

Informal specifications for DGO main service

1. Background

The exponential growth of the Blockchain, cryptocurrencies and Open Source projects – all developed and supported by communities of specialists and enthusiasts of technologies – is evident virtually in every domain of our lives. The increasingly important role that de-centrally governed technologies play in information, financial and communication technologies call for examination of the various types of decentralized governance mechanisms and architectures embedded in the organization and platforms that carry out their development, operation and use.

To understand the benefits of decentralized organization, governance mechanisms and architectures are effective when they integrate the incentives of individuals and groups with information in their environment to achieve and to fulfil their goals. In projects carried out by online communities, as in the case of Blockchain technologies and applications and cryptocurrency projects, online platforms that dictate cumulative decision making processes and utilize crowd wisdom (in the sense of combining the knowledge and the skills of individual participants) are necessary for the successful of the goals of community members and users of the technology.

Therefore, an effective centralized platform has to integrate the incentives of the individual participants that partake in its decision making, voting and operational processes that result from its decentralized architecture and from bringing the whole community of participants together online. Additionally, such a platform that facilitates decentralized governance should provide a proper place and position for representation of any information and knowledge that any participants suggest that should be considered in decision making processes. Further, such a platform and architecture should prevent situations of silencing the minority or even the majority and, on the other hand, they should provide a governance mechanism that eliminates trolling and "shouting over" loudly of individuals to overcome the opinions and suggestions of other participants.

The advantages of a fully centralized governance organization suggest that leaders of the community (appointed by it or securing their position as leaders) may have faster decision-making processes, but may prefer their own interests

over those of the other participants and even dictate the decisions by "the power of few".

The decentralized governance enables participants to collectively control the decisions of the community, to represent their opinions, knowledge and the relevant information that concerns the decisions to be made. However, decisions may be accepted due to the emotions evoked in the less-knowledgeable public that may consist the majority of decision makers. In such a situation, long term considerations may not be represented in the discussion or may not be considered by the less-knowledgeable majority (see for example the case of the UK public poll leading to the Brexit and resulting in long-term political and economic consequences for the UK). Further, as history teaches us, the majority of voters are not immune to manipulations that are based on media and decision-making biases towards irrational decisions and hence the decentralized mode of governance may be highly affected by a small group of individuals, if they have the knowledge and skills to stir the discussion towards their interests.

Any proposed models and architectures should then consider the following aspects:

- Avoiding potential dictatorship of the few in decision making processes
- Enabling everyone a chance to bring his opinion to the discussion or any information relevant to the decision making process
- Representing the vote of all participants as equal members of the community
- A mechanism for dealing with "trolls" affecting the discussion with irrelevant or intentionally wrong information or with irrelevant information
- Providing a fair chance for each participant to represent his opinion and vote
- A fully secure voting mechanism providing a fully transparent voting process that can be authenticated by any participant or by external parties

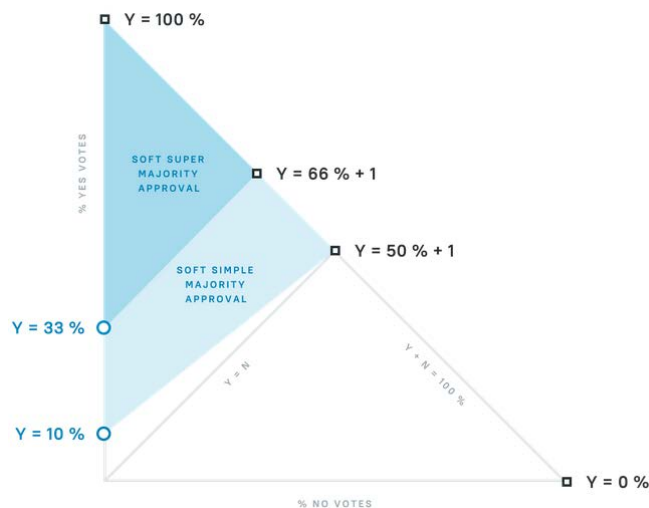
2. Voting mechanisms

This section brings different architectures of decentralized governance that are based on smart contracts on the Blockchain to manage the voting mechanism of the community participants.

