Reward System

Introduction

The Logos Reward System is designed to create and distribute rewards on the Logos Network - it incentivizes nodes to actively validate requests by rewarding them in proportion to the number of requests validated. Rewards are Logos currency that are accumulated during the Epoch in the form of transaction fees, and generated at the end of an Epoch in the form of inflation, then subsequently destributed to eligible participants. Specifically, transaction fees are distributed amongst delegates according to personal stake, and new Logos (generated by a 0.0035% inflation rate) are distributed to representatives and locked-staked accounts according to total stake. Furthermore, rounding is used to ensure invariants such as total token supply are not broken.

Representatives that fail to vote during an epoch lose their claim to the inflation and penalty distributions. Unclaimed rewards are added to the subsequent pool. Provided that epoch length is several orders of magnitude greater than transaction processing time (by construction), these reward requests will only represent a de minimis portion of overall network transactions.

Claiming Rewards

All Logos Network participants, with the exception of delegates, must submit valid reward claim requests before receiving any rewards that they've accumulated during their lifetime. If the request is approved, the full balance of rewards available for that account will be deposited to its balance. As with a native send request, this deposit will result in a receive appended to the account's receive chain.

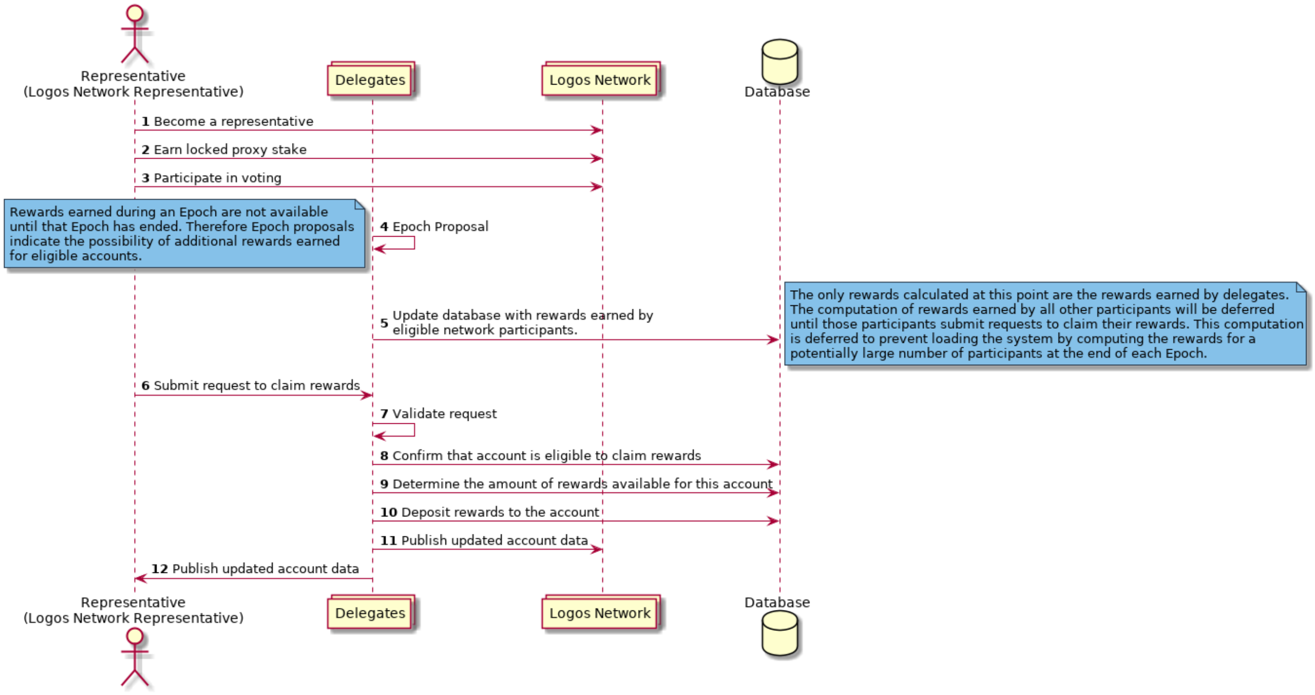
Algorithm

Participant	Reward Calculation
Delegate	The previous epoch block will be retrieved to determine each delegate's relative staking power and thus the percentage of the transaction fees it earns as a reward.

