Space Decentral Governance: The Social and Economic Fabric of Decentralized Space Funding

1. Introduction

In this paper we present the governance model of Space Decentral, a Decentralized Autonomous Organization (DAO) whose business logic utilizes the blockchain to reinvigorate the push for space exploration with the public in control. Space Decentral will design space missions collaboratively, share research for peer review, crowdsource citizen science efforts, and crowdfund projects that lack national budgets (or would be more appropriately funded by private efforts). For more details on Space Decentral, including the first funding proposal to establish foundational elements of the network, refer to the White Paper.

Space Decentral's governance procedures and norms will always evolve, especially as the network grows and the membership base increases. What we are presenting is an initial template — including a set of basic principles and guidelines — to provide some structure in the growth phases. This is a living document, that is currently open for peer review.

This Governance Paper is broken down into the following sections:

- **Section 2: Principles.** The principles and guidelines by which we put our mission into practice.
- **Section 3: Tokens.** Space Decentral is a multi-token ecosystem that includes a Faster Than Light (FTL) token and the Space Decentral Network (SDN) token.
- **Section 4: Stakeholders**. Stakeholders, their value propositions, and different conditions that need to be met to receive governance privileges.
- **Section 5: Voting Privileges**. Voting privileges per stakeholder, based on proposal type.
- **Section 6: Project Development**: The competitive process in which an idea turns into a fully funded solution for development.
- **Section 7: Open Source Development**: The collaborative process for open source development. Open source projects can include software, hardware, project plans, biological innovations, basic science, as well as contributions to the knowledge base.
- **Section 8: Network Fund**: Potential revenue sources and how the budget is distributed to network accounts.

2. Principles

Space Decentral is a social purpose organization that has foundational layers organized according to the principles of the international cooperative movement. We found it necessary to create Space Decentral, as a new entity, where regardless of organizational affiliation, individuals can participate and have a voice in decision-making as soon as the basic Membership requirements have been met.

The cooperative principles below are guidelines by which we put our mission into practice.

- **Open Membership**: Space Decentral is an organization open to all participants able and willing to accept the responsibilities of membership. We believe an inclusive team of members with long-term collective interests is a key factor for the success of the organization.
- **Member Control**: Space Decentral is an organization controlled by its members, who actively participate in setting their policies and making decisions. Members will have a voting weight that is determined based on average weekly contribution to open source projects[1]. Individuals serving as elected committee members are accountable to the membership.
- **Member Economic Participation**: Members collectively control the capital of Space Decentral. Members allocate funds for any or all of the following purposes: developing the agency, rewarding members in proportion to their open source contributions with the space agency, and supporting other activities approved by the membership.
- **Autonomy and Independence**: Space Decentral is an autonomous organization controlled by its members. When we enter into agreements with other organizations, including governments, or raise capital from external sources, we do so on terms that ensure democratic control by our members and maintain our autonomy. We are committed to ensuring that our members always retain such control over Space Decentral.
- **Education, Training and Information**: Space Decentral provides education and training for Members so they can contribute effectively to the agency. This allows Members to become multi-skilled, enabling full participation in both the coordination and development of the agency. We inform the general public about the nature and benefits of decentralization.
- **Cooperation among DAOs and cooperative organizations**: Space Decentral serves its Members most effectively and strengthens the DAO and cooperative movements by working with other DAOs and cooperatives through global and universal structures.
- **Care for Community and Environment**: Space Decentral works for the sustainable development of the global community through policies approved by their members, and internalizes environmental impacts in all decisions and plans.

3. Tokens

In traditional open source or volunteer-driven projects, there is not always a well-defined path laid out for integrating volunteers and their contributions into organizational planning and decision making. With the advent of decentralized organizations, we can now experiment with new ways of automating privileges that ties those privileges directly to actual contributions. Space Decentral has decided to adopt this approach to automating privileges for the Membership class of the network. And while we will support some projects that are not open source, for those projects that are open source, volunteers will be rewarded automatically for their contributions with enhanced privileges.

To enable this decentralized operation, the Space Decentral Network includes two tokens: the Faster Than Light (**FTL**) token and the Space Decentral Network (**SDN**) token. FTL is the governing token of the network, is transferable, and can be purchased at the token generation event. SDN represents the relative weight of intellectual contributions to the network, is non-transferable, and can only be gained by

[1] This is one principle that slightly deviates from one person, one vote. This voting method is one that will be more attuned to decentralized organizations, where new Members become activated in a permissionless manner.

contributing effort to strategic plans, open source projects, and the open knowledge base. To incentivize the development of open source space missions, rewards in FTL will be distributed to SDN holders in proportion to the amount of SDN they have collected.

This Governance Paper assumes a familiarity with alternative forms of social currency such as our SDN token. Alternative non-monetary currencies and awards have been in use for a long time in human history to incentivize human conduct of all kinds, including academic, athletic and acts of civic virtue and service to humanity.