The key for participation in voting through the architectures presented in this section is that all participants (or those who are interested to vote) will provide their wallet addresses on the chain for the provision of voting rights (i.e. "voting tokens"). The voting remains anonymous, as the participants are not personally identified with the address of their wallets.

2.1. Soft Majority Voting (SMV) on the Blockchain

Soft majority voting (SMV) is a transparent voting process with due announcement and timing before deadline. Members that do not participate in the vote (due to lack of opinion in the matter or reluctance to participate in voting for it) are assumed neutral and are not included in the voting resolution. Thereby, SMV does not force community members to vote, but rather facilitates their participation and votes in decisions that are of significance to them. The measure for passing a decision is the difference between % "Yes" minus % of "No". For example, if even a small group of voters (for example 10% of them) voted "Yes" and no voters oppose with "No" votes, then the decision is supported (as neutral and non-participants are not considered) and the decision is settled as "Yes". If all members voted, then a simple majority rule applies—and the voting option that received 50% of the votes+1 vote wins and is made the majority's decision. When we connect those two dots on a graph with % of Yes and % of No axes we get a "soft" simple majority threshold line.



The organizers of the voting will open as many wallets as the number of options to be selected by the participants of the vote. For example, for the vote "should the U.K. leave the E.U.?" – a "yes" wallet and a "no" wallet would be opened. The organizers then will mint voting tokens that amount to the number of community members that qualify to participate in the voting and the voting tokens will be distributed to the wallets of the participants.

Each participant will be able to vote for one of the options by transferring his voting token to the wallet of the desired option. On a pre-determined date and time, the smart contract will freeze the tokens in the wallets of participants (so no further voting is allowed on this matter beyond the date and time) and also in the wallets of the voting options. Finally, the amounts of voting tokens will be compared between the wallets of the voting options and the winning vote will be determined.

After concluding which option is the winner, the option wallets will remain in a frozen state, but they can be viewed to provide full transparency when inspection of the votes and the results is needed.

2.2. Jury Voting: Qualified majority voting (QMV) with equal voting power on the Blockchain

Jury voting (QMV) is based on appointment of members from the community that will be appointed for particular matters, for a defined period or for both as 'Senators' (i.e. appointed jury members) that vote on the issues that they are qualified to decide about them in a majority vote among them. In this respect, the Senators chosen by the community members are expected to reflect in their voting (and in the consequent results) the preferences and the interests of the member who chose them.

The process works on the Blockchain as follows:

- Voting tokens will be minted in the amount of the number of members who can participate in choosing Senators to represent them.
- Senator voting tokens will be distributed to the wallets of the members (one Senator voting token per member).
- Candidates for appointment as Senators will be presented to the community. For each candidate a voting wallet will be opened and the addresses will be published to the community members.
- Before a defined date and time members will vote by transferring their Senator voting token to the wallet of their preferred candidate.

- On the appointed date and time all the Senator voting tokens will be frozen in the wallets of the community members and in the candidate wallets.
- The X candidates that received most of the Senator voting tokens in their wallets, in a descending order, will be appointed as Senators.

After all the Senators are appointed, their wallet addresses will be recognized as Senator wallets.

Before each voting of Senators, a special voting token will be minted in the amount of the Senators (X). Since this mode is an equal power vote (each Senator has one vote like the others), a single voting token will be delivered to the wallet of each Senator. Then, option wallets will be opened until a pre-determined date and time and the Senators will receive their addresses for the voting (for example, the address of the "yes" wallet and the address of the "no" wallet). Each Senator will transfer the voting token to the option wallet of his choice. Once the date and time for voting is past, a smart contract will freeze the voting tokens in the wallets of the Senators and in the option wallets and the winning option put to vote will be determined by the maximal voting tokens that it received from the Senators.

