
Libre Space Foundation

Release 0+untagged.57.g4a4d7b8.dirty

Libre Space Foundation

Apr 25, 2024

PROJECTS

1	What is an LSF project?	1
2	Project management	3
2.1	Overview	3
2.2	Creation	3
2.3	Kanban board	4
2.4	Retrospective	5
3	Projects portfolio	7
3.1	Overview	7
3.2	Currently active projects	7
3.3	Administrative projects	8
3.4	Previously active projects	8
3.5	Contributors	9
4	Project joining	11
4.1	Overview	11
4.2	Governance	12
4.3	Technical	12
4.4	Legal	12
4.5	Brand	12
4.6	Press & Marketing	13
4.7	How LSF assists	13
4.8	Joining Process	13
5	Project proposing	15
5.1	Overview	15
5.2	Procedure	15
6	Roles	19
6.1	Project manager	19
6.2	Project champion	19
6.3	Peers	20
6.4	Role Assignment	20
6.5	Role Definition	20
7	People overview	21
8	Board	23
8.1	Joining	23

9	Core contributors	25
9.1	Joining	25
9.2	Onboarding	25
10	Paid contributors	27
10.1	Hiring	27
10.2	Compensation	27
10.3	Benefits	27
10.4	Time off	28
10.5	Bank holidays	28
10.6	Levels	29
10.7	Other matters	30
11	Human resources team	31
11.1	Overview	31
11.2	Roles	31
12	Human resources service desk	33
12.1	Overview	33
12.2	Sending requests	33
13	Hiring	35
13.1	General	35
13.2	Roles	35
13.3	Process	36
13.4	A good fit?	36
14	Decision Making	39
14.1	Overview	40
14.2	Prerequisites	40
14.3	Advice-based decision-making	40
14.4	Consensus-based decision-making	44
15	Meetings	49
15.1	Calling for meetings	49
15.2	Responding to invitations	50
15.3	Initiating meetings	50
15.4	Participating	51
15.5	Post-meeting actions	51
15.6	Regular LSF meetings	51
16	Conflict Resolution	53
16.1	Overview	53
16.2	Private Meeting	53
16.3	Involving a Mediator	53
16.4	Seek Guidance	54
17	LSF Code of Conduct	55
17.1	The LSF Guidelines in a nutshell	56
17.2	The LSF Statement of Principles	56
17.3	The LSF Code of Conduct	57
18	Communication Channels	61
18.1	External Communications	61
18.2	Project Communications	61

19 Event Management	63
19.1 Overview	63
19.2 Prepare	63
19.3 Propose	63
19.4 Attend	63
19.5 Report	63
19.6 Reimbursement	64
20 Contacts	65
20.1 Overview	65
20.2 Address Books	65
21 Entity	67
21.1 Libre Space Foundation AMKE	67
22 Procurement	69
22.1 Procurement process for common items	69
22.2 Procurement process involving quote request	70
22.3 Procurement information for flight models	70
22.4 Specific vendors	71
22.5 Legal entity details	72
23 Accounting	73
23.1 Payments	73
24 Shipping	75
25 Legal	77
26 IT infrastructure operations	79
26.1 Overview	80
26.2 Services	80
27 Hardware Development Guidelines	87
27.1 Overview	88
27.2 Design	88
28 Glossary	93
29 License	113
30 Intro	123
Index	125

WHAT IS AN LSF PROJECT?

Libre Space Foundation is home to a range of open source space projects, each working with their own collaborative community style to create technologies compatible with the [Libre Space Manifesto](#).

Within this documentation you can find details about the way Libre Space Foundation projects work, join the Foundation and are managed.

PROJECT MANAGEMENT

- *Overview*
- *Creation*
- *Kanban board*
 - *Open column*
 - *To-Do column*
 - *Doing column*
 - *Done column*
 - *Closed column*
- *Retrospective*
 - *Rules*
 - *Process*

2.1 Overview

This is the recommended Mode of Operation for Libre Space Foundation projects. GitLab issues shall be used as the platform for the project management of LSF projects. Kanban board shall be utilized to facilitate the project management process.

2.2 Creation

For any new or existing project generally there is an associated GitLab project. A new GitLab project can be requested [here](#) using the “GitLab - Create project” template.

2.3 Kanban board

The Kanban board shall have the following columns:

- Open
- To Do
- Doing
- Done (optional)
- Closed

Kanban process is task oriented. So, all issues created shall involve a task or be expressed as tasks.

2.3.1 Open column

Once an issue is created, it goes in the Open column as a new card. Cards which remain in this column shall always be unassigned. The idea with this column is that people can have a quick visual indication on which issues are pending. No GitLab label shall be used for this column

2.3.2 To-Do column

The backlog can grow quite large but the team has a maximum working capacity. The 'To Do' column is used to limit the pending work which can be overwhelming for the team. A set of cards is selected and moved to the 'To Do' column. These are the issues that the team shall focus on. Cards which remain in To Do state shall always be unassigned. The idea with this column is that people can have a quick visual indication on which pending issues to focus on. The set of issues in ready state shall be selected based on:

1. How ready are the issues to be worked on
2. If they all deliver a working feature
3. The future working capacity of the team.

The number of issues in this column shall be kept low and not more than the team can handle. A GitLab label shall be created for this column. The label shall have #F0AD4E as a background color.

2.3.3 Doing column

People can assign themselves issues using this column. This shall be done by:

1. Pulling the card from 'To Do' to 'Doing' column and
2. Assigning the card to themselves.

Cards which remain in doing state shall always be assigned. The idea with this column is that people can have a quick visual indication on which issues are worked on. The number of issues in this column shall not exceed at any time the maximum working capacity of the team. A GitLab label shall be created for this column. The label shall have #5CB85C as a background color.

2.3.4 Done column

Done column is optional. If used, completed tasks shall be moved in this column. Cards which remain in Done state shall always be assigned. It is mostly useful in projects where a regular status meeting takes place. During the meeting, completed tasks can be reviewed and closed. A GitLab label shall be created for this column. The label shall have #428BCA as a background color.

2.3.5 Closed column

The Closed column is used for:

- Completed tasks, when Done column is not used.
- Canceled or superseded tasks.

Cards which remain in Done state shall be assigned when completed and unassigned when canceled. A GitLab label shall be created for this column. The label shall have #428BCA as a background color.

2.4 Retrospective

The retrospective process is a method for teams to do self-inspection and continuously improve. Retrospectives meetings shall be executed regularly on all projects. The meeting shall result a concrete action plan towards improvement.

2.4.1 Rules

The retrospective meeting shall follow these rules:

1. A retrospective meeting shall be held once a month
2. A positive environment shall be created
3. The meeting shall focus on continuous improvement
4. Blaming people must be avoided
5. All opinions shall be listened

2.4.2 Process

The retrospective is a regular meeting. The meeting shall be scheduled when most people can attend, taking into account the distribution of people across different timezones. Although a physical meeting is ideal, an audio or real-time text meeting is also acceptable. The retrospective process steps are the following:

0. Invite the team to join the meeting
1. Discuss about what went well since the last meeting
2. Discuss about what lessons were learned
3. Make a plan and create actions needed for going forward

The actions shall create or update tasks in GitLab.

PROJECTS PORTFOLIO

- *Overview*
- *Currently active projects*
- *Administrative projects*
- *Previously active projects*
- *Contributors*

3.1 Overview

Libre Space Foundation develops and supports a variety of open source projects for space. For each project there is a project manager and a project champion (more on those *Roles*).

3.2 Currently active projects

The following major projects are in active development:

Project	Manager	Champion
Optical Makerspace	Pierros Papadeas	Pierros Papadeas
SatNOGS	Vasilis Tsiligiannis	Nestoras Sdoukos
SIDLOC	Vasilis Tsiligiannis	Manthos Papamatthaiou
REWIRE	Manolis Surligas	Manolis Surligas
SatNOGS COMMS	Manolis Surligas	Dimitrios Moustroufis
PICOBUS	Manthos Papamatthaiou	Thanos Patsas
Lab		Thanos Patsas
Infrastructure	Vasilis Tsiligiannis	Vasilis Tsiligiannis
SatNOGS Operations	Alfredos-Panagiotis Damkalis	Alfredos-Panagiotis Damkalis
SatNOGS Kits	aris nikas	George Pliakis
e-Shop		George Pliakis
Ephemerista	Pierros Papadeas	Nikoletta Triantafyllopoulou
esa11157 - HoLOGS	Pierros Papadeas	
NIS Pocketqube	Ilias Daradimos	Ilias Daradimos
PHASMA	Pierros Papadeas	Andreas Ampatzoglou
Spectrum Sharing Makerspace	Pierros Papadeas	Nestoras Sdoukos
QUBIK Bus	Ilias Daradimos	aris nikas
SatNOGS Optical	Pierros Papadeas	Fabian P. Schmidt
EU-RISE	Pierros Papadeas	Nikoletta Triantafyllopoulou
Launches	Manthos Papamatthaiou	Manthos Papamatthaiou
Ground Support Equipment	Andreas Ampatzoglou	Thanos Patsas

You can find other projects in lsf-core repository.

3.3 Administrative projects

The following projects are administrative projects running vertically across Libre Space Foundation:

Project	Manager	Champion
Communications	Nikoletta Triantafyllopoulou	Eleftherios Kosmas
Facilities management	aris nikas	Nestoras Sdoukos
Human Resources	Vasilis Tsiligiannis	Pierros Papadeas
Accounting and Finance	Pierros Papadeas	Pierros Papadeas
Business Development	Manthos Papamatthaiou	Pierros Papadeas
Legal Operations	Pierros Papadeas	Pierros Papadeas
Board	Pierros Papadeas	Manthos Papamatthaiou

3.4 Previously active projects

The following major projects have previously been in active development:

Project	Project Manager	Project Champion
OpenSatCom	Pierros Papadeas	N/A
UPSat	Pierros Papadeas	N/A

3.5 Contributors

Libre Space Foundation is an active and welcoming community around open source space projects. LSF welcomes all contributors in its projects and repositories. LSF recognizes those contributors that have been making considerable contributions in its projects by inviting them in the “LSF Core Contributors” group. Learn more about [Core contributors](#).

PROJECT JOINING

- *Overview*
- *Governance*
- *Technical*
- *Legal*
- *Brand*
- *Press & Marketing*
- *How LSF assists*
- *Joining Process*

4.1 Overview

Thank you for your interest in joining Libre Space Foundation as a project.

This document provides a simple list of the LSF expectations of any Libre Space project, with pointers to the detailed policies or best practices. “Libre Space project” specifically means a top level project at the LSF.

1. Some things projects **MUST** do are requirements; failure to follow those results in the board taking action to correct the issue.
2. There are many best practices that projects **SHOULD** do. Broad experience at the LSF shows these are proven methods that work well.
3. The LSF and some Libre Space projects have other suggestions and practices that projects **MAY** do.

Ultimately, Libre Space projects report to, and are responsible to, the Libre Space Foundation Board, which mandates these policies for the LSF as a whole.

4.2 Governance

1. Project decisions and direction **MUST** adhere to the Libre Space Manifesto.
2. Project technical decisions **MUST** be made and communicated on public and archived places.
3. Project discussions and interactions **SHOULD** be held in public in accessible, asynchronous and archived places.
4. Project discussions **SHOULD** use normal LSF-hosted communication channels.
5. Projects **MAY** use a documented consensus process or a **VOTE** for any new committers or project manager members, and carefully follow policies for granting access.
6. Projects **MUST** provide a quarterly status report to the Board.
7. Projects **MUST** govern themselves independently of undue commercial influence, and for the best interests of the project community as a whole.

4.3 Technical

1. The primary source control repository **MUST** be administered by the LSF Infra team on LSF organizational accounts.
2. Project **SHOULD** follow available tests and validation, preferably included in a continuous integration process.
3. Project **SHOULD** use common LSF projects set-up.
4. Projects **SHOULD** use fully open source tool chains: all tools used in a Libre Space project **SHOULD** be open source and compatible to avoid locks.

4.4 Legal

1. Projects **MUST** use an open source copyleft license for anything developed and released within the project, clearly marked in the source repository including **LICENSE**, and source headers.
2. Projects **MUST NOT** include software with unapproved or restricted licenses in Libre Space project releases unless following explicit exceptions.
3. Projects **MAY** include software with approved compatible licenses in Libre Space project releases.

4.5 Brand

1. Project websites and materials **MUST** comply with the Libre Space Project Branding Requirements.
2. Projects **MAY** request trademark registration and ownership by Libre Space Foundation.

4.6 Press & Marketing

1. Projects **MUST** work with Board Champion and Communications team on any formal press releases.
2. Projects **SHOULD** work with LSF Communications team to help coordinate any press, media, or analyst relations, or for marketing assistance.

4.7 How LSF assists

For all approved LSF projects the following support applies:

1. LSF **SHOULD** provide all needed infrastructure and tools for project development, deployment and operations. (for example repositories, discussion forums, servers)
2. LSF **SHOULD** sponsor the creation of a brand identity if the project is missing one.
3. LSF **SHOULD** provide legal guidance and help for a project.
4. LSF **MUST** provide governance, management and development guidance as requested by a project.
5. LSF **MUST** evaluate funding applications as submitted by a project and, if approved by the board, provide the funding and support around it. (for example development funds, internships, travel funding, event funding, tools and hardware).
6. LSF Board Champion of the project **MUST** work closely with the project manager or committee to ensure timely goal execution and smooth project development.

