Reward Schemes for DReps in Voltaire

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Introduction

This document describes some potential reward schemes for Voltaire-era DReps. The schemes are designed to be simple to administer, with the potential for automation. Determination of an appropriate DRep scheme is open for community consultation and further deliberation.

The age of Voltaire brings on-chain decision making to Cardano. Ada holders will have the ability to submit and vote on governance actions on-chain. Voting on governance actions will use a proxy voting scheme. This means that an ada holder has the option of either registering to become a delegated representative (DRep) or of delegating their voting power to one of the existing DReps.

One of the debates that has emerged through community consultation has been whether DReps should be compensated or not. There are obvious arguments that can be made for either direction. Voters usually are not getting paid to express their opinion in nationwide governmental or municipal elections. On the other hand, most representatives do get paid or at least receive some compensation for the job they do. A typical example is members of Parliament or Congress but apart from that, committee members may also receive an additional compensation to their salary, in smaller governing bodies, such as a university board or other similarly sized organizations.

Our view is that it is beneficial for Cardano to allow the option of monetary compensation for the DReps. A lack of monetary compensation (or any other form of compensation) would convey a lack of appreciation for the effort taken by the DReps to participate. In particular, it is expected that (benign) DReps will be making an effort to keep themselves informed on every governance action for which they will eventually have to cast their own ballot. At the same time, DReps are also expected to openly advertise their opinion and what they plan to vote, by providing arguments in favor of their ballot in social media, and any other means of discussion with other stakeholders. Hence, we view them as entities who will be engaging with the Cardano community and who can help stakeholders in shaping an opinion on

various aspects of governance. We therefore view rewards as a sign of appreciation and as an additional motivation (certainly not as the main motivation) to engage with Cardano.

Before presenting the reward mechanisms themselves, it is important to focus on the goal and examine the practical difference compared to having no rewards. In either case, we can reasonably expect large stakeholders to actively participate, given their vested interest. In addition, the reward mechanism is not a safeguard against attacks, as there can be no automated way of measuring the success of a proposal (or action of a DRep), without input from the voters. Some accountability could be enforced (e.g. by requiring a pledge from the DReps or voters that is locked for some time), but this is also not our objective. What we aim to do is provide an incentive structure for DReps with lower stake, but significant expertise that would otherwise abstain from actively participating in Cardano governance.

Stake-based reward schemes

Our proposal is to provide rewards based on the stake that is delegated to each DRep, measured as a percentage of the total active voting stake. This is a quantity that can be measured periodically, say every x number of epochs, for a given x. As an example, the reward for each DRep can be calculated every month, based either on the stake delegated to them at the epoch boundary at the end of the month or on the average stake delegated to them (after measuring the delegated stake at every epoch boundary within that month). The theory underpinning this approach is that there should be a (however loose) connection between the effort spent by the DReps studying the proposal, the cost of their effort (e.g. their time investment), the *quality* of their decision and amount of *stake* delegated to them. In addition, the cost as a function of effort is expected to have a steep rise (representative of a learning curve) for any non-trivial proposal. In addition, no amount of effort would guarantee that the DRep can be certain of the 'quality' of the outcome, and no outcome is universally desired by all voters. This suggests that a medium sized group of distinct, well-informed, DReps is a robust solution.

Note: Clearly the rewards could also depend on many other parameters. It has been suggested for instance that there could be a dependence also on the number of distinct wallets that delegate to a certain DRep (so that we provide additional rewards to DReps who collect delegations from more wallets). We feel however that this could lead to some Sybil-related attacks. We would support to launch first a simple scheme, dependent only on delegated stake and observe its performance in the first months of Voltaire, obviously with the choice of making corrective actions afterwards.

Proportional reward sharing. Perhaps the most natural reward scheme here is to allocate payments in proportion to the percentage of stake delegated to each DRep, out of the total stake that has been delegated. For example, if a DRep managed to attract (including her own stake) a total of 10% of the total stake that has been delegated to all DReps, then they should receive 10% of the budget that is available for the DRep rewards. Despite its intuitive appeal, we do not consider this to be a desirable scheme at least in the current phase of Voltaire. In a companion research paper that is currently in preparation and will be available in the Spring of 2024, we will include a game-theoretic analysis revealing that such schemes do not provide incentives to the DReps to make sufficient effort to understand the proposals and attract delegation. We instead propose below some variations of different schemes that induce more competition for DReps to engage with the community members and try to attract more delegations.