3.1. Faster Than Light (FTL) token

The token generation event for Space Decentral will raise funding by selling FTL tokens. This funding will be utilized for the development of the infrastructure (and incentives) necessary to facilitate decentralized space mission planning, peer review of solutions, and tools for distributed engineering on the Space Decentral Network. Hence purchasing FTL is also the DAO's initial vote to fund the technology roadmap described in the White Paper.

The primary utility of FTL is:

- The more FTL one holds, the higher one's level of comparative influence in defining the Space Decentral program.
- Contributors collaborating on open source projects can stake FTL to become part of the Member class and receive full governance rights (assuming minimum contribution requirements are met).
- Non-members pay fees in FTL to submit proposals to be considered for the program.
- Members of the network can offer consulting services[2] that are remunerated in FTL.
- FTL is the preferred currency for facilities built by Space Decentral on Earth & beyond.

3.2. Space Decentral Network (SDN) token

To build a thriving and intelligent ecosystem for space expansion, individuals and organizations participating in the network will be gain SDN tokens, which are non-transferable tokens and used primarily used as an accounting tool to measure contribution activity per person. SDN tokens will be allocated to open source tasks using smart contracts via a Planning app being developed by Space Decentral and Giveth[3], that has been funded in a grant from Aragon.

The primary utility of SDN is:

- SDN tokens are minted by Space Decentral on an as-needed basis, and are never sold by Space Decentral: their singular purpose is to be allocated against tasks and earned by contributors.
- SDN is used as an accounting tool to determine the FTL rewards to distribute per contributor.

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[2] At this time, Space Decentral does not expect to provide scheduling, task management or payment services for Members of the network who seek to do consulting work with other Members. Such arrangements, should they be made, will be organized and executed by Members at their own election. In the future, these features can be developed assuming that Members prioritize them.

[3] Giveth is an open-source platform that builds tools for distributing resources and encouraging transparency in decentralized communities.

- For any technology developed within the network that requires a patent, SDN can be useful to determine the top inventors for filing patents. However, Space Decentral does not envisage at this point in time taking formal positions on which Members, if any, should be named on particular patents to be filed with various patent granting agencies. Such decisions will be made by the appropriate parties on a case by case basis.
- If any technology within the network is commercialized and generates revenue, such as offering spacecraft operation services or software subscription fees, SDN can be used to determine revenue share per contributor based on SDN holdings.

3.2.1. Example: Revenue Share Based on SDN holdings

Revenue will be distributed in a pro-rata fashion to whoever contributes to a particular project. For example, consider a use case where a group of people contribute to the development of a lunar rover ("LR"). When the LR is finished, customers who want to operate it will pay a fee using the FTL utility token. Thus, when Space Decentral begins receiving revenue for the rover, the DAO's pre-defined smart contracts will calculate how much particular Members contributed to LR's ideation and development. At this point, all contributing members will receive a pro-rata share of that FTL that reflects the relative amount they contributed during the ideation and development phase.

For more use cases regarding the capital flow of Space Decentral, refer to the last Network Fund section of this document.

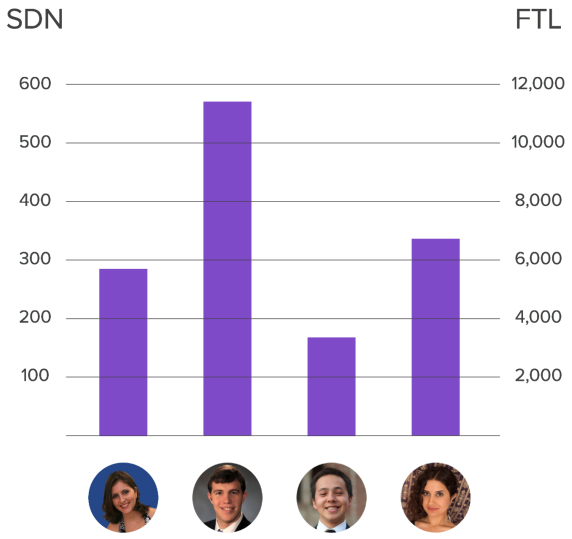

Figure 3.1. An example of how revenue in revenue in FTL will be shared with SDN holders.

4. Stakeholders

There are multiple stakeholders in the network, with differing value propositions, and different conditions that need to be met to receive governance privileges. At a high level, the Space Decentral model provides stakeholders who have contributed more financial capital and for longer periods of time with the privilege

to influence the higher-level development of the space program. Alternatively, recurring intellectual contributions which are most closely related to receiving Member voting shares will be valued for selection of the best project proposals within a specific program or the election of a Council. We believe this governance model will enable the growth of a value-aligned network.

4.1. Members

Members are active contributors to the development of Space Decentral and are the primary governing body that executes the majority of decisions. People can become members by meeting the both of the following conditions:

- Purchasing and staking a minimum of 1000 FTL
- Completing open source tasks and earning a minimum average of 10 SDN/week, over 12 weeks

One-time use voting tokens will be generated per vote, per Member. To determine the number of voting shares, all contributors are expected to utilize a task management system where each task has an associated SDN value. As contributors complete tasks, they collect SDN tokens. Members receive 10 to 40 voting tokens, the amount of which is directly related to the average SDN earned per week, over the previous 12 weeks. If a Member has earned more than an average of 40 SDN per week over this time period, only a maximum of 40 voting tokens will be allocated.