4.8 Joining Process

1. A project interested in joining Libre Space Foundation should review the conditions preceding and note possible incompatibilities or points needing clarification and/or discussion.
2. The project should initiate contact with the Board sending an email directly to a board member or board@ expressing interest.
3. The Board appoints a Board Champion to work with the project ensuring compatibility of the application.
4. The Board votes on accepting the project as a Libre Space Foundation project.
5. All necessary actions regarding project transition to LSF Project are done by the Board Champion and the Libre Space Foundation Operations team.
6. Communications team coordinates the announcement of the project joining LSF.

PROJECT PROPOSING

- *Overview*
- *Procedure*
 - *1. Ideation*
 - *2. Documentation*
 - *3. Feedback*
 - *4. Approval*
 - *5. Evaluation*

5.1 Overview

This is the recommended process to propose a new project regardless of scale within LSF. The overall process looks like this: a Core contributor, contributor, or community participant has an idea, documents it, asks for feedback, submits for approval to LSF board, runs the project and then LSF core contributors and board review it on regular basis or at specific dates.

5.2 Procedure

As a Core contributor you may have an idea about a specific project for LSF. It might be something new or building on top of existing projects and ideas.

Note: This is a process to be followed by Core Contributors. If you are not a Core contributor but have an idea for a project, please reach-out to one of the Core Contributors to help you.

5.2.1 1. Ideation

The first step of this process, would be the immediate ideation among the person (or persons) that came up with the idea. It is important the following items to be checked:

- The proposed project pushes the Libre Space Manifesto forward and abides by it.
- The people involved could have the capacity (priorities considered) to undertake the project.
- An initial resources (budget and people allocation) is made for the project
- A set of goals is set that align with the overall LSF strategy
- A set of measurable metrics and impact is set to be evaluated in a 3-month period (or 6 for larger projects)
- Basic project roles are identified (see [Roles](#))

5.2.2 2. Documentation

The person responsible for the project idea, documents it by filling a [Template Issue](#) in the lsf-core private repository.

5.2.3 3. Feedback

After the proposal issue is created, the proposing person, ensures that there is visibility for this proposal at a LSF Core level by:

- Posting on Core Contributors section in community.libre.space
- Posting on #lsf-core channel at Matrix
- Mentioning it on Monday and daily core group meetings
- Reaching out specifically to certain contributors to solicit feedback on the proposal

After discussions and possible feedback sessions are made then the points and possible alternation to the proposal should be reflected in the original proposal issue by the proposing person.

5.2.4 4. Approval

When the proposing person believes that the feedback loop is complete, submits the project for approval to the lsf-board by adding a comment “Ready for review” at the proposing issue.

The lsf-board group meets weekly and reviews any proposed proposals when they are ready.

Three different outcomes are possible: 1. Approval, in which case the project is commenced and issue is moved to Doing, 2. Rejection, where the issue is closed and tagged as Rejected, 3. More info needed, where a board member takes responsibility to have a feedback loop with the proposing person.

5.2.5 5. Evaluation

After a fixed period of 3 (or 6) months, a full project impact and results evaluation should be conducted as a public presentation to lsf-core group as the responsibility of the assigned project champion. The project might be concluded, extended, or made permanent based on lsf-board decision.

- *Project manager*
- *Project champion*
- *Peers*
- *Role Assignment*
- *Role Definition*

6.1 Project manager

While there are different scales of projects in LSF, in the broadest sense, project managers (PMs) are responsible for planning, organizing, and directing the completion of specific projects for LSF while ensuring these projects are on time, on budget, and within scope.

Specifics on the tooling and processes can be found in *Project management*.

6.2 Project champion

In order to ensure efficient and in-time resource allocation, each project employs a project champion role that is responsible to:

- Document project progress and report back to the rest of the org
- Communicate clear priorities and resource needs to the rest of the org
- Timely identify blockers and seek resolutions
- Critically analyzing and ensuring best practices for project management in collaboration with the Project Manager

It is possible that Project Champion and Project Manager is the same person, although it is envisioned as a separate individual for the larger projects of the org.

6.3 Peers

Peers are the people that are participants in a project.

6.4 Role Assignment

Whenever individually or in project-group level there is a need for role assignments the following process is followed:

1. First a review of the current role assignments is carried out to ensure that it reflects the present and immediate past situation by the PM and the group.
2. If there is a need for new roles then the “Role Definition” (see below) process should be followed.
3. Then peers of the project select the roles they want to be assigned in and input there perceived effort for the foreseeable future. In some projects this might be 1-3 months, in others it might be longer.
4. For roles that are not assigned to current peers, the marking “VACANT” should be used.
5. The “VACANT” should be advertised in lsf-core level.
6. If no peers are found to meet the “VACANT” role, the project manager creates a new job description to meet the need and brings it up to the HR team (process TBD).

Note: When not clear ownership of a step is defined, then “Project Manager” is assumed as the owner of that step/action.

Warning: People should ensure that they are not over-assigned in various projects. Check “People” Sheet when in doubt.

6.5 Role Definition

When there is a need for a new role definition, based on the project management process, the following steps are followed:

1. Check from available role definitions in “Roles” Sheet
2. If there is no exact match with the new role, create a new role in “Roles” Sheet with detailed description
3. On the project “Sheet” create a new row and add the newly defined role
4. Ensure the project peers are aware of the addition

Note: Roles could be refined by individuals at any moment.

Don't be afraid to create a new super-specific role describing your role in a project.

If there is a need to merge, reach-out to the PMs of the projects using the roles.

PEOPLE OVERVIEW

Libre Space Foundation is a vibrant organization comprised of multiple individuals around the world. This section of the documentation caters to their needs, helping with definitions and processes. Among others, it contains topics related to joining, training, engaging, coaching, and cooperation between individuals. Processes developed and documented in this section are meant to become useful tools for cultivating a common culture across the organization; a culture which is based on principles of self-management, self-governing, self-organizing and pure peer relationships.

• *Joining*

Libre Space Foundation Board is the governing body of LSF. As the highest leadership body of the Foundation and to satisfy its fiduciary duties, the board is responsible for:

1. Determining the mission and purposes of the Foundation
2. Selecting and evaluating the performance of the chief executive
3. Strategic and organizational planning
4. Ensuring strong fiduciary oversight and financial management
5. Fundraising and resource development
6. Approving and monitoring the Foundation's programs and services
7. Enhancing the Foundation's public image
8. Assessing its performance as the governing body of the Foundation

8.1 Joining

A new member joining the board requires an existing board member nomination and a unanimous decision among the current board members.

CORE CONTRIBUTORS

Volunteer and paid contributors to LSF that have showcased substantial contributions in one or more projects of the Foundation and alignment with the Libre Space Manifesto, are invited by the board to participate in the “Core Contributors” group.

Current “Core Contributors” can be found in the [About Us](#) section of the Libre Space website.

Being a member of “Core Contributors” grants the individual the following privileges and duties:

1. Recognition in [libre.space website About section](#)
2. Access to private “Core Contributors” discussion group in [community.libre.space](#)
3. Access to [#lsf-core:matrix.org](#) channel
4. An email account of [@libre.space](#) format accessible through [IMAP](#), [POP](#), [SMTP](#) and [website](#)
5. Membership to [LSF Core group on GitLab](#)
6. Access to [LSF cloud](#)
7. Participation to LSF All-Hands (annual get together of all core contributors)
8. Commitment to represent, spread and uphold the Principles and Pillars of the Libre Space Manifesto

9.1 Joining

Joining the “Core Contributors” group requires a nomination by an existing member and approval by the LSF board.

9.2 Onboarding

Once a new member is approved for the “Core Contributors” group, the process of onboarding can start. The first step of this process is to be assigned an onboarding “buddy”. The “buddy” helps and supports you with the process, guides you through the day-to-day processes and instills you with the values and culture of the organization. The onboarding also includes trivial IT operations actions as well as actions to kick-start collaboration with other contributors. The new contributor should [open a new onboarding issue](#) on the LSF organizational repository, and follow the checklist to completion. This detailed checklist contains all actions that need to happen so that the new contributor is fully enabled.

PAID CONTRIBUTORS

Paid contributors are a sub-set of LSF Core Contributors. In this page you can find information this is specific for LSF Paid contributors, otherwise known as employees.

10.1 Hiring

Besides the onboarding specified in the Core Contributors documentation there a few extra information that is needed to be communicated and arranged, contracts to be signed etc. The hiring responsible would know how to open an issue tracking this. See [Hiring](#) for more details.

10.2 Compensation

Your monthly compensation is be transferred to you at the last week of each month or within a week of you filling your invoice at pay @ libre.space (if you are under a freelance contract).

10.3 Benefits

Besides your paid compensation in LSF, as a regular paid contributor you are entitled to the following benefits:

1. A work laptop (see [Procurement](#))
2. An unlimited data and voice mobile phone plan

10.3.1 Mobile phone plan

An unlimited data and voice mobile phone plan is provided to each paid contributor. This includes unlimited Voice calls, SMS and data within the EU and UK

There are two available mobile plan options:

- A new phone number and mobile plan, property of Libre Space Foundation
- Transfer of ownership of your personal number to Libre Space Foundation in order to be part of the unlimited data and voice plan. Keep in mind that this may disrupt access to services that are part of your mobile phone account like phone bills etc. The transfer of ownership will be reverted at any time upon your request, restoring phone number ownership to you.

10.4 Time off

When you need to be off work please make sure to follow the following steps:

1. Coordinate with your peers on all projects you are part of, notifying them for your intention to leave.
2. Make sure that no blockers are created by your leave.
3. Assign a person (or more if needed) to be responsible for urgent needs at your absence.
4. Open a [Time Off issue](#).
5. Make sure you update your calendar to reflect your time off.
6. Remember to update the [issue board](#) to reflect the status of your absence by moving it to the correct column once in effect or after it's completed.
7. Enjoy your time off. (hopefully not a sick leave!)

10.4.1 Paid time-off

In case of planned time off (vacations etc) give ample notice to your colleagues and ensure no blockers are created by your absence. Try to coordinate as much in advance as possible. For minimum there needs to be a full working day in advance to give everyone a chance to respond and coordinate.

10.4.2 Sick leave

In case of emergency or any unforeseen event, try to follow the steps to the extend possible.

10.4.3 Unpaid time off

If you need to take a longer break, consider the option of unpaid time-off. Reach out to Human Resources team to coordinate the details which are varying depending on your employment status.

10.4.4 Parental leave

Please reach out to Human Resources team to discuss specifics based on your employment type.

10.5 Bank holidays

In addition to the official bank holidays in Greece, the following list of holidays have unofficially a similar status at LSF:

- Holy Spirit Day - Monday, movable

It is agreed by all contributors that during these days, no meetings shall be scheduled and no contributor is expected to be on call.

10.6 Levels

LSF implements a job levels system with a common path up to level C3. After the common path there are two distinct paths that can be followed; the “Technical Path” and the “Managerial Path” .

Code	Path	Description	Typical Years of Experience
C0	Common	You are probably an intern and you are developing your technical abilities while still studying.	0
C1		You are an entry level contributor you are developing your technical abilities. This is probably your first or second job.	0
C2		At this level you expand upon your foundational knowledge and develop an understanding of best practices in your field. You can work independently and regularly assist levels C0-C1 with tasks or troubleshooting problems.	3
C3		As a career contributor you have an established knowledge and experience in your field. You are working mostly independently and are able to take initiative and lead small teams and small projects.	5
T1	Technical	As a staff engineer you need to have a comprehensive knowledge of engineering development practices. Engineering at this level includes performing complex tasks and implementing complete systems. The job is often highly collaborative and may include leading teams or mentoring more junior engineers.	6
T2		As a more experienced staff engineer you need to have a comprehensive knowledge of engineering development practices. You are coming up with complete system designs and implementations of them. You are building up your expertise in the field in a distinctive way. The job is often highly collaborative and does include leading teams and mentoring more junior engineers.	7
T3		At this level you have the ability to perform tasks and large engineering projects with Independence and expertise. You are often responsible for guiding or mentoring other contributors, and regularly lead technical projects for external partners and clients.	10
T4		This is the highest level on the technical engineering career track. You are top in your field. You make strategic decisions about which team members should work on which areas of a project and you provide technical and professional leadership for other engineers.	15+
M1	Managerial	As an engineering manager you regularly lead teams or projects, and you provide support for initiatives throughout many areas within the organization.	5
M2		As a more experienced engineering manager you have a broad understanding of all aspects relating to the design, innovation and development of products and solutions. You are able to able to prioritize workloads, tasks and assignments to efficiently manage team projects.	7
M3		As a director you are responsible for managing multiple teams and coordinating with team leads or engineer managers. You have a keen understanding of the broad picture behind the organization initiatives and LSF development goals. You also have an expert level understanding in your field (engineering or managerial).	10
M4		You are a high-level executive who manages teams across the organization. You are responsible for designing and delivering projects and products that meet the organization goals. You have a tactical and strategic expertise as well as strong interpersonal and leadership skills.	15+
M5		You have the highest executive position within the organization, providing leadership and guidance across all different fields and teams. You are responsible for implementing the vision and strategy of the organization at the highest level.	15+

10.7 Other matters

If you have any other inquiries related to people operations, please don't hesitate to reach out to the HR team via email at [hr @ libre.space](mailto:hr@libre.space). HR team is always happy to assist you.

HUMAN RESOURCES TEAM

11.1 Overview

The purpose of a Human Resources is to support the organization and specifically its core, paid, and candidate contributors, on procedural matters related to recruitment, employment, labor laws compliance, and regulations, benefits, etc. The Human Resources team, is a group of people responsible for managing all these aspects of Human Resources functions.