The variations we propose provide much higher rewards to those who were able to have “enough” stake delegated to them for the period under consideration. The main takeaway is that additional competition between DReps is needed (compared to proportional rewards).

Variant #1a: The top-m rule

(Equal Rewards for the top DReps by Stake)

Parameters: m, r

Suppose we take a snapshot of the stake that is delegated to each DRep at a specific epoch boundary. This rule ranks the DReps in terms of total stake delegated to them (including their own), and only the first m DReps in this ranking will receive a reward equal to r. The remaining DReps will not receive a payment.

Example: Suppose m = 100 and r = 500 ADA. Suppose also that there are 250 DReps. Then when we take the measurement of delegated stake, we will give a reward of 500 ADA to the first 100 DReps, when ranked by their total delegated stake (i.e., their voting power). The remaining 150 DReps will not receive any payment.
Total expenditure: If we provide a monthly payment with the above parameters, m=100, r=500 ADA, then the annual budget would need to be equal to 600K ADA.

Note: if we know in advance an available budget B that is to be allocated to pay the DReps in every measurement of their delegated stake, then the parameter r will simply be equal to B/m.

The rationale of this rule is that it provides motivation and competition for the DReps to attract more delegation in order to be included in the top m DReps in terms of delegated stake. While it is simple, there are some shortcomings. Notably, towards the end of the first m DReps the fraction of stake might be quite low, and there are no incentives to increase this. Plus, the disparity in voting power between the DReps is generally undesirable.

Variant #1b: The top-m threshold-based rule

(Equal Rewards for the top DReps by Stake above a minimum threshold)

Parameters: m, r

Again, as before, suppose we take a snapshot of the stake delegated to each DRep at a specific epoch boundary. This rule ranks the DReps in terms of total stake delegated to them (including their own), and now only the DReps who attracted delegated stake that is at least 1/m as a percentage of the total delegated stake will receive a reward.

Example: Suppose m=100 and r = 500 ADA. Suppose again that there are 250 DReps. With this rule, only the DReps who managed to attract 1% of the total delegated stake (because 1/m=0.01) will receive a payment of 500 ADA. There can be at most 100 DReps who will get a payment. The remaining DReps will not receive any payment. The difference with before is that under Variant #1a, we know that exactly 100 DReps will receive a reward, whereas now we only know that up to 100 DReps will receive a reward.

This variant is more stringent on what the DRep is required to do in order to receive a payment. Under Variant #1a, it was sufficient for a DRep to rank among the top m DReps. Under Variant #1b, it is necessary not only to rank among the tom m DReps, but also to attract a minimum of 1/m percentage of the total delegated stake. As a result it may sometimes pay fewer DReps, but it can induce even more competition and engagement compared to Variant #1a, as the DReps will need to attract more delegations to ensure they surpass the threshold and qualify for a payment.

Variant #2a: The top-m proportional rule

(Proportional Rewards for the top DReps by Stake)

Parameters: m, budget B

In the previous 2 schemes, the DReps who are eligible to receive a reward receive the same amount of ADA. This can be seen as a drawback especially when there is a big discrepancy in the voting power of the first m DReps. An alternative view is that once we decide who are the DReps that will receive a reward, we can then pick a proportional scheme to split the rewards to them. This can be described as follows

- As in the previous variants, we again rank the DReps according to the stake delegated to them.
- We then select the top m DReps (as in Variant #1a)
- Once we determine the set of eligible DReps, we have them split the budget B, in proportion to the stake delegated to them.

Example: Suppose we have 50 DReps, and m=3 (for the sake of simplicity in the example we picked a small m here). Suppose we measure the following delegated stake, ranked in decreasing order.

DRep	1	2	3	…	50
Delegated stake	4· 10^6	2·10^6	10^6	…	< 10^6

If we select the top 3 DReps to receive a reward, then they will split the budget as follows: among them, the total delegated stake is 7·10^6. Hence DRep 1 will receive a reward equal to $[4/(4+2+1)]\cdot B = (4/7)\cdot B$. In a similar fashion, DRep 2 will receive $[2/(4+2+1)]\cdot B = (2/7)\cdot B$. Finally DRep 3 will receive a reward of $(1/7)\cdot B$.