If a contributor has earned less than an average of 10 SDN per week then they are not considered an official “Member”. This protection encourages that decision making is left in the hands of the most active, regular, and committed contributors.

On a cyclical basis, Members will receive rewards in FTL in proportion to how many SDN they have collected. Members will have the unique privilege of being able to nominate and elect committees, including the Council that is responsible for providing oversight and guidance toward evaluating project proposals.

If a Member is in violation of Space Decentral’s principles and there is proof that they are harming or manipulating the network, then a Member can be voted out via arbitration and lose their 1000 FTL stake. For more details, refer to Section 5.1 (Arbitration Procedures).

4.2. Council

The Council is the highest-level and first committee that will be created for Space Decentral. The Council will be composed of a variety of experts in fields of engineering, science, decentralization, software, and the environment, amongst many other fields. The number of Council members and date in which the first Council is elected will be determined based on a Member vote, and will occur in 2019.

The long-term importance of creating and maintaining a talented Council cannot be overstated. Space Decentral realizes that the ability to become appealing to potential Council members depends upon building a strong, effective decentralized space funding ecosystem. We realize, in other words, that selection procedures of the type set out above will only be truly valuable once we succeed to grow the Space Decentral community.

The benefits of being a Space Decentral Council member are multi-faceted. On one hand, the Council can execute the highest level of influence in the selection of space missions for the Space Decentral program, hence this is associated with receiving social capital for being elected. An additional benefit is that the Council will be a full-time and paid position. This is important to encourage more honesty, and to decrease the chances of various forms of misconduct during project selection processes.

4.3. Explorers

Explorers are financial contributors that receive FTL, which provides privileges on high-level resource allocation decisions, such as "What percentage of our budget should we allocate toward the Moon vs. Mars?" or "What percentage of our budget should we allocate toward telerobotics vs. human spaceflight?". These are considered program-level votes and do not require *Membership* to participate.

To become an Explorer, one must stake and lock their FTL used for voting for a minimum of one year, or have been holding it for at least one year. This will help protect programs from being manipulated by outsiders that want to "vote and dump". Votes will be weighted based on the balance of FTL, multiplied by the length of time (in years), *t*, that they have held the tokens, with the maximum weight being 5.

$$FTL_{power} = FTL_{balance} \times t$$

Equation 1. The FTL voting power is determined based on length of time held.

Explorers will have the unique privilege of being able to influence strategic priorities for space exploration at the highest level. Pragmatically speaking, FTL tokens will be used to indicate their approval for specific programs. To illustrate what we mean by program or category, consider the following examples: Mars Exploration is a type of program, as is Asteroid Mining; if a particular group wants to send a probe to Mars, that does not qualify as a program type or category.

For instance, when Space Decentral is trying to determine whether a new program should be added to the official roster of programs, a vote is held. If program categories X and Y are under consideration simultaneously, an Explorer can determine how to allocate her votes during the voting cycle. For example, if an Explorer has 1000 FTL tokens, she may allocate 200 to category X and 800 to category Y; she may also allocate 1000 to either mission category; finally, she may allocate 0 to either mission category during that voting cycle. As mentioned previously, the votes will also be weighted based on the time the tokens have been held.

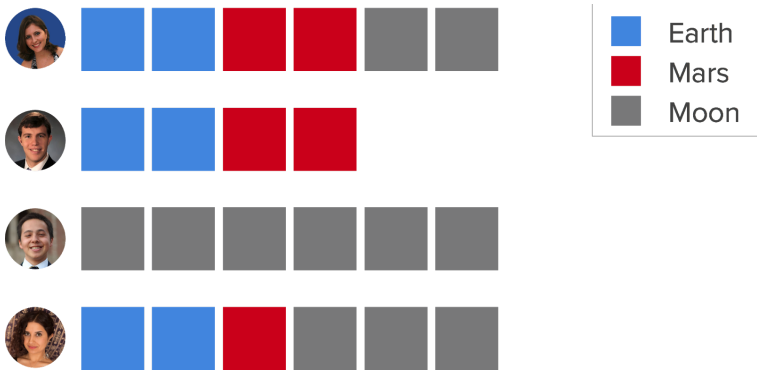

Figure 4.1. An example of how a program-level FTL vote functions. For this case, assume each square is 1000 FTL, and each voter has been holding their FTL for equal amounts of time.

4.4. Builders

Builders intellectually contribute to Space Decentral by completing open source tasks. Builders have not yet met the Membership requirements of the network, hence do not have governance privileges. Yet similar to Members, on a cyclical basis, Builders will receive rewards in FTL in proportion to how many SDN they have collected.

4.5. Project Team

Project Teams are a group of people that can include both Members or non-Members. Project Teams are formed to compete for RFP bounties and/or to win project development funding contracts. Hence the primary benefit of forming a Project Team is to receive funding for implementing projects in the Space Decentral program.