11.2 Roles

Each individual in the team self-assumes a set of roles for themselves following the [Decision making process of Libre Space Foundation](#). These roles have specific responsibilities based on the current needs. The roles are documented in the following table:

Role	Person	Description
Benefits Administrator	Dimitris Papadeas	Manages paid contributors benefit requests.
Compensation Analyst	Vasilis Tsiligianis	Analyzes the organization's compensation structure compared to the labor market norms and proposes changes and compensation policies to attract paid contributors to the organization.
	Dimitris Papadeas	
	Eleftherios Kosmas	
	Pierros Papadeas	
	Manthos Papa-matthaiou	
Documentation engineer	Vasilis Tsiligianis	Maintains systems for correct rendering of documentation from document source code.
Employment Compliance Manager	Vasilis Tsiligianis	Oversees compliance with employment laws, regulations, and requirements of the organization.
	Dimitris Papadeas	
Exit Facilitator	Vasilis Tsiligianis	Oversees and facilitates the process of a paid contributor to revert to a non-paid status.
Hiring Interviewer	Vasilis Tsiligianis	Conducts interviews and evaluates candidates during the hiring process.
	Pierros Papadeas	
	Manthos Papa-matthaiou	
Hiring Manager	Vasilis Tsiligianis	Executes the hiring process.
	Dimitris Papadeas	
Kanban Board Coordinator	Vasilis Tsiligianis	Manages and facilitates the use of Kanban boards within a team.
Payroll Administrator	Dimitris Papadeas	Processes and manages paid contributors compensation, ensuring accurate and timely payroll processing, including calculating wages, deductions, and benefits, and issuing paychecks or direct deposits to employees.
Project Champion	Eleftherios Kosmas	Follows closely and reports important updates related to the progress of the project.
Project Manager	Vasilis Tsiligianis	Coordinates with the managers of other projects in the organization for efficient resource sharing and planning.
Technical Writer	Vasilis Tsiligianis	Creates and delivers technical documentation and written content that is clear, concise, and user-friendly, including documentation, instructions and job positions.
32	Pierros Papadeas	Chapter 11. Human resources team

HUMAN RESOURCES SERVICE DESK

- *Overview*
- *Sending requests*

12.1 Overview

The Human Resources Service Desk serves as the primary contact point for paid contributors seeking assistance with HR-related inquiries, concerns, and requests. Such requests include HR matters such as benefits, payroll, leaves, and hiring.

12.2 Sending requests

The Human Resources Service Desk offers multiple channels for submitting requests. [GitLab issues](#) can be used for making requests, and a set of predefined issue templates for commonly requested matters are available for ease of use:

- Benefits
 - Mobile phone plan
 - * [Request](#)
 - * [Cancel](#)
- Hiring
 - Greece
 - * [Employee](#)
- Payslip
 - [Update PGP key](#)

For non-standard matters, paid contributors have the flexibility to provide details in free-text format or [email](#).

HIRING

New core members in a paid capacity is a great way to expand LSF team, abilities, passion, bandwidth, and culture. In this page you can find information about the hiring process and how LSF does this a bit differently.

13.1 General

In LSF, recruitment is led by the team in need of a new member (specifically the Project Manager), not by Human Resources team (which only takes care of the practicalities). Conversations with candidates tend to center around three topics: fit with the role, fit with the organization, and fit with the purpose. The last two are often considered more important, as in self-managing organizations like LSF, there is much fluidity around roles. Thus a prioritized list of topics is as follows:

1. Fit with purpose
2. Fit with organization
3. Briefing about needs
4. Drafting roles covering needs

A fundamental question is asked for any prospective new core member in paid capacity:

- **Do we sense that we're meant to journey together?**

This question can only be meaningfully answered when conversations are rooted in honesty and integrity, with a willingness to inquire deeply and openly.

13.2 Roles

Each Project Manager with their respective peers, defines roles (see [Roles](#)) for their projects in a regular cadence (some projects Quarterly others Annually etc).

Every month a dedicated team meets to define priorities for the vacant roles identified per project. The criteria for prioritization are project urgency, timelines, financial viability and other organization considerations.

This list is [published in a page](#) and can be seen by anyone interested.

Note: Roles and NOT Positions

LSF uses roles and does not follow the traditional position definition practice for recruiting/hiring. This essentially means that prospective candidates are applying to join a single or multiple teams, in a single or multiple roles. LSF

actively encourages new candidates to propose *their own roles too*, based on their expertise, passion and ideas that fit LSF mission and vision.

13.3 Process

1. Prospective applicant reviews the [list of \(vacant\) roles](#).
2. Applicant reaches out to project managers as stated in the *Projects portfolio*, to discuss general fit for the roles of interest.
3. Applicant sends an email to hr@libre.space with 4 key information:
 - a. Roles interested in and how the applicant see themselves fit in them (experience, motivations etc)
 - b. Applicant self-assessment for Level (see *Paid contributors*)
 - c. Applicant self-assessment for cultural fit in the organization
 - d. Any additional ideas/roles the applicant would like to bring forward
4. HR team [opens an Interview issue](#) in hr-org GitLab project and a Hiring Manager is assigned for a cultural fit interview.
5. After the cultural fit interview, the issue is updated with notes and the applicant is directed (or not) to further interviews as needed with project managers or prospective peers.
6. After each interview the issue is updated with notes.
7. The Hiring Manager ensures that an offer can be made if the following are all true:
 - a. Is the candidate a good organization fit?
 - b. Is the candidate a good fit for the roles applied?
 - c. Is the candidate a good fit for the organization purpose?
 - d. Is there available budget from the Accounting team for the level specified?
8. If the answer to all preceding is positive, the Hiring Manager [opens a Hiring issue](#).
9. An offer is made to the candidate by the Hiring Manager.
10. If the offer is accepted, then the candidate creates a GitLab account and opens a hiring issue on the HR service desk by selecting the appropriate issue template based on the type of employment and their local legislative region. A list of available issue templates can be found [here](#).
11. After the hiring process is completed, the onboarding process can begin (see *Core contributors*).

13.4 A good fit?

Note: Many of the following information and LSF hiring practices can be found in [Reinventing Organizations Wiki](#).

13.4.1 Fit for role

Assessing the fit in terms of skills, experience, and expertise remains an important component of the recruitment process, especially for specific roles requiring expertise. Roles in self-managing organizations are exchanged very fluidly, though. For that reason, the “fit for role” is often not considered to be paramount, as it is likely that a person’s roles might change quickly. Self-managing organizations experience that when employees are motivated to take on a new and challenging role, they pick up new skills and experience in surprisingly little time.

13.4.2 Fit with the organization

A second area to explore in conversation is: will the person blossom in the organization? Will he or she thrive in a self-organizing environment? Does the person feel aligned by the organization’s values? Does he or she “click” with the colleagues?

13.4.3 Fit with purpose

Note: LSF [Manifesto](#) can act as a perfect guide for purpose.

Finally, is the person energized by the organizations’ purpose? Is there something in the person’s history that makes them resonate, makes them want to serve this purpose at this moment in their life? The discussion triggered by these questions can reach substantial depth and help both the candidate and the organization learn more about themselves. Recruitment becomes a process of self-inquiry as much as a process of mutual assessment.

DECISION MAKING

- *Overview*
- *Prerequisites*
 - *Communication*
 - *Trust*
 - *Adaptability*
- *Advice-based decision-making*
 - *Rules*
 - *Workflow*
- *Consensus-based decision-making*
 - *Rules*
 - *Reaching Consensus*
 - *Deadlines on Initiating Discussions*
 - * *Key Aspects for Deadline Determination*
 - *Workflow*
 - *Common pitfalls*
 - * *Inaction to decide*
 - * *Vulnerability to malicious members*
 - * *Frustration and Demotivation*
 - * *Low-quality decisions*
 - * *Groupthink*
 - * *Member isolation*
 - * *Fallback to other decision-making processes*

14.1 Overview

Decision-making and collaboration are two essential aspects of any successful team or organization. When working together, individuals must be able to make informed choices, communicate effectively, and work together towards a common goal. Effective decision-making involves a process of gathering information, analyzing options, and ultimately selecting a course of action. Advice-based and consensus-based decision-making are the standard practices for all projects at Libre Space Foundation, excluding the LSF Board project, in which the decision-making model is not defined yet. As an organization that operates under self-management principles, the consensus-based decision-making process shall only be employed in cases where the advice-based decision-making cannot be followed.

14.2 Prerequisites

Before initiating any decision-making process, the following prerequisites need to be established:

14.2.1 Communication

One of the key aspects of effective decision-making is communication. Teams must be able to communicate openly and honestly, sharing ideas and feedback in a constructive manner. This requires active listening skills, empathy, and a willingness to compromise and work towards solutions that work for everyone involved.

14.2.2 Trust

Another important aspect is trust. Team members must feel comfortable sharing their opinions and ideas without fear of judgement or criticism. Building trust requires transparency, empathy, and a commitment to the larger goal.

14.2.3 Adaptability

Lastly, decision-making requires a willingness to take risks and adapt to changing circumstances. Teams must be open to new ideas and willing to pivot or change course if necessary to achieve their objectives.

14.3 Advice-based decision-making

Advice-based decisions are self-directed decisions that are made by individuals based on the guidance, input, or recommendations of others. It is a lightweight and fast process originating from do-ocratic and self-management principles with increased decision-making performance and efficiency. Nevertheless, this decision-making process is not suitable in cases where:

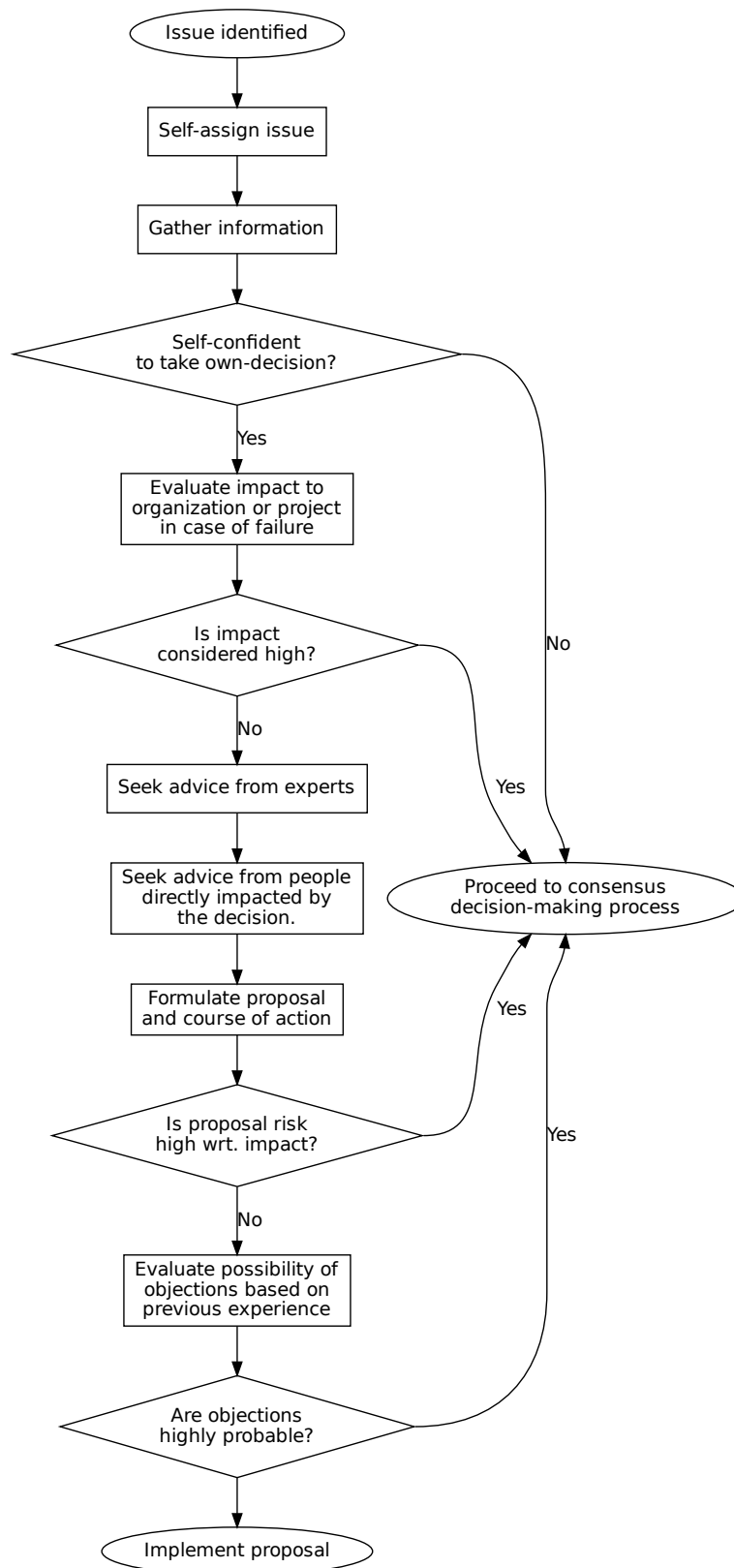
- Self-confidence to take own-decision is low.
- Decision is considered high risk.
- Impact to the organization or project in case of failure is considered high.
- There are known potential objections by other team members.

14.3.1 Rules

The key rules for advice-based decision-making are:

- Advice shall be sought from experts.
- Advice shall be sought from the people that will be most directly impacted by the decision.

14.3.2 Workflow



14.4 Consensus-based decision-making

Consensus-based decision-making is a collaborative decision-making process that seeks to reach agreement among all team members. In this approach, all members of the group participate in the decision-making process and work together to find a solution that everyone can support.