Participant	Reward Calculation
Representative	The *epoch_rewards_db* will be used to determine each representative's relative staking power for a particular epoch, and thus the percentage of transaction fees it earns as a reward.
Basic User	These accounts only earn rewards via levies placed on representatives.

Reward Claim Sequence

This demonstrates the process for earning and claiming rewards.


Representative
(Logos Network Representative)
Delegates
Logos Network
Database
1 Become a representative
2 Earn locked proxy stake
3 Participate in voting
4 Epoch Proposal
5 Update database with rewards earned by eligible network participants.
6 Submit request to claim rewards
7 Validate request
8 Confirm that account is eligible to claim rewards
9 Determine the amount of rewards available for this account
10 Deposit rewards to the account
11 Publish updated account data
12 Publish updated account data
Representative
(Logos Network Representative)
Delegates
Logos Network
Database

Rewards earned during an Epoch are not available until that Epoch has ended. Therefore Epoch proposals indicate the possibility of additional rewards earned for eligible accounts.

The only rewards calculated at this point are the rewards earned by delegates. The computation of rewards earned by all other participants will be deferred until those participants submit requests to claim their rewards. This computation is deferred to prevent loading the system by computing the rewards for a potentially large number of participants at the end of each Epoch.

Claim Processing Pseudocode

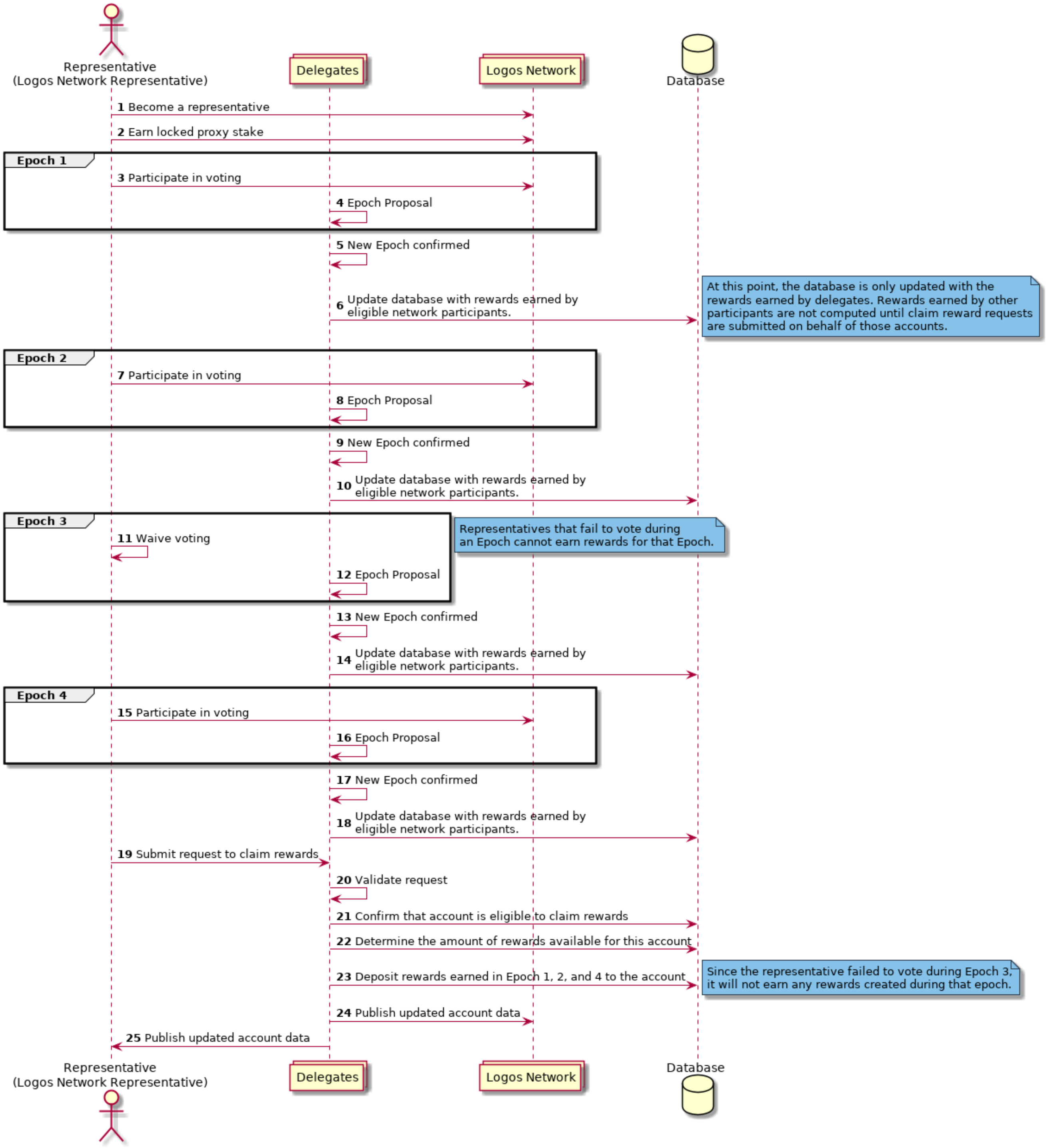
```
    claim reward request for accounts:
        let j = epoch referenced in claim reward request
        let i = most recent claim epoch

        let sum = 0

        for epoch n in range i -> j:
            access user's account request chain to determine the representative staked to in epoch n
            access the representative's account chain to determine the levy percentage promised to stakers in epoch n
            access epoch_rewards to determine the amount earned by this account and add this value to the sum

        add the sum to the user's account balance
        append claim reward request to account's send chain
        add a receive to the account receive chain
```

