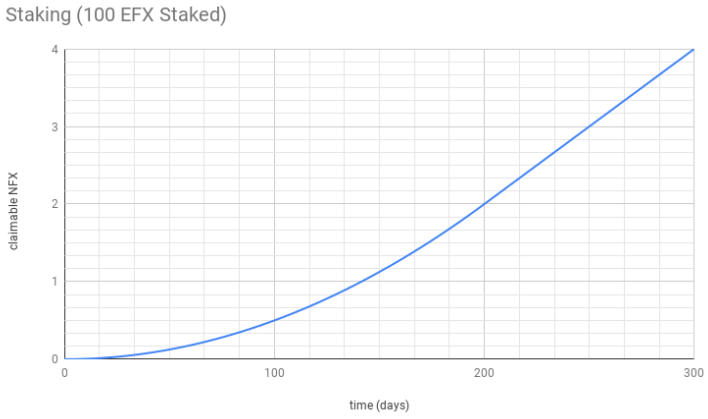

Figure 1: Claimable NFX over time with 100 staked EFX

Figure 1 shows that the claimable tokens grow exponentially in the beginning. This is due to Stake AGE. After 200 days the Stake AGE reached the limit and the grow will change from exponential to linear. This effect is even more clearly visible when looking at the delta of claimable NFX/day over time in Figure 2

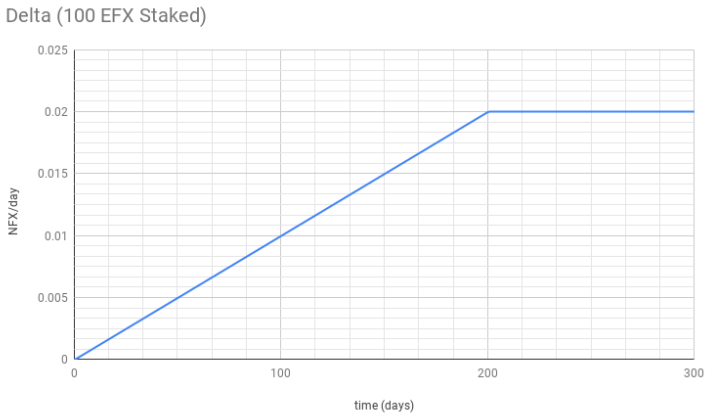

Figure 2: Claimable NFX/day over time with 100 staked EFX

References

[1] J. Eisses, L. Verspeek, C. Dawe, and S. Dijkstra, "Effect network: Decentralized network for artificial intelligence," 2018 (cit. on p. 1).

[2] F. Saleh, "Blockchain without waste: Proof-of-stake," 2018 (cit. on p. 3).

[3] S. Saraswat, V. S. Chauhan, and N. Faujdar, "Analysis on crypto-currency," *International Journal of Latest Trends in Engineering and Technology*, vol. 9, no. 1, 2017 (cit. on p. 3).