14.4.1 Rules

The key rules for consensus decision-making are:

- All information and knowledge to make a decision shall be freely available. The exchange of information shall not be hindered in any way.
- Members shall actively listen to and consider all viewpoints and perspectives.
- Agreed ideas and decisions shall belong to the team as a whole and not to individual members, even if the decisions were made using passive acceptance or tolerance by these members.
- In principle, disagreements can always be resolved with enough discussion.
- Consensus may be reached by composing all opinions as long as they do not conflict with each other.
- The right to object shall always be respected.
- Discussion logs shall be maintained to the extent possible and especially in case where objections have been expressed.

14.4.2 Reaching Consensus

Participation in the discussion process is expected from all stakeholders. Consensus is reached in any of the following cases:

- **Unanimity** - All members fully agree with the decision.
- **Acceptance** - Some members fully agree with the decision while the rest are neutral or have no opinion on the matter, effectively passively accepting the decision.
- **Tolerance** - Some members agree or accept the decision while the rest have objections but decide to tolerate it. In this case, the objections must be recorded.

There may be cases in which consensus is hindered by lack of participation from objecting parties. Therefore the following cases are considered as passive acceptance of the outcome of the decision-making process:

- **Refusal to Participate** - Declining to engage in the discussion process without justified reason.
- **Unjustified Absence** - Failure to participate in scheduled discussions without valid justification.

14.4.3 Deadlines on Initiating Discussions

When an objection to a proposal or decision is raised, it's crucial to address it promptly and constructively. To facilitate this:

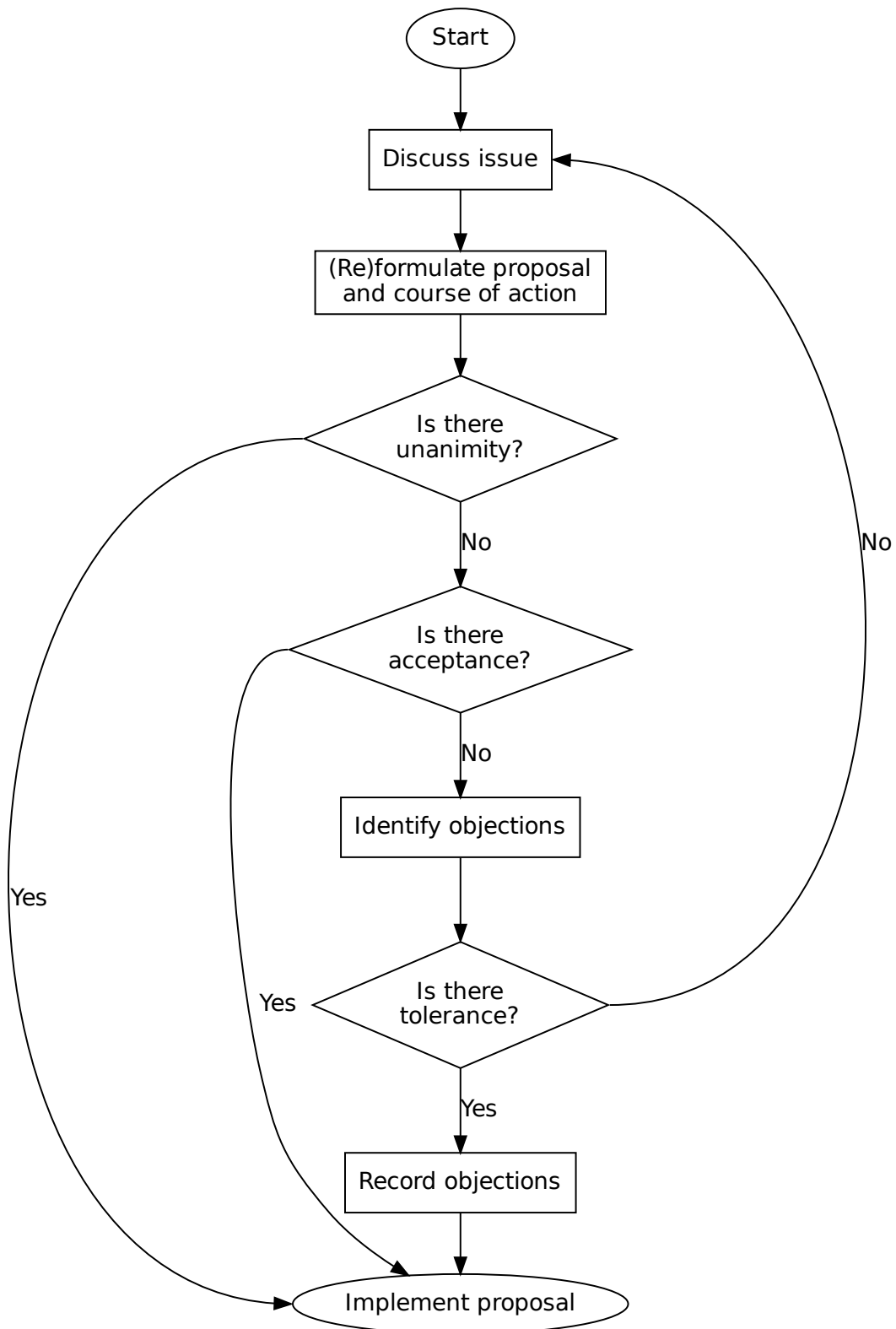
1. **Deadlines for Discussions:** Specific deadlines for initiating discussions to reach consensus must be defined immediately after an objection is recognized.
2. **Case-by-Case Consideration:** The deadlines shall be determined on a per-case basis, considering several key aspects to ensure fairness and efficiency.

Key Aspects for Deadline Determination

The following (non-exhaustive) list of aspects should be considered when setting deadlines for discussions:

- **Project Timeline Constraints** - How does the decision affect the overall project timeline and milestones?
- **Availability of People** - Are all necessary stakeholders available to participate in the discussion within a reasonable time-frame?
- **Impact of Decision** - What implications does the decision have on the project or organization?
- **Dependencies of Decision** - How does this decision affect other parts of the project?
- **Importance of Decision** - How inherently important is the decision itself?

14.4.4 Workflow



14.4.5 Common pitfalls

Inaction to decide

This occurs when the team cannot reach a consensus decision and can lead to a prolonged and unproductive decision-making process that can demotivate and frustrate team members. Inaction to decide can be caused by a lack of information, resistance to change or fear of failure.

Vulnerability to malicious members

Malicious team members can intentionally disrupt the decision-making process for their gain by continuously blocking decisions or advocating for decisions that serve their self-interest rather than the interest of the team. This can lead to a sense of distrust or resentment within the group. Another tactic that a malicious member can use to steer or block decisions is to dominate or hijack the discussions, leaving no room for other ideas to be expressed. Withholding information is also a common tactic used by malicious team members to manipulate decisions.

Frustration and Demotivation

Consensus decision-making, while democratic and inclusive, can be a time-consuming process. This can sometimes demotivate and frustrate team members.

Low-quality decisions

To achieve consensus, some members may reach a compromise or a composition of ideas that may not represent the ideal outcome for the team or may not solve the problem entirely and thus, conclude to a low-quality decision.

Groupthink

Groupthink is a phenomenon that can arise during consensus decision-making. It occurs when the desire for group harmony or cohesiveness results in a decision that is not well thought-out or objective. The pressure from the team can lead to individuals conforming to group norms or not speaking out, which can result in suboptimal or even dangerous decisions.

Member isolation

In a consensus decision-making process, it is important to ensure that all members feel heard and included in the decision-making process. If an objecting member is isolated or ignored, it can cause issues within the team and undermine the effectiveness of the consensus decision.

Fallback to other decision-making processes

Excessive use of the right to block decisions may lead to major frustration. In an attempt to unblock decisions, team members may be tempted to fallback to majority vote and in practice violate the consensus-based decision-making.

MEETINGS

Meetings can be called either on-demand or regularly. To avoid any miscommunication and facilitate syncing between meeting participants, it is recommended to follow the following guidelines.

15.1 Calling for meetings

1. **Define a goal**

Every meeting needs to have a goal. The goal should be clear in order to give direction to the discussion.

2. **Define the agenda**

All meetings must have an agenda. The agenda helps participants focus and keep the meeting within its time constraints. The agenda should at least contain:

1. The **topic** and **subtopics** to be discussed
2. Possible **preparation** required by participants to be able to attend

3. **Define participants**

The participants should be separated between:

1. **Mandatory** participants
2. **Optional** participants

4. **Define time**

The meeting should take place within a specific time-frame. The time-frame should be such that all mandatory participants can attend. Try not to exceed 1 h to avoid fatigue. Use free/busy information, if available, to minimize chances of rescheduling. The meeting should be scheduled far enough into the future to let participants respond in time for their availability. Always add some extra time; meetings usually run overtime.

5. **Define location**

The location, either physical or virtual, should be defined.

6. **Set reminders**

Participants should be reminded in some way when a meeting is starting soon.

7. **Make resources available**

Any resources needed to execute the meeting (documents, pages, links, etc.) should be available to the participants either directly or as links.

15.1.1 Calendar invitations

The most common way to call for meetings is through calendar event invitations. The recommended mapping between meeting properties and calendar invitations is:

Invitation	Meeting
Start time	Start time
End time	End time
Title	Agenda topic
Description	Agenda
Location	Location
Required attendees	Mandatory participants
Optional attendees	Optional participants
Reminders	Reminders (for example 15' before start)

15.1.2 Virtual meetings

Virtual meetings, preferably, take place on the Big Blue Button instance of Libre Space Foundation. The BBB service is integrated to Libre Space Foundation Cloud. Personal and shared meeting rooms can be managed through [the BBB tab of the LSF Cloud](#). Access to created meeting rooms can be set to 'Public' or 'Internal', with various combinations for guest access (password, waiting room, etc.). When creating a new meeting room, set the appropriate access control settings, based on the privacy-sensitivity of the subject and the audience expected to be invited. To join meeting rooms set to be accessed internally, users are required to log-in using their LSF Cloud credentials. Avoid joining as a guest when you do have an LSF Cloud account and log-in instead so that your user's avatar is properly displayed in the participants list. Always make sure that the audio setting are correct and the audio setup is functioning properly before joining a virtual meeting. A lot of frustration can be avoided by trying to briefly join with your devices (for example laptop, mobile phone) beforehand, in order to test that everything works and familiarize yourself with the platform. It is possible to join BBB virtual meetings using any modern web browser, including mobile web browsers; thus there is no need to install any specific mobile application.

15.2 Responding to invitations

Participants are expected to respond to invitation as soon as possible. Always check your calendar to avoid double booking and always account for possible time needed to prepare before responding to an invitation. It is acceptable for participants to completely deny attending or ask to reschedule a meeting. In any case, always reply with the reason.

15.3 Initiating meetings

To start a meeting, the following guidelines should be followed:

1. **Small talk for 5 minutes, if possible**

This helps people to start talking and also allows time for everybody to gather.

2. **Assign roles**

The following roles shall be assigned to people at the start of the meeting:

1. **Leader** - The person who leads the discussion; usually the person who called the meeting
2. **Notekeeper** - The person who keeps minutes of the meeting

3. **Kanban master** - If the meeting involves a Kanban board review, the person who goes over the Kanban cards (for example GitLab issues)
4. **Timekeeper** - The person who makes sure that the meeting runs on schedule
5. **Participant** - Anyone who is invited and attends the meeting

15.4 Participating

To make meetings more efficient, the following guidelines should be followed after meeting starts:

1. Always try to stick to the agenda and the meeting goal, as defined by the organizer
2. Come up with clear action items which can be later documented as tasks for people undertake
3. Avoid overrunning the scheduled meeting time; people may have scheduled other tasks after the meeting

15.5 Post-meeting actions

After the end of the meeting, the meeting notes should be published by the **Notekeeper** and all action items should be filed as tasks to the task track system (for example GitLab issues) by all participants assigned to them.

15.6 Regular LSF meetings

15.6.1 Morning get-together

This meeting takes place every week from Tuesday to Friday, between 10:00 AM and 11:00 AM, Athens local time. It is open to any discussions and attendance is optional. No Leader is required. The meeting is also exempted from the rule to keep notes, thus a Notekeeper is not necessary. At Friday there is an all day gathering at HQ (**HSGR**).

Evaluation

The meeting is currently running an experimental period. The parameters of the morning get-together meeting shall be evaluated between 23rd to 27th October, 2023.

15.6.2 Monday Priorities Meeting

This meeting takes place every week at Monday, between 10:00 AM and 11:00 AM, Athens local time. This meeting is split in two parts. In the first half, project champions report to the head of operations the status of project (Done, Doing, To Do). Leader of meeting and Kanban master is the head of operations. Project champions must have added notes before the meeting. The meeting notes are placed in Project Tracking issue board under the Core repository. Participants are all the core members. This meeting sets the priorities for the week on an organization level. In the second half of meeting, each core member reports on dependencies with other people. During this process, individual priorities might shift, following the needs of the organization. Leader could be anyone of the team. Notekeeper is each contributor for their priorities.

Evaluation

The meeting is during an evaluation period. The parameters of the morning get-together meeting shall be evaluated between 15th to 19th January, 2024.

CONFLICT RESOLUTION

- *Overview*
- *Private Meeting*
- *Involving a Mediator*
- *Seek Guidance*

16.1 Overview

Working with other people may sometimes lead to disagreements. These disagreements may start as engineering decision disputes but can evolve to personal or emotional conflicts. In most cases, such disagreement are extinguished at the spot during day-to-day communication and do not lead to major conflicts. This section describes a formal process followed in Libre Space Foundation to negotiate and resolve conflicts between individuals. The process is mainly based on private meetings between the individuals and a defined course of action which should resolve any conflict as early as possible.