Musings On the Accumulation of Dust

Accounts that earn rewards from levy percentages are entitled to an amount of Logos that may have a fractional component that is too small to receive. To mitigate this, when an account claims rewards from a representative's pool, the amount will always be rounded down to eliminate the dust, and the last account to claim from a representative's pool will simply receive whatever is left of the pool, potentially earning more than the preceise percentage to which it is entitled.

Voting's Impact on Rewards

Representatives can only earn rewards for Epochs during which they successfully participated in voting. Failure to vote during an Epoch excludes representatives from earning rewards for that particular Epoch.


Representative
(Logos Network Representative)
Delegates
Logos Network
Database
1 Become a representative
2 Earn locked proxy stake
Epoch 1
3 Participate in voting
4 Epoch Proposal
5 New Epoch confirmed
6 Update database with rewards earned by eligible network participants.
Epoch 2
7 Participate in voting
8 Epoch Proposal
9 New Epoch confirmed
10 Update database with rewards earned by eligible network participants.
Epoch 3
11 Waive voting
12 Epoch Proposal
13 New Epoch confirmed
14 Update database with rewards earned by eligible network participants.
Epoch 4
15 Participate in voting
16 Epoch Proposal
17 New Epoch confirmed
18 Update database with rewards earned by eligible network participants.
19 Submit request to claim rewards
20 Validate request
21 Confirm that account is eligible to claim rewards
22 Determine the amount of rewards available for this account
23 Deposit rewards earned in Epoch 1, 2, and 4 to the account
24 Publish updated account data
25 Publish updated account data
Representative
(Logos Network Representative)
Delegates
Logos Network
Database

At this point, the database is only updated with the rewards earned by delegates. Rewards earned by other participants are not computed until claim reward requests are submitted on behalf of those accounts.