4.6. Affiliates

Affiliates support the Space Decentral mission by paying a subscription fee, which will provide them with unique network benefits. Some of those possible benefits will include:

- Receive discounts off products and services, such as the operation of a spacecraft
- Early invites to special conferences and events
- If the affiliate is a consultant, they can be placed in the top search results

5. Voting Privileges

Different voting privileges are granted to different stakeholders in the Space Decentral Network. This is by design, as we are trying to create an ecosystem that allocates greater influence to the Explorers and Members who are particularly active and engaged. Not only do we believe that engagement can be increased by granting greater influence to highly active participants, we also believe that by rewarding engagement in this fashion we will create a virtuous cycle of activity in space funding.

The network will support and uptake two types of insights: votes and signals. Votes are binding agreements that execute some code or contract such as distributing capital to a project or upgrading a system parameter. Signals are non-binding and provide FTL and SDN token holders without voting

privileges to participate in the governance by *signaling their preferences*, yet no code is executed based on the signals.

The responsible party with voting privileges will be able to review the signals from other token holders to have a pulse of the network before submitting a vote. In the table below, the responsible party for each voting proposal is indicated by the shaded cell.

Table 5.1. Voting Privilege by Proposal and Stakeholder

Proposal	Stakeholder		
	Member	**Council**	**Explorer**
Determining project ideas to develop into RFPs	✓	☐	☐
Determining % of FTL/SDN tokens to allocate to RFPs	✓	☐	☐
Updating network parameters[4]	✓	☐	☐
Updating budget allocations of the Network Fund	✓	☐	☐
Nominate and elect Committee members[5]	✓	☐	☐
Arbitration related to Committees, Builders, Affiliates	✓	☐	☐
Sensitive, high-level infrastructure decisions[6]	✓	☐	☐
Determining best solutions to become validated for funding[7]	☐	✓	☐
Arbitration related to Members	☐	✓	☐
Determining the higher-level space program	☐	☐	✓

5.1. Arbitration Procedures

Whenever there is a dispute within the network, it will be addressed as a standard voting proposal via an arbitration process.

For example, one dispute can be that someone has evidence that a Member of the network is assuming multiple identities to manipulate the voting process. An arbitration proposal can be created to determine if

[4] Once example is the percentage of yes votes required to pass a proposal.
[5] One example of a committee is the Council.
[6] One example is upgrading the FTL token to FTL blockchain.
[7] Solutions that are scientifically and technically sound.

the proof is valid and whether Membership would need to be revoked, in which case they end up losing their minimum Membership stake.

Depending upon the party that files the dispute (Affiliate, Builders, Members, Committee), the arbitration proposal will be routed to different stakeholders within the ecosystem for ultimate decision-making power.

Aragon, an organization that is developing a DAO governance platform will eventually include decentralized arbitration services[8], which can also be utilized in extreme cases where outside arbitration is necessary.

5.2. Committees

A Committee is a group of Members or third-party candidates that come together to pursue a set of shared objectives. For example, a Committee could be formed to determine whether materials science is an investment category that should receive special attention from Space Decentral on an ongoing basis.

At Space Decentral committees are formed and dissolved on an as-needed basis, which distinguishes our committees from the type one may be familiar with in the context of traditional corporate governance or state and federal government. In many companies and most state and federal governments, there are standing committees that persist over long periods of time. This is true even when the committee in question is ineffective or no longer necessary.

Committee creation and dissolution will be handled via a Member voting process. Only Members or candidates vetted by Members will be eligible to be nominated for a committee seat. It is possible for one person to belong to multiple Committees.

Committees will have unique non-transferrable tokens, where each elected Committee Member receives a single token, providing them with an equal voting share in the Committee. A person's Committee token will expire after one of the following conditions is met:

- The term length has ended
- Arbitration occured to remove the member from the committee
- Arbitration occured to terminate their membership from the DAO
- The committee is dissolved

6. Project Development

The Project Development process manages the process by which an idea becomes a Request-for-Proposals (RFP) that seeks community solutions, which are then vetted to become projects added to the Space Decentral program. Validated solutions will have a seal of approval and become activated for both community crowdsourcing and crowdfunding.

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[8] Cuende, L., & Izquierdo, J. (2017, April 20). Aragon Whitepaper. Retrieved April 5, 2018, from https://github.com/aragon/whitepaper/blob/master/Aragon Whitepaper.pdf