16.2 Private Meeting

This is the first action that should be attempted to resolve a conflict. The offended party is defined as the individual who recognizes first that a conflict exists with another individual. The offending party is defined as the other individual in the conflict. The offended party communicates to the offending party the will to invoke the current process. Both parties hold a private meeting to discuss the issue at hand on a mutually agreed time and place. The parties discuss and attempt to reach an agreement. If an agreement is not reached and the conflict still continues, then they move to the next action.

16.3 Involving a Mediator

This is the second action that should be attempted to resolve a conflict, if the previous action fails. The parties agree on a mutually accepted mediator, invited as a facilitator to their discussions. The offended, offending parties and the mediator hold a private meeting to discuss the issue at hand on a mutually agreed time and place. The parties discuss and attempt to reach an agreement, with the help of the mediator. The mediator shall use their skill to improve communication between the parties and must be very careful not to express opinion or take the side of any party. If an agreement is not reached and the conflict still continues, then they move to the next action.

16.4 Seek Guidance

This is the last action that should be attempted to resolve a conflict, if the previous action fails. The parties seek guidance and advice on how to reach an agreement from Libre Space Foundation Board. Libre Space Foundation Board is the body responsible for preserving cultural integrity and leading transformations within the organization.

LSF CODE OF CONDUCT

- *The LSF Guidelines in a nutshell*
- *The LSF Statement of Principles*
- *The LSF Code of Conduct*
 - *Sharing Different Ideas, Dealing with Disagreements, Carrying Inclusive Conversations*
 - *Providing feedback and Criticism*
 - *Collaborations, leadership, accountability*
 - *Unacceptable Behaviours*
 - *Consequences of Unacceptable Behavior*
 - *When and How to Use These Guidelines*
 - *Reporting*
 - *Communicating with the team*
 - *Ask Questions*
 - *Contact Info*
 - *License and Attribution*
 - *Modifications and Updates to these Guidelines*

The strength of the Libre Space Foundation is its people; who make up a majestic, diverse, collaborative and inclusive community. As such, we at Libre Space Foundation have compiled the Participation Guidelines for the LSF Community, including the code of conduct and statement of Principles.

These are inspired by the LSF Manifesto. And they are created with primarily one thing in mind: creating an environment where humans from around the world will be able to contribute, learn and evolve at their own pace. With mutual respect and freedom to share ideas and opinions that will help make Space humanity's future. With these Guidelines, the LSF Community should be granting its members an opportunity to explore (their potential freely), develop (their skills), use (the knowledge acquired), and (help them) thrive differently. A way to ensure the longevity, sustainability, openness, equality of those efforts for all humanity ... (and for all the members of the community alike).

17.1 The LSF Guidelines in a nutshell

Celebrate our Similarities and Accommodate our Differences

The LSF Community is made up of individuals coming from many different cultures and backgrounds. Cultural differences can encompass everything; from religious beliefs to political views, to personal habits and clothing and to technology as well. Be respectful of people with different cultural practices, attitudes, ideas and beliefs. Focus on eliminating your own biases and discriminatory practices. Instead of criticising, work on eliminating your prejudices. Always put yourself into the other person's shoes-think of their needs from their point of view. In interaction, do not ignore the preferred titles (including pronouns) and be careful with using the appropriate tone of voice. Respect people's right to privacy and confidentiality. Respect their process and the time they need to get accustomed to new practices, information and a new environment. Be open to learning from others and helping others to learn. Respect the time they need to adapt and allow for questions, worries and thoughts while learning. Interactions with people from different cultures take time to ease into a smooth process. Be respectful, open and inclusive.

17.2 The LSF Statement of Principles

We value discussion, trust, accountability and collaboration

Be Open

To knowledge, approaches, different opinions. To making mistakes, asking questions, providing answers. About your problems, obstacles and new ideas.

Be Collaborative

With everyone within the community and outside of it (for that matter). Help educate those who know less than you do, and ask to acquire knowledge. Steer away from unstructured criticism. Feedback is always welcome but judgement is not.

Be Respectful

Differences of opinion, approaches and techniques will arise, but knowing how to solve those is of primary significance. Please be kind and courteous. There's no need to be mean or rude.

Be Considerate

Be aware of the impact of your words and your behaviour and how these may be affecting others. Intense interactions may affect other people in ways you fail to understand.

Be Transparent

If you disagree state your disagreement. If you are facing a problem let your close collaborators know. Be direct with the things you disagree on and form your argument in a constructive way.

Create a Safe, respectful and collaborative environment for everyone to thrive in regardless of their:

- Background
- Family status
- Gender
- Gender identity or expression
- Marital status
- Sex
- Sexual orientation
- Native language

- Age
- Ability
- Race and/or ethnicity
- Caste
- National origin
- Ethnic Origin
- Socioeconomic status
- Religion
- Political Views
- Geographic location
- Any other dimension of diversity

The LSF Principles are created to set the tone for individuals and groups to interact and collaborate freely and respectfully to the community's mutual advantage.

The LSF Code of Conduct illustrates both the expected and prohibited behaviour.

17.3 The LSF Code of Conduct

17.3.1 Sharing Different Ideas, Dealing with Disagreements, Carrying Inclusive Conversations

We value discussion and sharing of different ideas, approaches and points of view. Therefore, consciously seeking diverse perspectives. Ask for different opinions. Diversity of views and of people on teams fuels innovative solutions, even if the process is not always comfortable or smooth. Encourage all voices. Allow space for new perspectives to be heard and try to listen actively.

Be open to different possibilities, to different truths. But most importantly be open to the possibility of being wrong.

If you find yourself dominating a discussion, it is significant to step back and encourage other voices to speak. Be aware of how much time is taken up by the dominant members of the group. Provide alternative ways to contribute or participate when possible.

In a conversation, be inclusive by respecting and facilitating people's participation in the interaction. Everyone should be joining a conversation regardless of whether they are: Remote, A native speaker or not, Coming from a different culture, Located in a different time zone, Facing any number of challenges that make their participation difficult

Stand up for your opinion and approach and hold your ground if you disagree. A well-structured conversation will teach us all something new. While disagreement is welcome poor manners and/or abusive behaviour is not. And it will not be tolerated.

Be Open and Direct when we disagree and when we believe that improvement is necessary. Withholding hard truths from collaborators does not make the process better-in fact it worsens the situation. But keep unstructured critique to a minimum.

Be direct, constructive and positive. Positive is the keyword here. Step up when you must take responsibility for the impact of your actions, words and your mistakes - if someone says they have been harmed through your words or actions, listen carefully, apologize sincerely, and correct the behaviour going forward.

17.3.2 Providing feedback and Criticism

Being respectful when providing criticism is as important as being open to receiving it. Be conscious and on the lookout for the right moment to share the criticism with the other person. Be direct with delivering the truth but do so in a kind and respectful way. Do not be offended if it is hard for others to receive your truth. Allow time and space for the other person to receive the information you shared. Make sure the feedback you share is focused solely on the other person's work and not on their personality. Make it clear that the approach or the technique followed is falling short and not the other person's skills or aptitude or their capacity to do something. Refrain from using diminishing language.

17.3.3 Collaborations, leadership, accountability

If you don't know something, ask questions and seek answers. Ask for help when unsure. Nobody is expected to be perfect or to hold all the knowledge and answers within a community. Be open to asking and receiving questions always in a respectful way. Asking questions early on helps avoid many misunderstandings and problems. When asked a question, be responsive and helpful.

Take up leadership and responsibility. Lead by example and encourage other members to do so. Encourage new participants to feel empowered to lead, to share ideas, to take action, to experiment when they feel that a project should be handled differently in order for it to improve. Leadership can be exercised by anyone simply by taking action. There is no need to wait for recognition when the opportunity to lead presents itself.

Match your words with your actions. Your actions not only do they influence others but they also have an impact on the way the Community works, communicates and collaborates. Be a link of inclusivity and openness. Design your projects and work for inclusion. To enable others to become a part of it. Hold yourself and others accountable for inclusive behaviours and make decisions based on the Principles of the Libre Space Manifesto.

When somebody disengages themselves from a project or decides to leave the project altogether, it is preferred that they do so in a way that eliminates (if possible) or minimises disruption of the project. They should notify people in due time and take the necessary steps to ensure that others can pick up where they left off.

17.3.4 Unacceptable Behaviours

The following behaviours are unacceptable within our community:

- Personal Attacks. In a diverse Community, conflicts will inevitably arise. But differences in opinion or approach often lead to frustration and to a personal attack. It is not acceptable to insult, demean or belittle others. Attacking someone for their opinions, beliefs and ideas is not acceptable.
- Unwelcome Sexual Attention or Physical Contact. Unwelcome sexual attention or unwelcome physical contact is not acceptable. This includes sexualized comments, jokes or imagery in interactions, communications or presentation materials, as well as inappropriate touching, groping, or sexual advances.
- Violence and threats of violence
- Derogatory comments, related to gender, gender identity and expression, sexual orientation, disability, mental illness, physical appearance, body size, race, religion, politics or socioeconomic status. Avoid using overtly sexual aliases or other nicknames that might detract from a friendly, safe and welcoming environment for all.
- Posting or threatening to post other people's personally identifying information ("doxing").
- Deliberate intimidation
- Advocating for, or encouraging, any of the above behaviour.
- Private harassment is also unacceptable.

No matter who you are, if you feel you have been or are being harassed or made uncomfortable by a community member, please contact *conduct@libre.space* immediately. Whether you're a regular contributor, a paid employee, a volunteer

or a newcomer, we care about making this community a safe place for you and we've got your back. A community where people feel uncomfortable or threatened is not a productive and inclusive community.

17.3.5 Consequences of Unacceptable Behavior

Unacceptable behaviour from any community member (paid employee or volunteer), including those with decision-making authority, will not be tolerated.

Anyone asked to stop unacceptable behaviour is expected to comply immediately.

We don't tolerate behaviour that excludes people in socially marginalized groups.

If a community member engages in unacceptable behaviour, the LSF team may take any action they deem appropriate, up to and including a temporary ban or permanent expulsion from the community without warning.

Reports of harassment/discrimination will be promptly and thoroughly investigated by the people responsible for the safety of the LSF environment. Appropriate measures will be taken to address the situation.

In addition, any members of the LSF Community who abuse the reporting process will be considered to be in violation of these guidelines and subject to the same consequences. False reporting, especially to retaliate or exclude, will not be accepted or tolerated.

17.3.6 When and How to Use These Guidelines

These guidelines outline the behaviour expectations of all the members of the community and contributors. Whether offline or online, during virtual events or individual conversations, online meetings or on the public channels, throughout all the activities, operations, and projects. Your collaboration is necessary and your participation is contingent upon following these guidelines throughout all the LSF activities, including but not limited to:

- Collaborating in Libre Space Foundation spaces (hackerspace.gr).
- Collaborating with other contributors and other community members online or co-located.
- Representing LSF at public events.
- Representing LSF in social media (official accounts, staff accounts, personal accounts, Facebook pages).
- Participating in workshops and training whether online or offline.
- Participating in the Libre Space Foundation Community forums, mailing lists, wiki pages, websites, chat channels, groups or person-to-person meetings, and all LSF-related correspondence and communication.

The Code of Conduct and its Guidelines are an active topic as we continuously seek to make the community even more inclusive and diverse. We anticipate and welcome the Community's feedback in order to help us further enhance and outline the appropriate boundaries so that we create a safe and inclusive space (see what we did there..) for everyone to thrive in.

17.3.7 Reporting

If you believe you're experiencing unacceptable behaviour that will not be tolerated as outlined above, please contact *conduct @ libre dot space* to report. Reports are received by Nikoletta and Andreas.

After receiving a concise description of your situation, we will review and determine the next steps.

Please also report to us if you observe a potentially dangerous situation, someone in distress, or violations of these guidelines, even if the situation is not happening to you.

If you feel you have been unfairly accused of violating these guidelines, please follow the same reporting process.

17.3.8 Communicating with the team

The Code of Conduct (CoC) team is here to support all individuals to feel safe and heard within the LSF ecosystem. This means that the members of the Code of Conduct team are available and open to be contacted for various matters that might be troubling the members of the LSF community. The CoC team is here not only to receive reports of incidents, rude behaviours or disputes but also to provide emotional support to individuals or groups within LSF. Whether you're a regular contributor, a paid employee, a volunteer or a newcomer, we care about making this community a safe place for you, and we've got your back. A community where people feel uncomfortable or threatened is not a productive and inclusive community.

For this, the CoC team is available and open to all members of the LSF community (whether paid employees or volunteers) to actively listen to, discuss, and support all individuals and what is troubling them via e-mail, chat, or conference call. Through e-mails and conference calls, the individual has the option to contact a specific member or the whole team; the chat option can be used to contact a specific member directly.

Keep in mind that should you wish to speak to one of the members of the CoC team alone, you are more than welcome to do so. However, depending on the nature of the issue and its significance, the CoC team member might discuss your issue with the rest of the CoC team, provided that they take all measures necessary to protect your anonymity.

17.3.9 Ask Questions

Feel free to reach out to us and ask any questions you might have about these guidelines. Your input is welcome.

17.3.10 Contact Info

E-mails

- conduct @ libre dot space (*received by all members*)
- nikoletta @ libre dot space
- andreas @ libre dot space

Matrix handles

- @nikoletta:matrix.org
- @andreas_amp:matrix.org

17.3.11 License and Attribution

This set of guidelines is distributed under CC-BY-SA

17.3.12 Modifications and Updates to these Guidelines

The LSF Participation Guidelines (Statement of Principles and Code of Conduct) will be amended from time to time so as to include, support and protect the well being of the Community and its members. This also means that the procedures may also be updated from time to time. Therefore, you are kindly requested to keep an eye on the Guidelines and be aware that your agreement to comply with the guidelines will be deemed agreement to any changes to it.