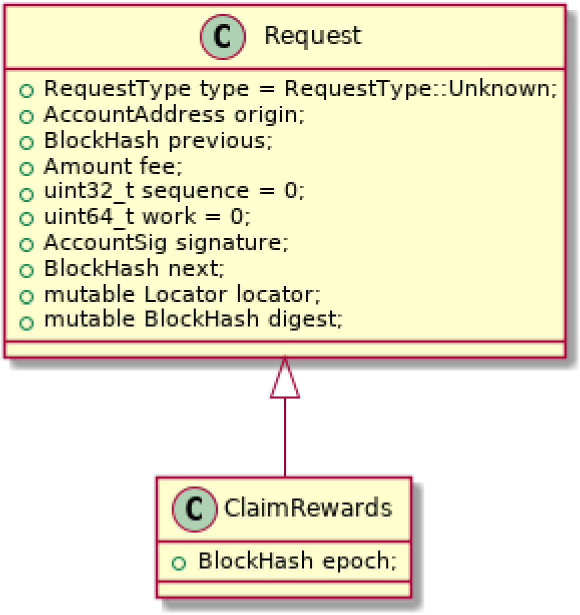
Representatives that fail to vote during an Epoch cannot earn rewards for that Epoch.

Since the representative failed to vote during Epoch 3, it will not earn any rewards created during that epoch.

Claim Reward Request

The reward system introduces a distinct request type to the Logos Network implementation that will be used to claim any rewards available for a particular account. If no rewards are available but the request is otherwise valid, it will still be post-committed and the corresponding account will be updated.

As with all other requests, the claim reward request will simply extend the Request base class. Members of this derived class will be determined at a later time.