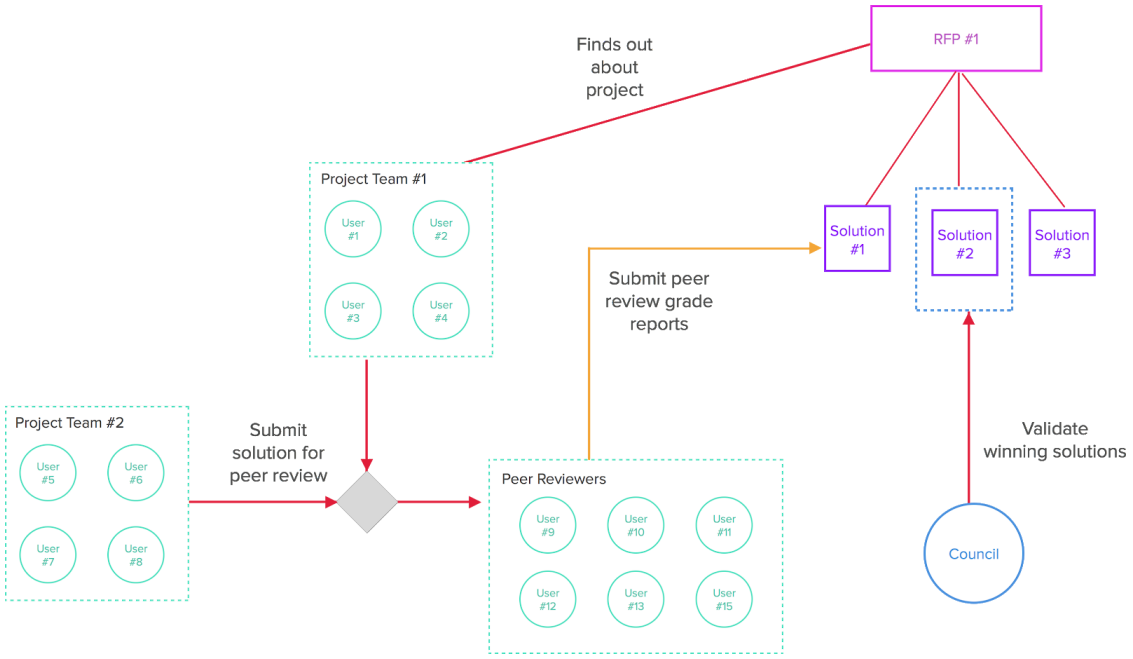

Figure 6.1. Project Development flow for Steps 4-6.

Table 6.1. Project Development: Event Sequence

#	Event	Stakeholders	Contract Calls
1	**Idea Sourcing** Community participants can propose different ideas to be considered for the Space Decentral program. These are not expected to be full solutions yet, but "ideas" that should be considered for the RFP process.	Anyone	Non-Members pay fee to submit ideas[9]
2	**Idea Vetting** Members will review the ideas and the network's signals. A Member vote will occur across the network to determine the highest-ranking ideas.	Members	
3	**RFP Definition** An RFP is written per activated program/project. Bounty amounts are allocated per RFP. This period is expected to include internal debates amongst the stakeholders. It's	Members, Council	Bounties are allocated per RFP

[9] Fee amount to be determined. This helps prevent spam and solicits more serious, quality ideas. We will set a fee in good faith, however, to ensure that the fee is not prohibitively high.

	possible for multiple ideas to become consolidated into a single RFP.		
4	**Solution Sourcing** The RFPs are announced. Community participants form Project Teams, develop detailed proposals, and submit solutions to the RFPs.	Project Teams[10]	Non-Members pay fee to submit solution
5	**Solution Peer Review** Peer review will occur for community-vetting of submitted solutions.	Members[11]	
6	**Solution Vetting** The Council will review the submitted solutions and peer review results in addition to broader community signals. Top proposals for each project will be selected.[12]	Council	Winning Project Teams and Peer Reviewers receive rewards.
7	**Fundraising** Funds are collectively raised, with appropriate fundraising strategies chosen on a case-by-case basis, to support the development, testing, and launch of the top proposals.	Anyone	Project is opened for crowdfunding.
8	**Development, Launch, Operations** Successfully funded solutions are activated for development, manufacturing, launch and operations.	Project Team	Project Team receives funding on milestone-basis to fulfill the contract

6.1. Idea Sourcing

Community members will have the ability to add new project ideas to be considered for the Space Decentral program. At the minimum, ideas should contain a name, short description, long description, and justification that helps address:

- Why this is an important idea
- Who else is working on it
- What has changed such that we can develop this idea now

[10] Council are not eligible to be members of a proposal team.
[11] Members part of Project Teams will not be eligible to peer review for the solution cycles they participate in.
[12] While the Council can provide their recommendations, the community can still fund projects from their personal funds for the projects not recommended by the Council (assuming they are viable).

6.2. Idea Vetting

Signal votes can be performed to determine the network's mission preferences. Signalers "spread" their preference across the various project ideas based on the amount of tokens they hold, utilizing range voting. The stakeholders will review the ideas and signals. RFPs for the projects are developed based on the highest-ranking ideas. The stakeholders will determine the number of projects to develop RFPs for, based on their available bandwidth and budget.

6.3. RFP Definition

An RFP is written per activated project, with bounties allocated. This period will include a lot of internal proposals and debates amongst the Council and Members to develop fully refined RFPs. It's possible for multiple ideas to become consolidated into a single RFP.

6.4. Solution Sourcing

Community participants form proposal development teams to create thorough solutions that include all of the engineering, scientific, operational, budgetary, and scheduling details necessary for external parties to evaluate the proposal for viability.