COMMUNICATION CHANNELS

Libre Space Foundation uses various channels, technologies and methods to communicate among its members, projects and to the world.

18.1 External Communications

For a list of external communication channels and specifics around the organization of the Communications Team check out the [Communications Organizational Project](#) .

18.2 Project Communications

Different project employ different types of communications:

18.2.1 Email

Project	Email	Description
LSF - Generic	info@libre.space	Central email for all LSF related inquiries
LSF - Generic	shop@libre.space	Online shop related emails
LSF - Generic	ops@libre.space	Infrastructure related emails
LSF - Generic	ssa@libre.space	Space Situational Awareness team email
LSF - Generic	moc@libre.space	Mission Operations Center email
LSF - Generic	all@libre.space	All LSF core members alias (restricted to LSF emails only)
LSF - Generic	staff@libre.space	All LSF employees (restricted to LSF emails only)
LSF - Generic	acct@libre.space	Financial and Accounting project team email
LSF - Generic	bills@libre.space	Incoming email for Odoo accounting system
LSF - Generic	components@libre.space	Alias used in vendor accounts for procurements
LSF - Generic	pay@libre.space	Alias used for requesting payment

18.2.2 Real-time communications

Project	Channel	Description	Access
LSF - Generic	#librespace:matrix.org	Generic channel for all LSF projects	Open
LSF - Generic	#lsf-ops:matrix.org	Infrastructure team channel	Invite-only
LSF - Generic	#lsf-core:matrix.org	Channel for all LSF Core members	Invite-only
LSF - Generic	#librespace-comms:matrix.org	Communication team channel	Invite-only
LSF - Generic	#librespace-board:matrix.org	LSF Board channel	Invite-only
SatNOGS	#satnogs:matrix.org	SatNOGS project main channel	Open
SatNOGS	#satnogs-dev:matrix.org	SatNOGS Developers channel	Open
SatNOGS	#satnogs-missions:matrix.org	Missions using SatNOGS	Open
SatNOGS	#satnogs-operators:matrix.org	Channel for SatNOGS scheduling and operators	Invite-only
SatNOGS	#satnogs-comms:matrix.org	SatNOGS COMMS CubeSat subsystem project	Open
SatNOGS	#satnogs-optical:matrix.org	SatNOGS Optical Ground Station development	Open
SIDLOC	#sidloc:matrix.org	SIDLOC spacecraft ID and localization project	Open
PQ9ISH	#PQ9ISH:matrix.org	PQ9ISH PocketQube standard and compatible projects	Open
QUBIK	#qubik:matrix.org	QUBIK and PICOBUS, PocketQube LSF projects	Open
stvid	#stvid:matrix.org	stvid, optical SSA observations project	Open
OCSW	#oscw-public:matrix.org	Open Source CubeSat Workshop	Open
OSCW	#oscw:matrix.org	OSCW organization committee	Invite-only
Polaris	#polaris:matrix.org	Polaris machine learning project	Open
Metasat	#metasat:matrix.org	Metasat project	Open
Cronos Rocket	#cronos-rocketry:matrix.org	Cronos Rocketry project	Open

EVENT MANAGEMENT

19.1 Overview

LSF contributors regularly attend or organize meetings to promote our projects and engage with the broader community. This page describes the process which should be applied for all events.

19.2 Prepare

Think about what do you want to get out of the event participation. Plan carefully and as much in advance as possible. If needed, feel free to notify or ask for help on the [community forums](#).

Check [previous presentations](#) and you can also use [LSF logos \(and related designs\)](#).

19.3 Propose

Make sure to follow the instructions of the event and propose your participation (booth, talk, session, paper etc) as soon as possible. In case you need financial (or other) help with attending and representing LSF at the event, make sure to use [this form](#) to request for assistance.

19.4 Attend

Be present, be active, keep notes on contacts and meetings, as well as document interesting things you see and might be of interest in the LSF community.

19.5 Report

Post back at the community forums for how the event went, as well as any recordings made, contacts acquired and follow-ups needed.

19.6 Reimbursement

Scan all your receipts in a single PDF, then sum the amount and convert it to EUR, and post the file and details to pay@libre.space.

CONTACTS

20.1 Overview

The shared address books within LSF are centralized repositories of contact information which can be accessed and utilized by multiple members and groups of the organization. These address books streamline communication and collaboration by ensuring that contact details for contributors and other stakeholders are readily available and up-to-date. LSF uses Nextcloud as the tool for contact management since it integrates seamlessly with the rest of the cloud collaboration services.

20.2 Address Books

20.2.1 Contributors

The **Contributors** address book contains contact information of all active LSF core contributors. The address book is shared with read/write access to the **Contributors** group. Each member of this group is individually responsible for keeping their contact information current and up to date.

20.2.2 Contributors' contacts

The **Contributors' contact** address book contains contact information of people which is useful to active LSF core contributors. The address book is shared with read and write access to the **Contributors** group. All members of this group share the responsibility for ensuring the contacts in this address book are kept tidy and well-organized.

20.2.3 Board

The **Board** address book contains contact information of all the board members. The address book is shared with read access to the **Contributors** group, and read/write access to the **Board** group. Each member of the board is individually responsible for keeping their contact information current and up to date.

20.2.4 Board's contacts

The Board's contacts address book contains contact information of people which are useful to board members. The address book is shared with read/write access to the Board group. All members of the board share the responsibility for ensuring the contacts in this address book are kept tidy and well-organized.

ENTITY

Libre Space Foundation is currently registered since 2015 as a civil non-profit company in Athens, Greece.

21.1 Libre Space Foundation AMKE

21.1.1 Statute

Libre Space Foundation AMKE latest statute can be [found here \(in Greek\)](#).

21.1.2 Details

Some useful legal entity details are the following:

Attribute	Value
Full Legal name (GR)	Libre Space Foundation -
Full Legal Name (EN)	Libre Space Foundation Civil Non-Profit Company
Address	Irous 21, 10442, Athens, Greece
VAT number	EL997539194
Telephone	+30 213 0210437
Tax Office	A' Athens
Legal Representative	Matthaios Papamatthaiou
Business Registry # ()	133102301000
EORI Number	GR997539194
ESA Entity Code	1000026920
ESA Business Unit Code	8000030062
European Commission PIC Code	915366788
DUNS Number	525027028
NCAGE Code	G2922
EC Transparency ID	550336651403-41
SANA OID	1.3.112.4.1.301
SAM.gov UID	TNJAMXL6UMK3
NASA Vendor DB	TNJAMXL6UMK3
Airbus Supplier ID	E6172409

21.1.3 Registrations

LSF is registered in various registries:

Registry	Maintainer (Access)	Frequency	Next Up-date
Greek Tax Authorities ()	Accountant (user6838505334)	If needed	N/A
Greek Business Registry ()	Lawyer (LIBRESpace)	If needed	N/A
Real Beneficiaries Register ()	Accountant (Manthos GSIS ID)	If needed	N/A
ESA Star	Pierros (em_ppapadea)	Yearly	2024-10-04
SAM.gov	Pierros (pierros@)	Yearly	2024-04-17
European Commission SEDIA	Pierros (n0023uql)	Yearly (for SME status)	2024-10-01
European Transparency Register	Pierros (pierros@)	Yearly	2024-10-20
International Astronautical Federation (IAF)	Legal Representative (only paper)	If needed	N/A
Space Assigned Numbers Authority (SANA)	Pierros (pierros@)	If needed	N/A
Airbus UMS	Pierros (pierros@)	If needed	N/A

PROCUREMENT

For various project and activity needs, contributors of LSF need to procure various items or services. Here is a brief outline and some guiding principles

Note: The following procedures apply to major items, that is items costing more than 500 EUR. For minor purchases please see [Accounting](#).

22.1 Procurement process for common items

The term “common items” refers to items that are readily available on the market and for which there are no specific requirements or questions to be answered by the manufacturer. Their price is provided by the vendor and there is no need to request a quote (in that case see the relevant section below). A good example of common items are electronic components.

1. Identify the need and think about possible future evolution of this need.
2. Check with Lab (contacting Aris) on possible existing stock
3. Identify the best vendor possible taking into account lower price but also a prioritization with regards to vendor location. The priority is as follows:
 1. EU vendor with valid VAT VIES number
 2. Greek vendor with VAT number
 3. Non-EU vendor with local VAT number (avoid if possible!)
 4. Any vendor without a VAT number (avoid if possible!)
1. Request a pro-forma invoice to be issued (unless specific vendor below) to LSF Company details.
2. Forward to [pay@libre.space](#) for payment via bank transfer or via a card purchase link. Always prefer bank transfer over PayPal.
3. Once paid, you receive confirmation from the people behind pay@
4. Once the items arrive, scan and forward the invoice to [bills@libre.space](#)

22.2 Procurement process involving quote request

As is the case with many items, the vendor does not disclose the price on their website and a quote is needed. A quote may also be required when there is the need to ask for specific information about the product. In this case, the following information exchange with the vendor is performed.

1. LSF sends an RFQ to which the manufacturer replies with a quote. Other questions about the product are included in the RFQ.
2. If there is a high degree of certainty about the purchase of the product, LSF can ask for additional, more specific information (for example materials or components list).
3. If LSF is ready to proceed to purchase, a PO (Purchase Order) is sent to the vendor, to which the vendor replies with a pro-forma invoice.
4. Finally, LSF completes the payment and an invoice is received together with the product.

22.3 Procurement information for flight models

When procuring components/subsystems for flight models, some extra information shall be requested from the manufacturer. Since the depth and quantity of the requested information indicate a further commitment into the procurement, they should be requested at a second stage, not together with the initial quotation request. Internally, those are requested for quality assurance and risk evaluation purposes, while externally they are sometimes requested by the contracting agencies. The information to be requested are described below.

1. Components List

This is basically the Bill Of Materials of the subsystem and it is requested to enable LSF to investigate the suitability of individual components in case it is needed.

2. Materials List

This is more generic than the Components List and includes the materials used in the product. It can be used to assess whether the product contains materials unsuitable for the operational environment of the project or materials that can hinder the performance of other subsystems.

3. Inspection Process

This information request is concerned with the quality inspection procedures to which the manufacturer has subjected the product.

4. Qualifications

This refers to the standards to which the product complies.

You can copy/paste the following text to request the preceding information: ` Please provide with your quote or proforma invoice the following detailed information: a) Detailed components list, b) Materials list, c) Inspection Processes applied, d) Qualifications of items `

22.4 Specific vendors

The following vendors have been used extensively in the past and should be preferred since there is a special setup (See notes)

Vendor	Type	Username	Access	Notes
Amazon	Everything	individual accounts	All core contributors	Business account, Purchases with policies
Mouser	Components	librespace-foundation	Pierros, Agis, Ilias, Dimitris M, Shadi	Business account, Details completed. On the “order number” field add a name indicative of the project and date.
Digikey	Components	pierros@libre.space	Pierros	Business account, Details completed
Far-nell	Components	librespace	Pierros	Business account, Details completed
TME	Components	pierros@librespace	Pierros	Business account, Details completed
Mini Circuits	Components		Pierros	Details for export control added
Dis-comp	Networking		Pierros, Aris	Business discount and details entered
JLC PCB	PCB Production	procurement@libre.space	Pierros, Agis, Ilias, Aris, Dimitris M, Shadi	Business account, Details completed. Choose DDP for shipping.
LCSC	Components	procurement@libre.space	Pierros, Agis, Ilias, Aris, Dimitris M, Shadi	Business account, Details completed
Eurocircuits	PCB Production	individual accounts	Pierros, Dimitris M	Business account, ask for individual account invites
Mapbox	Services	ops@libre.space	Pierros, Shadi	Ops account
AirBnB	Accommodation	pierros@libre.space	Pierros, Shadi	Business account for invoices
Fiverr	Services	pierros@libre.space	Pierros, Shadi, Nikoletta, Nestoras	Business account for invoices
Reichelt	Electronics	pierros	Pierros, Shadi	Business account for invoices
Framework	Laptops	pierros@libre.space	Pierros	Business account for invoices

If you require a purchase from the vendors in the preceding table, please reach out directly to someone with access. Same goes for requesting access to those vendors.

A special alias (procurement@libre.space) is created for common accounts. People with access to procurement@libre.space are Pierros, Agis, Ilias, Aris, Dimitris M

22.5 Legal entity details

For legal entity details (company numbers and info) see [Entity](#).

ACCOUNTING

Libre Space Foundation AMKE (the legal entity) employees the double-entry book-keeping method for accounting and financial management purposes.

A dedicated ERP system (erp.libre.space) is deployed to meet the Accounting, Procurement and Sales functions needed.

23.1 Payments

Besides the regular *Procurement* process that applies to major items (~500+ EUR), the following three cases exist:

1. **You have an LSF regular debit card (you are Manthos, Pierros or DimitrisP)**
 - a. You make a purchase
 - b. You send the invoice or receipt directly to bills@libre.space
2. **You have an LSF Curve card (linked to regular debit cards)**
 - a. You make a purchase
 - b. You send the invoice or receipt directly to bills@libre.space
3. **You pay with your own money (reimbursement needed)**
 - a. You make a purchase
 - b. You scan and upload the invoice or receipt to pay@libre.space (this creates an issue in the GitLab Accounting project)
 - c. A member of the financial team, progresses your issue (you get email updates!)
 - d. Once the payment has been made, the financial team member makes sure to upload the receipt to ERP and notify accounting appropriately.

Warning: Regular procurement rules still apply in minor items, that is preferred vendors, invoices etc. See *Procurement* for details.