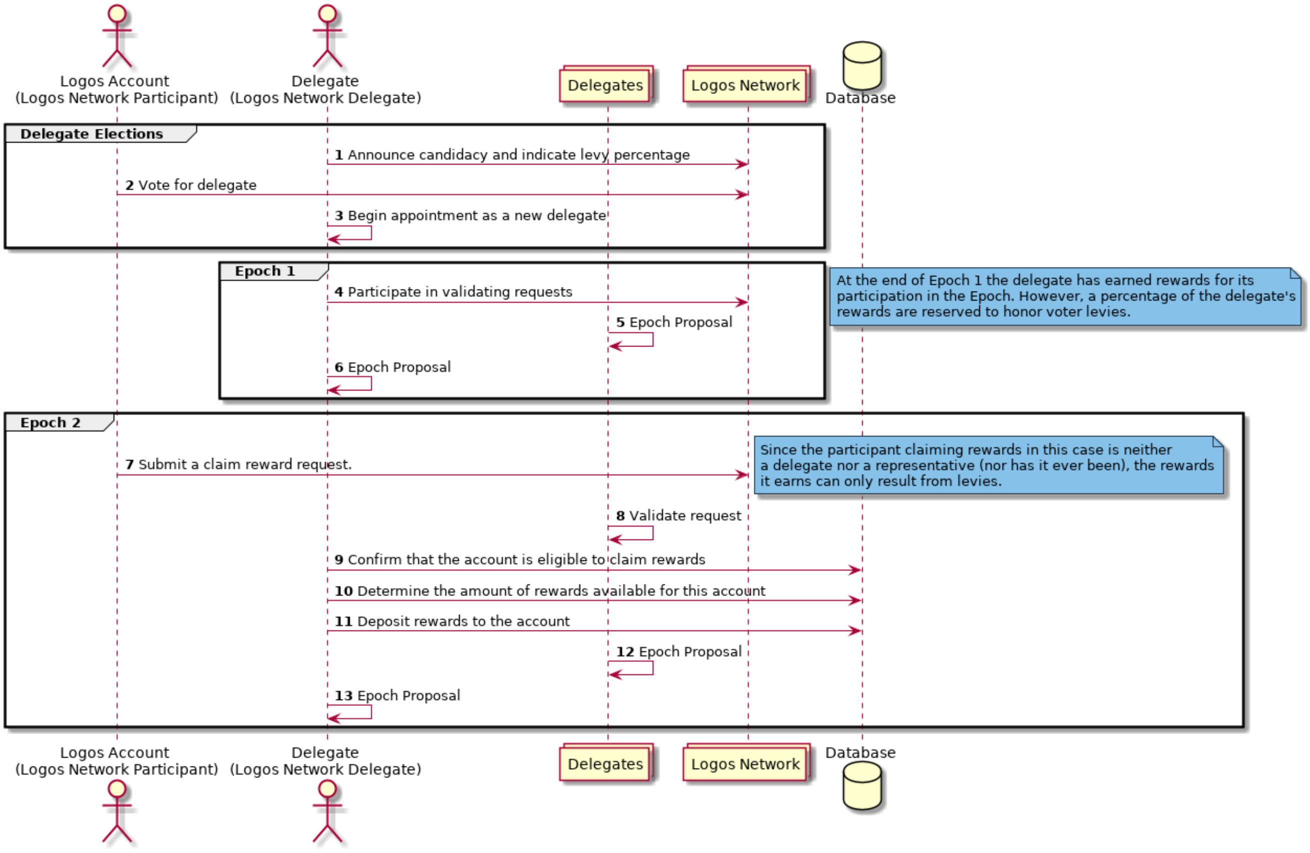


Levy Percentage

Representatives may choose to allow other participants to place levies on the rewards they've earned, whereby a percentage of a representative's rewards will be deposited into the accounts of locked-proxy staked participants.

Representative Levies

Logos Network participants may be entitles to levies placed on locked-stake representatives.


Logos Account
(Logos Network Participant)
Delegate
(Logos Network Delegate)
Delegates
Logos Network
Database
Delegate Elections
1 Announce candidacy and indicate levy percentage
2 Vote for delegate
3 Begin appointment as a new delegate
Epoch 1
4 Participate in validating requests
5 Epoch Proposal
6 Epoch Proposal
Epoch 2
7 Submit a claim reward request.
8 Validate request
9 Confirm that the account is eligible to claim rewards
10 Determine the amount of rewards available for this account
11 Deposit rewards to the account
12 Epoch Proposal
13 Epoch Proposal
Logos Account
(Logos Network Participant)
Delegate
(Logos Network Delegate)
Delegates
Logos Network
Database

At the end of Epoch 1 the delegate has earned rewards for its participation in the Epoch. However, a percentage of the delegate's rewards are reserved to honor voter levies.