6.5. Solution Peer Review

Peer review will occur for community-vetting of submitted solutions. Peer reviewers will be matched to RFPs based on their expertise. Each solution will likely require multiple peer reviewers, to ensure each solution has a diverse set of opinions. A lottery process will be used if there are more Peer Reviewers available than Solutions that require reviewing.

Peer reviewers will be rewarded for their work by sharing the solution application fees, in addition to a percentage of the bounty. If there is consensus among the peer reviewers that a solution should be discarded, then it will not be sent to the next Solution Vetting step.

6.6. Solution Vetting

The Council will review submitted solutions alongside peer review results. The extended community can also review the solutions and signal their preferences or add further feedback. The Council will perform a vote, selecting the best solution for each RFP that will get an "Engines On" certification. Winning teams will receive 98% of the bounty, with the remaining 2% allocated to peer reviewers who participated in the cycle.

It is possible for all solutions to be rejected. If this is the case, no project team will receive a bounty, but the peer reviewers will still receive their bounties. The RFPs will become reactivated, returning to Step 4 and project teams will be able to edit their proposals and re-submit, or new teams can participate in the process.

6.7. Fundraising

For each vetted solution, there can be many possible paths for how it is funded for development. The best

fundraising strategy will be determined per solution on a case-by-case basis. For each case, a collective decision will be made about how to proceed. Some possible scenarios are:

1. Space Decentral sells FTL in the token reserves to fund the solution.
2. Space Decentral funds the solution by rewarding project teams with FTL in the token reserves.
3. Develop child DAOs and have a separate token offering. This may be good for projects that have clear monetization or token utility strategies as opposed to purely research-driven projects.
4. Individuals directly fund the solution as a donation, using FTL, ETH, or a currency of choice.
5. The Project Team incorporates a Cooperative Corporation and offers co-ownership roles to Space Decentral members.
6. The Project Team incorporates a traditional shareholder corporation and offers early investment opportunities to Space Decentral members. (We have deliberately included this option because while Space Decentral is organized as an autonomous, decentralized organization, we recognize that some solutions and projects are best organized through a more traditional corporate form. Such solutions and projects will need to recruit and retain more traditionally-minded engineers, product managers and other contributors, many of whom require the stability of a traditional corporate form for a host of reasons.)

The point is that while token based funding seems more lucrative, there may be cases where teams want to contribute a solution or technology to the Space Decentral program, yet prefer traditional funding along with the licensing and revenue possibilities that such funding structures support and promote.

This has some important implications worth highlighting. First, Space Decentral is primarily interested in ensuring that space exploration is funded at a scale appropriate to the problem. As such, our main goal is to provide meaningful guidance and stewardship to the participants and contributors who constitute and enrich our ecosystem.

Second, by providing participants and contributors with a flexible, mission-specific approach to supporting their space exploration endeavors, we will become and remain a hub to for entrepreneurs to find co-founders or seed funding for early stage, bootstrapped visions.

6.8. Development, Launch and Operations

Successfully funded solutions are activated for development, manufacturing, launch and operations. The community will continuously keep the proposal teams in check by reviewing the funding milestones and assess delivery. This will help evaluate if the winning proposal team should still receive funding.

For a Project Team to receive the funding, bylaws and organizational processes of the team needs to be documented, to establish rights and responsibilities and ensure continuity of teams as leaders come and go.

7. Open Source Development

There are many tasks that will be included in the open source roadmap. Open source tasks can include software and hardware development, knowledge bases, long-term strategic plans and decadal surveys. Additionally, it is possible that after a solution is vetted from the competitive Project Development process, that aspects of the solution can be open sourced, where the broader community, beyond the proposal team, can assist with the ultimate execution.

Table 7.1. Open Source Development: Event Sequence

#	Event	Role
1	**Task Planning** The first step is to gather requirements and write complete task descriptions that includes a user story[13], specifications, and acceptance criteria.	Coordinator
2	**Planning Poker[14]** (meeting) The project team has a meeting where each task in the sprint is evaluated, and budgeting occurs for the amount of tokens each task is worth. Planning poker, or a consensus-based technique used to estimate the allocations with a team.	Team
3	**Token Allocation** Planned token amounts are allocated as bounties using the Planning app.	Coordinator
4	**Express Interest** Contributors (which can be Builders and Members) review the bounties, and express interest in working on the task.	Contributor
5	**Task Assignments** (meeting) For the tasks with more than one person that has expressed interest, the Team reviews the candidates and decides the top candidate to be assigned the task.	Team
6	**Development** Assignees work on the tasks that are assigned to them.	Contributor
7	**Quality Assurance** Completed work is reviewed before the due date, and potentially sent back to the assignee if it needs more work. Once the deadline is reached, a final review is performed, and a quality rating is associated with the assignee and task.	Reviewer
8	**Token Distribution**	Coordinator

[13] User stories are tools used in agile planning to capture a description of a software feature from an end-user perspective. The user story typically describes the type of user, what they want and why.