CHAPTER TWENTYFOUR

SHIPPING

Many times LSF ships items around the world. The following are some services in use that LSF has accounts setup:

Warning: Before using any vendors below, please check prices using a site like ShipLemon .

Shipping dor	Ven-	Type	Username	Ac- cess	Notes			
FedEx		Business Account	ship- ping@libre.space	Pierros	Business	account,	Details	com- pleted
DHL		DHL+ Account	ship- ping@libre.space	Pierros	Business	account,	Details	com- pleted
ACS		Account for Greece	ship- ping@libre.space	Pierros	Business	account,	Details	com- pleted

Note: Get familiar with [Incoterms](#) since those are really useful terms when arranging shipping.

Note: For LSF HQ details like company numbers, address, and info see [Entity](#).

CHAPTER TWENTYFIVE

LEGAL

Libre Space Foundation has a legal team and External Legal Counsel to look after all things legal (i.e contracts, compliance etc)

You can reach out to the team for any requests, guidance, or issue at legal@libre.space

IT INFRASTRUCTURE OPERATIONS

- *Overview*
- *Services*
 - *Communication*
 - * *Email (libre.space)*
 - * *Email (other)*
 - *Collaboration*
 - * *Cloud*
 - * *Web conferencing*
 - *Development*
 - * *DevOps platform*
 - * *Distribution packages repository*
 - * *Python packages repository*
 - * *Docker images repository*
 - * *Application Error Tracking system*
 - * *PCB design visual collaboration platform*
 - *Documentation*
 - * *Sphinx hosting platform*
 - * *Online LaTeX editor*
 - * *Hardware assembly instructions system*
 - *Social*
 - * *Websites*
 - * *Community forum*
 - * *Event management system*
 - *Lab*
 - * *Inventory*
 - * *ELN*

- *Auxiliary*
 - * *Status page system*
 - * *URL shortener*
- *Projects*
 - * *SatNOGS*

26.1 Overview

IT infrastructure operations are the various activities related to the operation and maintenance of the organization's IT infrastructure. They encompass all the essential components of an organization's IT environment, including hardware, software, data centers, networks, servers, storage, and other infrastructure elements. The IT infrastructure operations focus on ensuring the availability, reliability, security, and performance of the IT systems and services that support the organization. It also involves the implementation of processes and procedures to manage and monitor the infrastructure components to deliver uninterrupted services to end-users.

26.2 Services

A variety of IT services are used within the organization. These services can be either self-hosted or externally hosted.

26.2.1 Communication

Email (libre.space)

Info table	
URL	https://webmail.migadu.com/
Active	Yes
Self-hosted	No
SSO	No

Email (other)

Info table	
URL	https://mail.libre.space/
Active	Yes
Self-hosted	Yes
SSO	No

26.2.2 Collaboration

Cloud

Info table	
URL	https://cloud.libre.space/
Active	Yes
Self-hosted	Yes
SSO	No

Web conferencing

Info table	
URL	https://cloud.libre.space/apps/bbb/
Active	Yes
Self-hosted	No
SSO	No

26.2.3 Development

DevOps platform

Info table	
URL	https://gitlab.com/
Active	Yes
Self-hosted	No
SSO	No

Distribution packages repository

Info table	
URL	https://build.opensuse.org/
Active	Yes
Self-hosted	No
SSO	No

Python packages repository

Info table	
URL	https://pypi.org/
Active	Yes
Self-hosted	No
SSO	No

Docker images repository

Info table	
URL	https://hub.docker.com/
Active	Yes
Self-hosted	No
SSO	No

Application Error Tracking system

Info table	
URL	https://sentry.io/
Active	Yes
Self-hosted	No
SSO	No

PCB design visual collaboration platform

Info table	
URL	https://cadlab.io/
Active	Yes
Self-hosted	No
SSO	No

26.2.4 Documentation

Sphinx hosting platform

Info table	
URL	https://readthedocs.org/
Active	Yes
Self-hosted	No
SSO	No

Online LaTeX editor

Info table	
URL	https://overleaf.com/
Active	Yes
Self-hosted	No
SSO	No

Hardware assembly instructions system

Info table	
URL	https://ohai.libre.space/
Active	Yes
Self-hosted	Yes
SSO	No

26.2.5 Social

Websites

Info table	
URL	https://libre.space/
Active	Yes
Self-hosted	Yes
SSO	No

Community forum

Info table	
URL	https://community.libre.space/
Active	Yes
Self-hosted	Yes
SSO	Yes

Event management system

Info table	
URL	https://events.libre.space/
Active	Yes
Self-hosted	Yes
SSO	No

26.2.6 Lab

Inventory

Info table	
URL	https://inventory.hackerspace.gr/
Active	Yes
Self-hosted	Yes
SSO	No

ELN

Info table	
URL	https://eln.libre.space/
Active	Yes
Self-hosted	Yes
SSO	No

26.2.7 Auxiliary

Status page system

Info table	
URL	https://status.libre.space/
Active	Yes
Self-hosted	Yes
SSO	No

URL shortener

Info table	
URL	https://s.libre.space/admin/
Active	Yes
Self-hosted	Yes
SSO	No

26.2.8 Projects

SatNOGS

Info table	
URLs	<ul style="list-style-type: none"> • https://network.satnogs.org/ • https://db.satnogs.org/ • https://network-dev.satnogs.org/ • https://db-dev.satnogs.org/ • https://dashboard.satnogs.org/ • https://warehouse.satnogs.org:8086/
Active	Yes
Self-hosted	Yes
SSO	Yes (except data warehouse)

HARDWARE DEVELOPMENT GUIDELINES

- *Overview*
- *Design*
 - *Repository*
 - *KiCad and FreeCAD Workflow*
 - *An example KiCAD workflow for multiple boards (from SIDLOC project)*
 - * *Change the common schematic*
 - * *Change the specific schematic and project*
 - * *General checks*
 - *Integrating lsf-kicad-lib in a KiCAD project*
 - *Electronics Parts*
 - *KiCAD Preferred settings*
 - *FreeCAD Preferred settings*
 - *Releases*
 - * *Fabrication*
 - *PCB Ordering*
 - * *Assembly*
 - *PCB assembly*
 - *Mechanical Parts assembly*
 - *Cables assembly*

27.1 Overview

This guide refers to practices that is followed for hardware projects. It contains 3 sections:

1. design
2. fabrication
3. assembly

Each of the sections refer to a different stage of hardware development.

27.2 Design

27.2.1 Repository

The repository of a hardware project must include:

1. License file for example, [CERN Open Hardware Licence Version 2 - Strongly Reciprocal](#)
2. Libre Space Foundation [Contribution Guide](#)
3. Git ignore files for different kind of programs, like KiCad, FreeCAD and QUCS.
4. In case of CAD files, for example FreeCAD, it is recommended to use [Git LFS](#)
5. For project management follow, [recommended Mode of Operation for Libre Space Foundation projects](#)
6. An (under test) method to keep track of issues with epics and/or milestones is followed at [SIDLOC project - issue and some notes](#)

27.2.2 KiCad and FreeCAD Workflow

1. KiCad workflow for multiple boards is under test in [SIDLOC project](#) and an example of the method is given below.
2. FreeCAD workflow uses [Git LFS - File Locking](#)

27.2.3 An example KiCAD workflow for multiple boards (from SIDLOC project)

Consider the case where someone wants to make some schematic and PCB changes in one of the SIDLOC sub-projects (for example RFFE). Described below is a series of steps to perform these changes according to the “Breadboards Prototyping Workflow” scheme.

Change the common schematic

First thing would be to clone either a branch of SIDLOC Schematic project or a forked repository:

```
git clone link_to_forked_repo
```

Then, changes can be made on the specific sheet of the SIDLOC schematic project. In our case, the RFFE sheet (which corresponds to the `rffe.kicad_sch` file). When the changes are ready, they shall be pushed to the branch or the forked repository.

```
git status
```

The git status command may show changes in other files, but one has to add only the file of interest.

```
git add rffe.kicad_sch (and any other files containing PURPOSEFUL changes)
git status
```

Use git status again to confirm that the correct files have been changed

```
git commit -s -m "message"
git push (appropriate remote and branch name e.g. "origin master" for pushing on the
↪ master branch of the remote repo named "origin")
```

After pushing, a merge request can be submitted, reviewed and merged into the upstream SIDLOC Schematic repository.

Change the specific schematic and project

Now, one needs to clone the specific project they want to work on, again in a branch or fork, including the sidloc-schematic submodule.

```
git clone --recurse-submodules link_to_forked_repo
```

In case one had already cloned into the specific repository when the changes on the SIDLOC Schematic were made, they can navigate into the sidloc-schematic folder and use:

```
git pull
```

A note : this folder is linked to the LSF SIDLOC schematic repository, not any forked repository. This can be seen in the .gitmodules file. So, one has to wait for the changes to be merged into the LSF SIDLOC Schematic repository. One could also change the .gitmodules file to pull changes from the forked SIDLOC Schematic repository, but this is not particularly useful as corrections might occur during the merge request review process. So it is best to wait for the changes to be merged.

After successfully pulling the changes in the sidloc-schematic folder, it is time to modify the board-specific components of the project. If not already done, follow the steps above to set-up the project-specific schematic :

1. Create a hierarchical sheet whose file name points to the corresponding file in the sidloc-schematic project. In our case that would be sidloc-schematic/rffe.kicad_sch. **The internals of this sheet should NOT be changed from the specific project. They are changed in the SIDLOC-Schematic with the steps described above and after pulling the changes in the ``sidloc-schematic`` folder, this sheet will be automatically updated.**
2. Check that the hierarchical sheet pins are the same as those in the common SIDLOC-Schematic. These are added manually (they are not updated when pulling changes in the sidloc-schematic).
3. Add any connectors and parts that are specific to your board implementation of the SIDLOC project. Remember that the common SIDLOC-Schematic has no specific board implementation - one might as well put all subsystems in a big board. So, any connectors like the PQ9 connector are considered project-specific and are placed outside the hierarchical sheets.

When changes to the breadboard project are complete, then they can be committed, pushed on a fork/branch and then merged upon review.

```
git status
```

Make sure to add only the project-specific files (not files from the sidloc-schematic folder) that were PURPOSEFULLY changed (for example changes in the PCB)

```
git add sidloc-rffe.kicad_pcb
git status
```

Commit and push:

```
git commit -s -m "Message"
git push (appropriate remote and branch name e.g. "origin master" for pushing on the
↳ master branch of the remote repo named "origin")
```

Finally, submit a merge request.

General checks

- **All ports required by either the common project or the breadboard projects** are exposed as hierarchical labels
- **ERC passes on all projects; unused hierarchical ports must be set to “not connected”.**
- There is no net naming conflicts
- There is no component naming conflicts (annotations)

27.2.4 Integrating lsf-kicad-lib in a KiCAD project

LSF maintains a symbol, footprint and 3D model library for KiCAD under the [lsf-kicad-lib repository](#). For LSF projects, it is good to regularly merge the symbols/footprints created for the project into the lsf-kicad-lib; contribution guidelines are written in the repository’s README. To use the library in a design, the following steps are proposed (also summarized in the README) :

- Clone lsf-kicad-lib anywhere in your computer (choose a writeable location to allow modifications to the library)
- Under Preferences -> Configure Paths set a new environment variable named LSF_KICAD_LIB and set the path to the location where lsf-kicad-lib is cloned
- Under Preferences -> Manage Symbol Libraries add lsf-kicad as a global symbol library using the \${LSF_KICAD_LIB}/lsf-kicad.kicad_sym path
- Under Preferences -> Manage Footprint Libraries add lsf-kicad-lib as a global footprint library using the \${LSF_KICAD_LIB}/lsf-kicad-lib.pretty path

27.2.5 Electronics Parts

1. An inventory with electronic parts is kept in LSF lab. For that reason it is recommended to select parts from inventory that the threshold of minimum order is above 20 (more details TBA)
2. Parts like MCUs, PSUs etc are preferred to re-used for all the projects
3. Preferred [vendors](#)
4. For Board to wire connectors the Molex - PicoBlade and Hirose - DF11 series are preferred
5. A [Libre Space Foundation KiCad Library](#) exists. It is advised to use parts from it (or KiCAD libraries). In case that a part does not exist a merge request in to library is more than welcome

6. To export a BOM, for example for Mouser, use either *bom_csv_grouped_by_value* and from generated .csv use the second table of follow a guide: [The Generation of Bill of Material Files](#)

27.2.6 KiCAD Preferred settings

1. Schematic grid size: 1.27mm
2. PCB Logos: project logo, license logo and Libre Space Foundation logo.
3. CI for KiCad ([Under development](#))
4. Add Fiducial points that help stencil alignment in stencil printer

27.2.7 FreeCAD Preferred settings

1. For fabrication drawings use [Libre Space Foundation templates](#)

27.2.8 Releases

The release scheme is under development and testing in [SatNOGS COMMS](#) project

Fabrication

27.2.9 PCB Ordering

1. Preferred [vendors](#) are to be followed
2. Tag a release on the hardware repository and write all production details like [this](#) .
3. Ping people with access according to Procurement policy.
4. Note: Stencil size (maximum) 180x220 mm (due to stencil printer)

Assembly

27.2.10 PCB assembly

Libre Space Foundation uses [hackerspace.gr](#) laboratory with:

1. Reflow oven, TBD
2. Pick and Place, TBD
3. Stencil printer, TBD

27.2.11 Mechanical Parts assembly

TBD

27.2.12 Cables assembly

TBD

GLOSSARY

The purpose of this document is to provide a reference for acronyms and terms used in the Libre Space Foundation community and contributors may cross reference any of the supplied terms.