2.3. Jury Voting: Qualified majority voting (QMV) with relative voting power on the Blockchain

Jury voting (QMV) with relative voting power is based on appointment of members from the community that will be appointed for particular matters, for a defined period or for both as 'Senators' (i.e. appointed jury members) that vote on the issues that they are qualified to decide about them in a majority vote among them. However, in QMV with relative power each Senator receives a different voting power according to the relative share of members that chose him as a Senator.

The power (P) of each Senator will be determined by subtracting the number of the votes that he received as a candidate for a Senator from the total number of votes that candidates appointed as Senators (the votes for candidates that were not appointed as Senators are not included).

For each vote, a fixed number of voting tokens will be minted (for example, 1000 voting tokens). Senators will receive the relative share of voting tokens according to their relative power (in this example, each Senator will receive $1000 \times P$ voting tokens of the total of 1000 tokens). Then, each Senator will distribute his voting tokens to the option wallets of the vote. In this respect, the Senators chosen by the

community members are expected to reflect in their voting (and in the consequent results) the preferences and the interests of the relative share of members among all members in the community who chose them and the relative size of the sub-group of members that chose them as their representatives.

However, there are two possible options for the distribution of voting tokens:

Option A:

Senators will be able to vote for only one option by distributing all their voting tokens only to one option wallet. For example, if the vote is on the color of the website and the options are 'green', 'yellow' and 'red' – a Senator can choose for example only option 'red' and back it with all his $1000 \times P$ voting tokens, or choose not to back any option.

Option B:

Senators will be able to vote for several voting options and distribute their voting tokens among them as they wish (or not to back any option). For example, if the vote is on the color of the website and the options are 'green', 'yellow' and 'red' – a Senator can choose for example to back option 'yellow' with $(0.3 \times P \times 1000)$ voting tokens and the remaining $(0.7 \times 1000 \times P)$ voting tokens to dedicate to backing option 'red'. Finally, the smart contract will freeze on the pre-determined date and time the voting tokens in the wallets of the Senators and in the option wallets. The voting option with the maximal voting tokens in its wallet is the winner.

The process works on the Blockchain as follows:

- 1) Voting tokens will be minted in the amount of the number of members who can participate in choosing Senators to represent them.
- 2) Senator voting tokens will be distributed to the wallets of the members (one Senator voting token per member).
- 3) Candidates for appointment as Senators will be presented to the community. For each candidate a voting wallet will be opened and the addresses will be published to the community members.
- 4) Before a defined date and time members will vote by transferring their Senator voting token to the wallet of their preferred candidate.
- 5) On the appointed date and time all the Senator voting tokens will be frozen in the wallets of the community members and in the candidate wallets.
- 6) The X candidates that received most of the Senator voting tokens in their wallets, in a descending order, will be appointed as Senators.

After all the Senators are appointed, their wallet addresses will be recognized as Senator wallets.

Before each voting of Senators, a special voting token will be minted in a fixed amount. Each Senator will receive the share of voting tokens that is equivalent to the share of the votes that selected him from the total votes that all the selected Senators received. The voting tokens will be delivered to the wallet of each Senator. Then, option wallets will be opened until a pre-determined date and time and the Senators will receive their addresses for the voting (for example, the address of the "yes" wallet and the address of the "no" wallet). Each Senator will transfer either all the voting tokens that he owns to a single option wallet of his choice (Option A) or distribute them between several option wallets of his choice (Option B). Once the date and time for voting is past, a smart contract will freeze the voting tokens in the wallets of the Senators and in the option wallets and the winning option put to vote will be determined by the maximal voting tokens that it received from the Senators.

2.4. Setting an agenda for voting

The community can decide that every member or a group of members can initiate via the platform voting decisions, set the voting wallets and mint voting tokens that will be automatically distributed to the community. This setting provides to the community members full involvement in its operations and the liberty to raise issues and decisions for votes. By applying this possibility of the "liberty to initiate a voting process", members of the community will be free to engage in discussions that are of interest to them and even decide to vote only for issues that attract their attention.