[14] Planning poker, also called Scrum poker, is a consensus-based, gamified technique for estimating, mostly used to estimate effort or relative size of development goals in software development. From https://en.wikipedia.org/wiki/Planning_poker

	Based on the quality rating, the token bounty is either approved or rejected. If rejected, the task remains open and returns to step 4.	

7.1. Coordinators

To begin with, select Members will be appointed the Coordinator privilege, and will be responsible with managing a monthly allocation of tokens. The DAO will approve the larger budget for the month or quarter, then the Coordinator will be responsible for working with the project planning teams to collectively allocate tokens to tasks. There will be a two week grace period until tokens are fully released to tasks, to ensure there is enough time to mitigate bad actors. This Coordinator role is necessary, until the Aragon Planning app is live, where tokens can be allocated to tasks collectively.

7.2. Reviewers

Reviewers help review completed tasks and validate they were successfully delivered. This is most similar to a quality assurance role. When a Reviewer is not assigned, the Coordinator will perform the reviewer role. To begin with, select members will be appointed the Reviewer privilege. As a reputation system is adopted, the assignment of Reviewers will become automated.

7.3. Determining Task Value

All tasks will have SDN allocated, which is an estimated representation of the the amount of intellectual power a user contributes to Space Decentral. The goal is to model the Task Value (T) by estimating the amount of hours it would take to complete the task, then multiplying that by a Skill Level (L) multiplier and a Priority (P) multiplier.

$$T = Estimated\ Time \cdot L \cdot P$$

Equation 2. The value of a task is estimated based on the estimated time, skill level and priority.

Table 7.2. Skill Levels and their multiplier values

Skill Level (L)	Multiplier value
Beginner	1.0
Mid-Level	1.5
Experienced	2.0
Expert	3.0

Table 7.3. Priority Levels and their multiplier values

Priority (P)	Multiplier value
1	1.15
2	1.10
3	1.05
4	1.00

The assumption is that tasks that require more advanced skills will have an additional weight applied, that increase the SDN value, and each correspond with a value as shown in Table 7.2. An additional Priority (P) factor can be multiplied as a way to provide additional incentives to expedite the completion of top

priority tasks. By default, tasks will be Level 4 Priority, meaning there is no additional bonus. The values for skill level and priority multipliers are considered network parameters can be upgraded via Member governance processes, as described in Section 4.

It is optional for the task to have ETH or FTL, which will be used when the project has the budget and the tasks are in the immediate roadmap.

7.4. Quality Ratings

After a task is completed by a contributor, a Reviewer will assess the work and assign a Quality rating (Q) to the task, based upon the performance of the contributor. The possible quality ratings are in the range of 0 to 1.1 and are shown in Table 7.4. Any submission of work that is scored with a rating of 0-0.5 will be rejected and no tokens will be awarded. For ratings of 0.8 and above, the rating will also act as a multiplier on the assigned SDN value of the task, meaning the SDN earned by the contributor is directly correlated with the quality of the work contributed.

$$SDN_{earned} = SDN_{task} \times Q$$

Equation 3. The SDN earned from completing an assignment is directly correlated with the quality of the work contributed.

Table 7.4. Quality Rating Breakdown

Quality Rating (Q)	Meaning
1.1	Exceptional work
1.0	Complete Work
0.8	Needs Improvement
0.5	Task incomplete (work rejected)
0.25	Task incomplete, little effort shown (work rejected)
0	Nothing submitted (work rejected)

7.5. Reputation Score

Each user will have at least one Reputation score (Rep) associated to their account. Reputation will serve to help identify reliable contributors, which will enable the task assignment process to be more streamlined & transparent. If someone has earned a high quantity of SDN and possesses high Rep, then they can more easily be identified as a reliable contributor, although a low score should not preclude a contributor from working on a project. For example, a low score might mean that the contributor requires more thorough review before earning an assignment, or would be better suited for less critical work. Reputation is still a research topic and we plan to develop the model with the community.

8. Network Fund

The Network Fund is a smart contract for the reserves of Space Decentral, that collects revenue in ETH, FTL or any other ERC-20 token the DAO chooses to accept. The following categories are possible revenue sources:

- Multimedia & Entertainment
    - Sci-fi franchise to spread the vision of a decentralized space future
- Space Commodities
    - Helium-3 from the Moon, platinum or water from asteroids
- Space Operations
    - Space telescope, earth observation satellites, or rover operations
- Space Tourism
    - Lunar hotel, orbital space habitats
- Consulting Services
    - Engineering, design, manufacturing and architecture
- Software as a Service
    - Enterprise grade software, turnkey solutions
- Intellectual Property
    - Licensing intellectual property to large corporations and governments
- Project Proposals
    - Application fees for submitting project proposals to Space Decentral
- Affiliate Membership
    - Affiliates pay a subscription fee and receive benefits such as discounts on services and products described here.

