

Staking

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Abstract—This document discusses the proposal of staking strategy with a fair reward distribution.

Keywords—Staking, coin

I. INTRODUCTION

THIS document focus on Staking coin and receives reward problem.

The Stak event begins with fixed pool size and staking time. How to deal with fairly things?

- (1) The reward should be fixed at staking time and maybe grow up in the future.
- (2) The sooner staking is, the more reward the staker gets.
- (3) The longer staking is, the more reward the staker gets.

II. FAIR STRATEGY

A. Idea

Deal with (1), depend on fixed pool size and staking time, we get a fixed total reward per second.

Deal with (2), the fixed reward per second need variable with staking time by percent, we get a total bonus to accumulate offset between fixed total reward per second and user fixed reward per second with staking time variable.

Deal with (3), the user bonus reward is the percent keep time per total staking time multi total bonus.

B. Implementation

Setup for event

A = Pool size = Total amount (fixed)

T = Total staking time (fixed)

ST = Start time (fixed)

At time = 0

SC = Staked coins at zero = 0

R = Remaining size = A – staked coins = 1000

FB = Total fixed bonus = 0 (collect from time = 0 to user staking time)

TBS = Total bonus by second

BA = Bonus amount

TR = Total reward per second = A / T

TKT = Total keep time

By user

ust = user staking time = 0

uwt = user unstaking/withdraw time = now

ukt = user keep time = uwt - ust

Context: If a user stake X coins at st

- up = User percent staked coins = X / A
- ufr = User fixed reward = up * TR

- $TKT = TKT + ukt$
- $R = R - X$
- $FB = FB + ufr * ust$
- $urs = \text{User reward by second} = ufr * (1 - ust/T)$
- $ubo = \text{User bonus offset by second} = ufr - urs$
- $TBS = TBS + ubo * ukt$
- $BA = TBS + FB$
- $ubs = \text{User bonus by second in lifetime} = ukt / TKT * ubo$
- $utr = \text{User total reward in lifetime} = urs * ukt + ubo$

III. EXAMPLES

Assume:

- **A = 1000**
- **T = 100**
- **ST = 0**
- SC = 0
- R = 1000
- FB = 0
- $TR = A / T = 10$
- TKT = 0

Case 1

A user stake 10 coin at time = 0 and withdraw at pool end = T

X = 10

ust = 0

uwt = T = 100

ukt = uwt - ust = 100 - 0 = 100

$up = X / A = 10 / 1000 = 1\%$

$ufr = up * TR = 1\% * 10 = 0.1$

$TKT = TKT + ukt = 0 + 100 = 100$

$R = R - X = 1000 - 10 = 990$

$FB = FB + ufr * ust = 0 + 0.1 * 0 = 0$

$urs = ufr * (1 - ust/T) = 0.1 * (1 - 0/100) = 0.1$

$ubo = ufr - urs = 0.1 - 0.1 = 0$

$TBS = TBS + ubo * ukt = 0 + 0 * 100 = 0$

$BA = TBS + FB = 0 + 0 = 0$

$ubs = ukt / TKT * BA = 100 / 100 * 0 = 0$ lifetime

$utr = urs * ukt + ubo = 0.1 * 100 + 0 = 10$ lifetime

⇒ Assume 100 users stake 10 coin (pool size = 1000) at the same time $ust = 0$ ⇒ At the end, 10 users get total $10 * 100 = 1000$ coins = pool size ⇒ Correct

Case 2

User1 stake 100 coin at time = 0 and withdraw at T

User2 stake 900 coin at time = 10 and withdraw at T

For User1

X = 100

ust = 0

uwt = T = 100

ukt = uwt - ust = 100 - 0 = 100

$up = X / A = 100 / 1000 = 10\%$

$ufr = up * TR = 10\% * 10 = 1$

$TKT = TKT + ukt = 0 + 100 = 100$
 $R = R - X = 1000 - 100 = 900$
 $FB = FB + ufr * ust = 0 + 1 * 0 = 0$
 $urs = ufr * (1 - ust/T) = 1 * (1 - 0/100) = 1$
 $ubo = ufr - urs = 1 - 1 = 0$
 $TBS = TBS + ubo * ukt = 0 + 0 * 100 = 0$
 $BA = TBS + FB = 0 + 0 = 0$
 $ubs = ukt / TKT * BA = 100 / 100 * 0 = 0$
 $utr = \mathbf{urs} * \mathbf{ukt} + ubs = 1 + 0 = 1$

For User2

X = 900

ust = 10

uwt = T = 100

ukt = uwt - ust = 100 - 10 = 90

$up = X / A = 10 / 1000 = 90\%$
 $ufr = up * TR = 90\% * 10 = 9$
 $TKT = TKT + ukt = 100 + 90 = 190$
 $R = R - X = 900 - 900 = 0$
 $FB = FB + ufr * ust = 0 + 9 * 10 = 90$
 $urs = ufr * (1 - ust/T) = 9 * (1 - 10/100) = 8.1$
 $ubo = ufr - urs = 9 - 8.1 = 0.9$
 $TBS = TBS + ubo * ukt = 0.9 * 90 = 81$
 $BA = TBS + FB = 81 + 90 = 171$
 $ubs = ukt / TKT * BA = 90 / 190 * 171 = 81 \text{ lifetime}$
 $utr = \mathbf{urs} * \mathbf{ukt} + ubs = 8.1 * 90 + 81 = 729 + 81 = 810 \text{ lifetime}$

* Note: after user 2 join, the TKT & FB change so final reward of user1 will be change when query latest reward corresponding:

- Latest TKT = 190
- Latest FB = 90
- Latest TBS = 81
- Latest BA = 171

User1 update:

- $ubs = ukt / TKT * BA = 100 / 190 * 171 = 90 \text{ lifetime}$
- $utr = \mathbf{urs} * \mathbf{ukt} + ubs = 1 * 100 + 90 = 190 \text{ lifetime}$

Total A = 1000 by 2 users (1 and 2) = 810 + 190 = 1000 = A => Correct

By **ukt** will increase by second and the final ratio to it.

IV. LIMITATION

This strategy requires all staker to lock their assets to the end of the event. Deal with a complex case that the user withdraws in middle.

- Update pool size and remaining to new value after staker withdraws = A - staker's reward
- Update TKT, FB, TBS, BA by minus the withdrawal staker