Nonetheless, another possibility is that within a short period the members of the community can be "flooded" with voting requests and lose interest in engaging in discussions, voting and influencing important decisions. In order to rate the issues that are put into voting according to the interest of the community members to engage in discussing them and to vote for them, we can propose a "prioritization voting". This process will define the agenda for a periodic voting cycle and which will bring only the most important matters for the community to voting. Members of the community will receive X "priority tokens" and a list of issues for an upcoming vote. Every potential voting application will have a wallet that will be indicated next to the description of the voting application. The number Y of voting applications in the upcoming round ($Y < \text{Total number of potential voting applications}$) will be indicated too. Members can distribute the priority tokens between applications that are interesting them as they wish, even dedicate all the tokens to a single application or not engage in prioritization of

them. On a particular date and time, the wallets and the priority tokens will be frozen by the smart contract and the Y applications that received to their wallets the largest amounts of priority tokens in a descending order will be brought to voting. The other applications can be brought as potential applications in the next voting round or be dismissed.

The platform will grant also an opportunity to discuss proposals in designated forums (according to the subject of the vote applications or the sub-governance domain that they relate to), allow the submission of applications online and vote or by the members of the community (in the SMV mode of voting) or by the jury for applications. It will include a messaging board under which applications for voting will be submitted for review of the community members or the jury, discussions will be developed regarding any aspects of future votes and finally the prioritization of potential applications for votes will be conducted by the community members. By providing this platform for discussion, feedback from the community can be provided regarding any application that is put for voting, by expressing opinions and bringing relevant information to the attention of other community members or to the jury's appointed Senators.

2.5. High level description of the system

The system is based on generation of voting applications by both community members and/or Senators (i.e. appointed members of the jury). Applications are then put to discussion via an online forum. Prior to voting dates on applications, the number of the applications that are put to vote is determined and then a prioritization process is operated as follows to determine which applications will be included in the voting agenda (i.e. applications that are important enough for the community members) – See Figure 1:

- A smart contract will generate "priority tokens" for the prioritization of applications.
- The smart contract will distribute equal number of priority tokens to each member of the community.
- Each voting application will have a wallet.
- Members will transfer priority tokens to wallets of voting applications that they prioritize.
- On a particular date and time, the smart contract freezes the wallets and the priority tokens for transfer (the end of the prioritization vote).
- The wallets of the voting application with the largest amounts of priority tokens in a descending order will be brought to voting.

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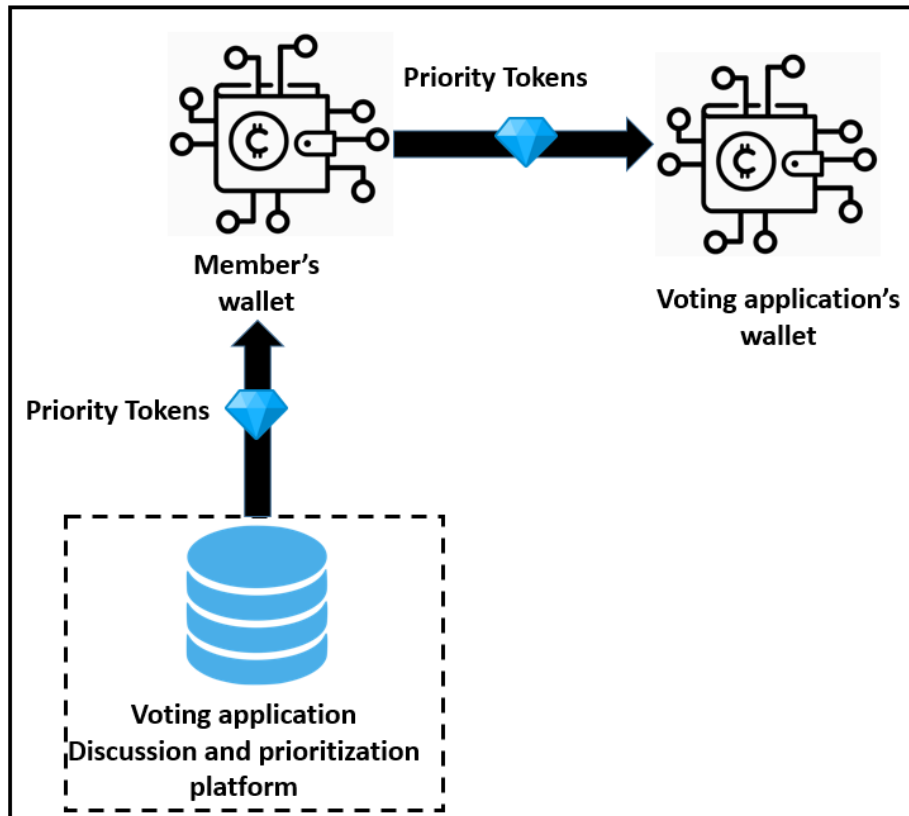