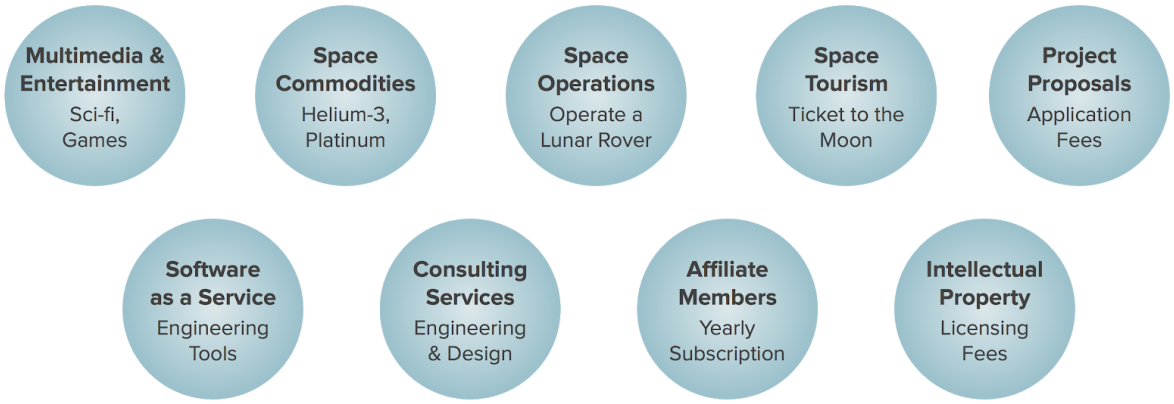

Figure 8.1. There are many possible revenue sources for Space Decentral.

8.1. Budget Engine

There are at least six proposed accounts that need to be budgeted for, to strategically spend the revenue that the network generates from the categories described in the previous section (this is not the budget for how revenue from the initial token generation event is spent). A *Budget Engine* carries the logic that will distribute revenue from the Network Fund to these six accounts. The initial budget values per account will

be determined based on a Member vote and will be updated by a voting proposal on a yearly basis. It is also possible for special voting proposals to be created that modify the account budgets outside of the regular voting cycle.

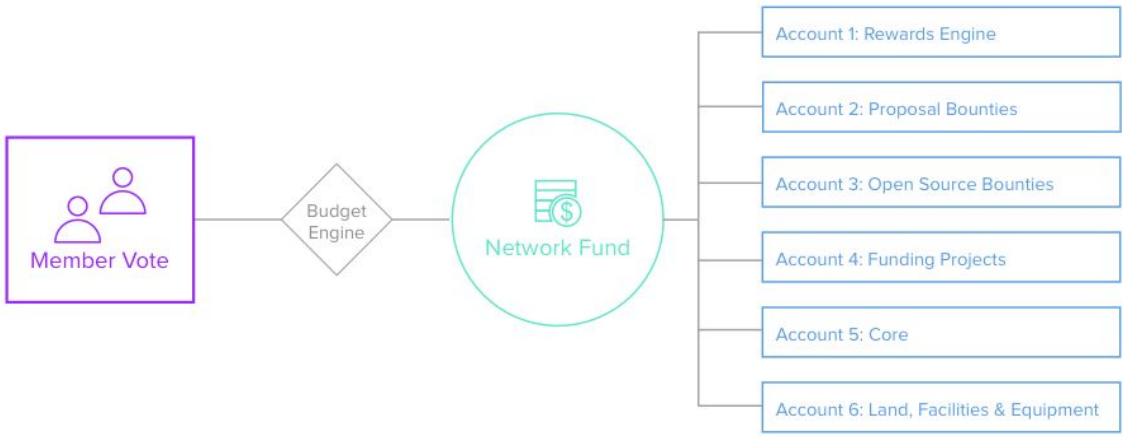

Figure 8.2. The flow for how a Member vote sets values in a budget engine, which is encoded with the smart contract logic that distributes capital from the Network Fund to various accounts.

Account 1: Rewards Engine

This account is used to distribute rewards back to SDN holders. SDN Rewards are distributed on a quarterly cycle, in proportion to the SDN holdings of each token holder.

Account 2: Proposal Bounties

The account is used to allocate capital to winning proposal teams that submit solutions to RFP competitions. These are treated as bounties for the delivery of the proposal, and do not require the winner to use the funding to develop the project.

Account 3: Open Source Bounties

This account is used to allocate capital to tasks in the open source development environment. The open source development environment is a nice playground that can also help identify new core team members.

Account 4: Funding Projects

This account is used to allocate capital toward the development of vetted project solutions. This includes funding for contractors, production, test, launch and operations.

Account 5: Core

This account is used to allocate capital toward full-time Members, Council members and partners. The core is responsible for developing the network infrastructure in addition to project management such as identifying tasks for the open roadmap and contributing to projects to ensure there is momentum. As the balance of the Core account increases, more members from the DAO can be brought in to the Core and more partnerships with external organizations can form. Core team members can be full-time or half-time.

Account 6: Land, Facilities & Equipment

This account is used to allocate capital toward land, facilities and equipment such as villages, manufacturing or vehicle assembly buildings. This infrastructure will support the development of all of the space missions within the network and potentially supply housing for the workers who desire it.