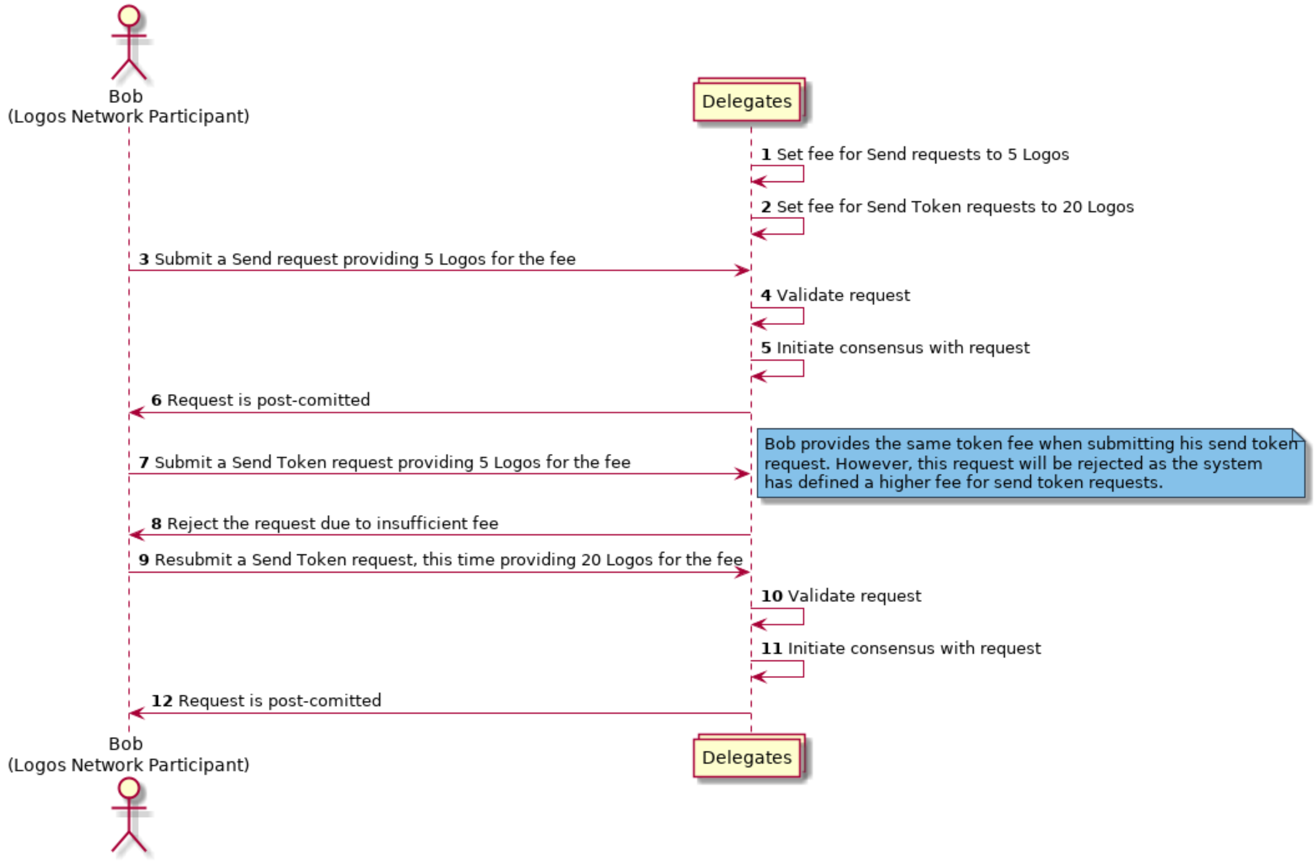
Since the participant claiming rewards in this case is neither a delegate nor a representative (nor has it ever been), the rewards it earns can only result from levies.

Fees

Fees are are imposed on requests sent on the Logos Network and are amassed at the end of each Epoch to be disbursed amongst the delegates. Additionally different request types may have different fee requirements.

Fee Requirement Discrepancies

Different request types may require different fees.


Bob
(Logos Network Participant)
Delegates
1 Set fee for Send requests to 5 Logos
2 Set fee for Send Token requests to 20 Logos
3 Submit a Send request providing 5 Logos for the fee
4 Validate request
5 Initiate consensus with request
6 Request is post-comitted
7 Submit a Send Token request providing 5 Logos for the fee
8 Reject the request due to insufficient fee
9 Resubmit a Send Token request, this time providing 20 Logos for the fee
10 Validate request
11 Initiate consensus with request
12 Request is post-comitted
Bob
(Logos Network Participant)
Delegates

Bob provides the same token fee when submitting his send token request. However, this request will be rejected as the system has defined a higher fee for send token requests.

Databases

Database	Description
epoch_db	When computing the transaction fee rewards earned by the delegates, this database is used to determine each delegate's relative weight and thus the percentage of transaction fees it will earn.
epoch_rewards_db	When computing the inflation rewards earned by representatives, this database will be used to determine a rep's total locked stake for a particular epoch.
epoch_rewards_db	This database will also be used to temporarily store rewards earned by all stakers for a particular rep for a particular epoch, as well as the rep's rewards for that epoch.
global_epoch_rewards_db	This database is also used when computing the rewards earned by representatives as it contains the sum of stake (including lock proxi of all reps who voted for a particular epoch.

→ Next to **Echo**