Figure 1: The process of prioritizing voting applications by using a smart contract with priority tokens.

SMV will include all the community members, though they will not be enforced to vote for any of the options put in the voting application. The process of SMV will go as follows:

- Wallets as the number of options will be open on the Blockchain.
- A smart contract will generate amount of voting tokens that is equal to the number of community members.
- The smart contract will distribute the voting tokens to the wallets of the community members (one voting token per member).
- Each participant can vote for one of the options by transferring his voting token to the wallet of the desired option.
- At the vote end date and time, the smart contract will freeze the tokens in the wallets of participants (so no further voting is allowed).
- The winning option will be determined by the maximal voting tokens in its wallet.

Jury voting will be conducted as follows – See Figure 2:

- A smart contract for selecting jury members ('Senators') will generate voting tokens in amount equal to the number of community members.
- The smart contract will distribute Senator voting tokens to the wallets of the community members (one Senator voting token per member).
- Candidates for appointment as Senators will be presented to the community and the smart contract will open a voting wallet for each one of them to receive Senator voting tokens from members who choose them. The wallet addresses will be published to the community members for voting.
- Members will vote by transferring their Senator voting token to the wallet of their preferred candidate for the jury.
- On the appointed date and time, the smart contract will freeze all the Senator voting tokens in the wallets of the community members and in the candidate wallets (end of vote).
- The X candidates that received most of the Senator voting tokens in their wallets, in a descending order, will be appointed as Senators (jury members).