Variant #2b: The top-m threshold-based proportional rule

(Proportional Rewards for the top DReps by Stake above a minimum threshold)

Parameters: m, budget B

We can also have a variant that is analogous to Variant #1a, but with a proportional share. This is similar to #2a, but differs on how we pick the DReps who will be rewarded. It can be described as follows

- We again rank the DReps according to the stake delegated to them.
- We then select the DReps who received delegated stake at least 1/m as a percentage of the total delegated stake (as in Variant #1b).
- Once we determine the set of eligible DReps, we have them split the budget B, in proportion to the stake delegated to them.

Note: If we decide to use proportional sharing among the top m DReps, whether it is Variant #2a or #2b, we also need to be careful about the following scenario: suppose that we select the top m DReps, and the first one has received a significantly higher delegated stake, compared to what the remaining m-1 have received. Then under proportional sharing, the top DRep will receive most of the budget and the other m-1 will receive a reward close to 0. To avoid such a split, we may impose a cap on the reward so that the final payment to each of the m DReps would be equal to: min{cap, proportional share}.

Variant #3: Proportional with bonus for top-m

(Proportional Rewards for the top DReps by Stake, with a bonus)

Parameters: m, budget B1, budget B2 (expenditure = B1+B2)

While all the previous approaches are theoretically robust, they may not offer the best experience for DReps who are working hard to climb through the ranks. In particular, under the presented schemes, it is always up to m DReps that get a reward, while the next ones do not, no matter how close they are to make it in the top m. This can be discouraging: competition is necessary, but positive reinforcement is also needed to help DReps commit to their difficult journey. For this reason, we also consider a rewards scheme that tries to compensate (even by a small amount) all DReps, but also incentivizes effort to collect more delegations.

The final variant is simply a combination of a proportional reward scheme together with a bonus for the top m DReps. The rationale is to provide a small reward to all DReps for their effort, but to still keep a live competition for DReps to attract more stake. This scheme works as follows

- First, all the DReps receive a reward from the budget B1, equal to their proportional share, in terms of stake delegated to them.
- Then, we rank the DReps according to the delegated stake.

- The top m DReps in the ranking receive an extra reward from the budget B2. This reward can be given by using either one of Variants #1a, #1b, #2a, #2b, presented earlier.

Example: Suppose we have 100 DReps and we choose m=10. Suppose also that we have a budget of 50K to be allocated in the next measurement of delegated stake. Let us split this into B1 = 20K ADA and B2 = 30K ADA. Then if s_i is the stake delegated to DRep i for i=1,...,100, each such DRep receives a reward equal to $(s\_i/\Sigma\ s\_j)\cdot B1$, i.e. her proportional share from B1. Then, the top 10 DReps, will also receive an additional reward from B2. In particular, if we use Variant #1a, to distribute the bonus reward, each of the top 10 DReps will receive an extra reward of B2/10 = 3000 ADA.

Implementation

For simplicity, CIP-1694 deliberately does not discuss any rewards scheme for DReps.

In the first instance, each of these schemes can be implemented by the community using simple treasury withdrawals that are ratified by the DReps and constitutional committee.

In this case, it is recommended that rewards are calculated periodically (for example, every 6 epochs or 30 days, based either on the delegated stake at the epoch boundary on day 30 or on the average delegated stake measured at the boundaries of all 6 epochs), and treasury withdrawal actions submitted to reward the eligible DReps. To simplify the transactions and reduce errors, a limited number of DReps should be rewarded in each transaction.

Once the rewards mechanism has been tested and confirmed to be effective, a CIP can be defined, and work on this can be included in the Cardano development roadmap. The mechanism can automatically calculate and disburse the rewards every epoch in a way that is analogous to the stake rewards mechanism. None of the schemes described here is expected to cause major implementation issues.

Conclusions

This document provides a series of simple, easy to implement schemes for rewarding DReps in the Voltaire era. Viewing these through the lens of engaging experts in Cardano governance, we believe these reward schemes induce sufficient competition among DReps to attract delegated stake and hence engage with the Cardano community. All these schemes are also defined in a parametrized way, and hence can be tuned, dependent on availability of funds.

Appendix: Frequently Asked Questions

	Question	Answer
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2.		
3.		
4.		