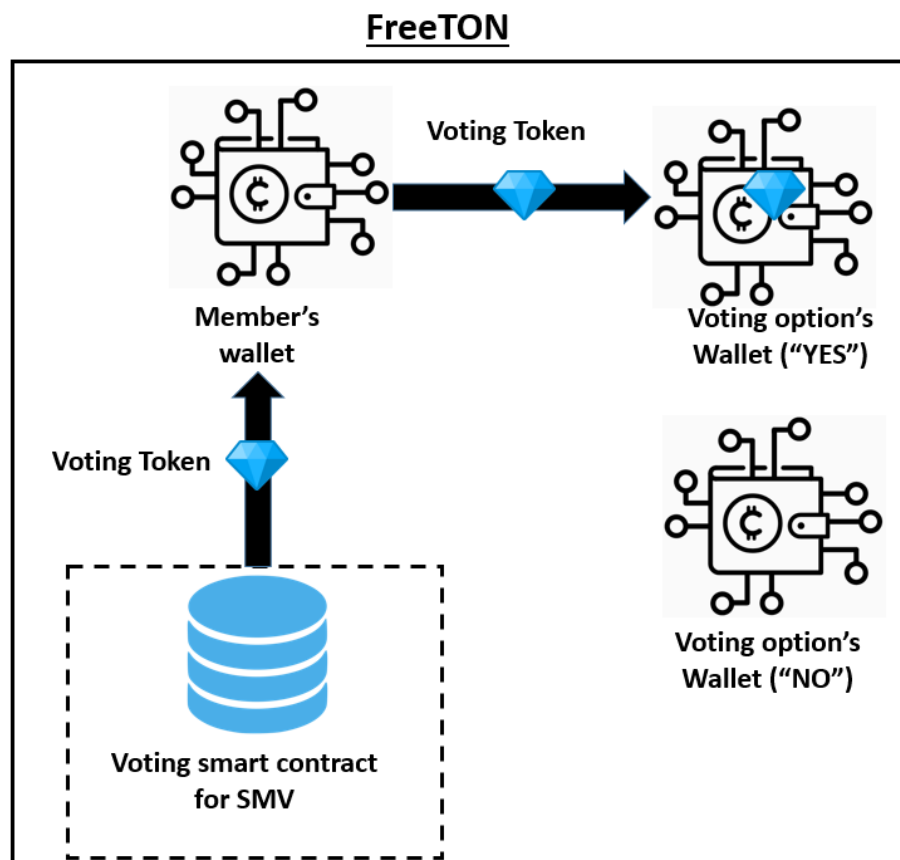


Figure 2: The process of SMV by community members.

When there is a jury voting, the following process will take a place – See Figure 3:

- A smart contract will generate a special voting token will be minted in the amount of the Senators.
- Each Senator will receive by the smart contract a single voting token to his wallet.
- A smart contract will open option wallets for the options included in the voting.
- Senators will receive their addresses for option wallets and transfer their voting token to the option wallet of their choice.
- On the date and time that the vote ends, a smart contract will freeze the voting tokens in the wallets of the Senators and in the option wallets.
- The winning option has the maximal voting tokens of Senators in its wallet.

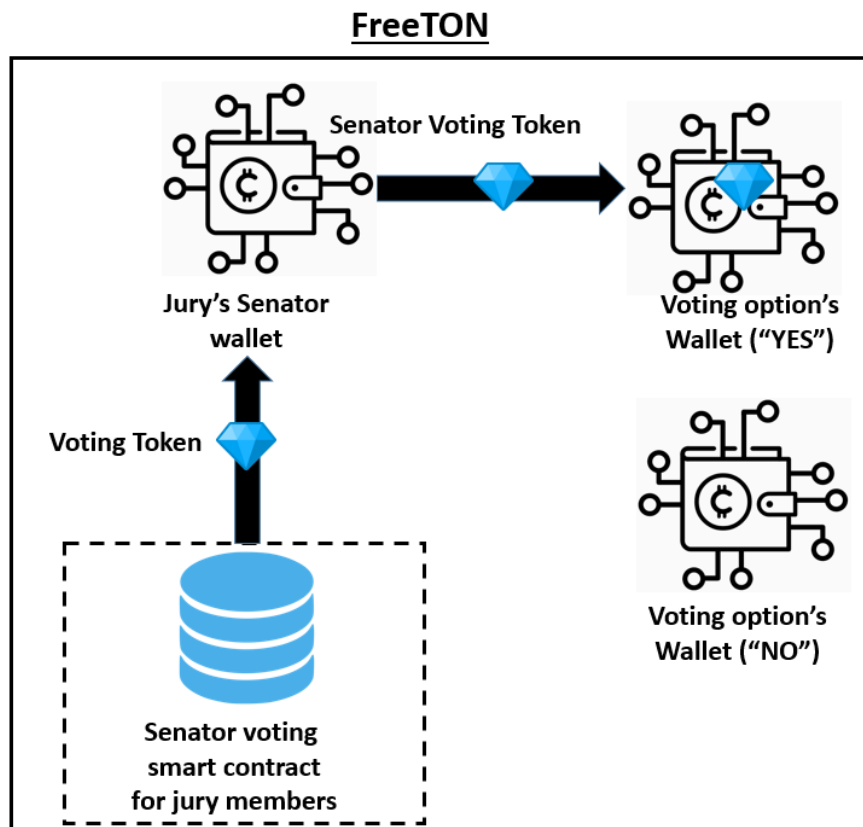


Figure 3: The process of jury member (Senator) voting.