AB

Abstract

ABCL

As-built Configuration Data List

AC

Alternating Current

ACI

Adjacent Channel Interference

ACS

Attitude Control System

ACU

Antenna Control Unit

ADC

Analog to Digital Converter

ADCS

Attitude Determination and Control System

AFSK

Audio Frequency Shift Keying

AFT

Abbreviated Functional Test

AGC

Automatic Gain Control

AGPL

Affero General Public Licence

AI

Artificial Intelligence

AIT

Assembly Integration and Testing

AIV

Assembly Integration and Verification

AM

Amplitude Modulation

AMSAT

Amateur Satellite

AOCS

Attitude and Orbit Control System

AOS

May refer to: Acquisition Of Signal or, Advanced Orbiting Systems

AoV

Angle of View

API

Application Programming Interface

APT

Automatic Picture Transmission

ARM

Advanced RISC Machines

ARRL

American Radio Relay League

ARTES

Advanced Research in Telecommunications Systems

ASIC

Application-Specific Integrated Circuit

ASW

Address and Synchronization Word

AXI

Advanced eXtensible Interface

B2B

Business to Business

B2C

Business to Consumer

BaLun

Balanced to Unbalanced

BMU

Battery Management Unit

BER

Bit Error Rate

BOM

Bill Of Materials

BR

Brochure

BPF

Band Pass Filter

BPbis

Bundle Protocol

BPSK

Binary Phase Shift Keying

BSD

Berkeley Software Distribution

CAD

Computer Aided Design

CAN

Controller Area Network

CAN-FD

Controller Area Network Flexible Data-rate

CC-BY-SA

Creative Commons Attribution-ShareAlike

CCD

Contract Closure Documentation

CCI

Co-channel Interference

CCSDS

Consultative Committee for Space Data Systems

CDR

Critical Design Review

CEPT

European Conference of Postal and Telecommunications Administrations

CERN

Center for European Nuclear Research

CERN-OHL

[CERN](#) Open Hardware Licence

CFDP

[CCSDS](#) File Delivery Protocol

CI

Continuous Integration

CI/CD

Continuous Integration/Continuous Development

CIDL

Configuration Item Data List

CNC

Computer numerical control

COLDSUN

Communications reLay for Deep-Sea Underwater Networks

COMMS

Communications

CONOPS

Concept of Operations

COTS

Commercial off the Shelf

CPLD

Complex Programmable Logic Device

CPU

Central Processing Unit

CRC

Cyclic Redundancy Check

CSP

Content Security Policy

CSS

Cascading Style Sheet

CV

Cirriculum Vitae

CVCM

Collected Volatile Condensable Material

CW

Continuous Wave

D

Deliverable

DAC

Digital to Analog Converter

dB

Decibel

DB

Database

DC

Direct Current

DDR

Double Data Rate

DL

Deep Learning

DM

Development Model

DMSA

Deployable Multifunction Solar Array

DP

Data Package

DR

Design Review

DSN	Deep Space Network
DSP	Digital Signal Processing
DTN	Delay and Disruption-Tolerant Networking
DUT	Device Under Test
DUV	Data Under Voice
DVB-RCS	Digital Video Broadcasting - Return Channel via Satellite
DVB-S2	Digital Video Broadcasting - Satellite -Second Generation
Eb/N0	Energy per bit to noise power spectral density ratio
E2E	End-to-End
ECC	Error-correcting code
ECCS	Emergency Communication Cell over Satellite
ECSS	European Cooperation for Space Standardization
EDAC	Error Detection And Correction
EDEN	<i>EGSE</i> Data Exchange Network
EDRS	European Data Relay Satellite System
EDV	Energy Detection Value
EGSE	Electrical Ground Support Equipment
EIRP	Equivalent isotropically radiated power
EM	May refer to: a) Engineering Model b) Electrical Model
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference

eMMC

embedded Multi-Media Controller

EMS

Emergency Management Services

ENBW

Equivalent noise bandwidth

ENOB

Effective number of bits

EO

Earth Observing

EPS

Electrical Power System

Es/N0

symbol energy to noise ratio

ESA

European Space Agency

ESOC

European Space Operations Center

ESR

Executive Summary Report

ESSB

[ESA](#) Standardization Steering Board

ESTEC

European Space Research and Technology Center

ETA

Estimated Time of Arrival

EUR

Euro

FAR

Final Acceptance Review

FDIR

Failure Detection, Isolation and Recover

FEA

Finite Element Analysis

FEC

Forward Error Correction

FITS

Flexible Image Transport System

FFT

Fast Fourier Transform

FM

May refer to: Flight Model or, Frequency Modulation

FMC

FPGA Mazzanine Card

FOC

Full Operational Capability

FOSDEM

Free and Open Source Developers European Meeting

FOR

Frame Of Reference

FORTH

Foundation for Research and Technology Hellas

FOV

Field of View

FP

Final Presentation

FPGA

Field Programmable Gate Array

FR

Final Report

FSK

Frequency Shift Keying

G/T

Gain-to-noise-temperature

GB

Giga Byte

GCC

GNU Compiler Collection

GEO

Geostationary Equatorial Orbit

GESTRA

German Experimental Space Surveillance and Tracking Radar

GFSK

Gaussian Frequency Shift Keying

GHz

Giga Hertz

GLONASS

Global Navigation Satellite System

GMAT

General Mission Analysis Tool

GmbH

Gesellschaft mit beschränkter Haftung: German for a limited liability company

GNSS

Global Navigation Satellite System

GPCPU

General Purpose *CPU*

GNU

GNU's Not Unix

GPL

GNU General Public License

GPS

Global Positioning System

GPSd

Global Positioning System Data

GPSDO

GPS-Disciplined Oscillator

GRAVES

Grand Réseau Adapté à la Veille Spatiale

gRPC

gRPC Remote Procedure Calls

GS

Ground Station

GSE

Ground Support Equipment

GSPS

Giga Samples per Second

GSoC

Google Summer of Code

GUI

Graphical User Interface

HAL

Hardware Abstraction Layer

HDF5

Hierarchical Data Format

HDL

Hardware Description Language

HEEQ

Heliocentric Earth Equatorial

HEO

Highly Elliptical Orbit

HFT

Hidden Factors as Topics

HPA

High Power Amplifier

HPC

May refer to: a) High-performance Computing b) High Pin Count

HQ	Head-Quarters
HTML	Hyper Text Markup Language
HW	Hardware
I2C	Inter-Integrated Circuit
IaC	Infrastructure as Code
IARU	International Amateur Radio Union
IC	Integrated Circuit
ICT	Information and Communication Technology
IDE	Integrated Development Environment
IDLE	Integrated Development Environment
IEEE	Institute of Electrical and Electronics Engineers
IESL	Institute of Electronic Structure and Laser
IF	Intermediate Frequency
IFFT	Inverse Fast Fourier Transform
IO	Input/Output
IOCR	In-Orbit Commissioning Review
IOD	In-Orbit Demonstration
IOT	Internet Of Things
IQ	In-phase/Quadrature
IP	Implementation Plan
IP3	Third-order intercept point

IPND

IP-based Neighbor Discovery

IPv4

Internet Protocol version 4

IPv6

Internet Protocol version 6

ISI

Intersymbol Interference

ISM

Industrial, Scientific, and Medical

ISON

International Scientific Optical Network

ISS

International Space Station

ITT

Invitation To Tender

ITU

International Telecommunication Union

ITU-R

International Telecommunication Union - Radiocommunications

ITU RR

ITU Radio Regulations

JAXA

Japan Aerospace Exploration Agency

JPL

Jet Propulsion Laboratory

KO

Kick-Off

KOM

Kick-Off Meeting

LCNS

Lunar Communication and Navigation System

LDPC

Low-Density Parity Check

LGPL

GNU Lesser General Public License

LEDSAT

LED-based Small SATellite

LEO

Low Earth Orbit

LEOP

Launch and Early Orbit Phase

LFSR

Linear-Feedback Shift Register

LNA

Low Noise Amplifier

LO

Local Oscillator

LOS

May refer to a) Line of Sight b) Loss Of Signal

LRPT

Low-Resolution Picture Transmission

LRR

Laser Retro Reflector

LSF

Libre Space Foundation

LSTM

Long Short-Term Memory

LSTN

Library Space Technology Network

LTAN

Local Time of the Ascending Node

LVDS

Low Voltage Differential Signalling

LVTTL

Low Voltage TTL

M2M

Machine To Machine

MAIV

Manufacturing, Assembly, Integration and Verification

MB

Mega Byte

MCC

Mission Control Center

MCMC

Markov Chain Monte Carlo

MCOR

Mission Close-Out Review

MCT

Mission Control Software

MCU

Micro-Controller Unit

MDS

Minimum Detectable Signal

MEMS

Micro-Electro-Mechanical Systems

MEO

Medium Earth Orbit

MEX

Mars Express

MGSE

Mechanical Ground Support Equipment

MHz

Mega Hertz

MIB

Mission Information Base

MIMO

Multiple-Input, Multiple-Output

MIT

Massachusetts Institute of Technology

ML

Machine Learning

MLRR

Modulated Laser Retro-Reflector

MoM

Minutes of Meeting

MOOC

Massive Open Online Course

MPL

Mozilla Public License

MPPT

Maximum Power Point Tracker

MPR

Monthly Progress Reports

MRG

Microelectronics Research Group

MRR

Modulated Laser Retro-Reflector

MS

Milestone

MSK

Minimum Shift Keying

MSPS

Mega Samples per Symbol

MSS

Mobile Satellite Service

NASA

National Aeronautics and Space Administration

NEC2

Numerical Electromagnetics Code Version 2

NF

Noise Figure

NIST

National Institute of Standards and Technology

NORAD

North American Air Defense Command

NRZ-M

Non-Return-to-Zero Mark

NS-3

Network Simulator 3

NSL

NearSpace Launch

NTE

Nanosatellite Tracking Experiment

OBC

On-Board Computer

OBSW

On-Board Software

OCS

Orbit Control System

ODM

Orbit Data Message

OEM

May refer to: a) Original Equipment Manufacturer b) Orbit Ephemeris Message

OOL

Out-of-Limits

OOT

Out-of-Tree (GNURadio Out-of-tree module)

OpenEMS

Open Source Energy Management System

OpenSatCom

Open Satellite Communications

OPS

(Space) Operations

OS

Operating System

OS3

Open Source Satellite Simulator

OSCW

Open Source Cubesat Workshop

OSDLP

Open Space Data Link Protocol

OSI

May refer to a) Open Systems Interconnection b) Open Source Initiative

OTA

Optical Tube Assembly

OTP

One time programmable

PA

Power Amplifier

PAPR

Peak to Average Power Ration

PC

May refer to: a) Project Coordinator b) Personal Computer

PCB

Printed Circuit Board

PCDU

Power Conditioning and Distribution Unit

PCIe

Peripheral Component Interconnect Express

PDM

Product Data Management

PDR

Preliminary Design Review

PL

Processing Logic

PLL

Phased Locked Loop

PLM

Product Lifecycle Management

PMIC

Power management integrated circuits

PNT

Positioning, Navigation and Timing

PoC

Proof of Concept

PoE

Power over Ethernet

POSIX

Portable Operating System Interface for Unix

PQ

PocketQube

PSK

Phase-Shift Keying

PSLV

Polar Satellite Launch Vehicle

PV

Photovoltaics

PWM

Pulse-width Modulation

PWP

Project Web Page

QA

Quality Assurance

QPSK

Quadrature Phase Shift Keying

QSFP

Quad Small Form-factor Pluggable transceiver

R&D

Research & Development

RAAN

Rigth Ascension of the Ascending Node

RAM

Random Access Memory

RD

Reference Document

REST

Reprentational State Transfer

RF

Radio Frequency

RFMC

RF Mezzanine Card

RFQ

Request For Quote

RFSoc

RF System on Chip

RHCP

Right Hand Circular Polarized

RILDOS

Radio with Identity and Location Data for Operations and SSA

RPC

Remote Procedure Calls

RR

Requirements Review

RSSI

Received Signal Strength Indication

RTC

Real Time Clock

RTOS

Real Time Operating System

RW

Reaction Wheel

RX

Receiver/Reception

SANA

Space Assigned Numbers Authority

SATA

Serial Advanced Technology Attachment (hard disk interface)

SATCOM

Satellite Communication

SatNOGS

Satellite Network Open Ground-Station

SAW

Surface Acoustic Wave

SBC

Single Board Computer

SC

Spacecraft

SDA

Space Data Association

SDLS

Space Data Link Security

SDN

Software Defined Networking

SDR

May refer to: a) Software Defined Radio b) System Design Review

SGP4

Standard General Perturbations Satellite Orbit Model 4

SEE

Single-event effects

SESP

Simulation for European Space Programmes

SEU

Single-event upset

SFCG	Space Frequency Coordination Group
SFPT	Satellite Functions and Performance Test
SHF	Super High Frequency (3-30 GHz)
SIDLOC	Satellite Identification and Localisation
SiDs	Simple Downlink Share Convention Protocol
SigMF	Signal Metadata Format
SIMD	Single Instruction, Multiple Data
SLE	Space Link Emulator
SMA	SubMiniature version A
SMT	Surface Mount Technology
SNR	Signal-to-noise ratio
SNS	Satellite Network Simulator
SNS3	Satellite Network Simulator
SoC	System On a Chip
SOS	Space Operation Service
SoW	Statement of Work
SPENVIS	Space Environment, Effect and Education System
SPI	Serial Peripheral Interface
SPOC	Spacecraft Operation Center
SPP	Space Packet Protocol
SQNR	Signal-to-quantization-noise ratio

SRF	Software Reuse File
SRS	Space Research Service
SSA	Space Situational Awareness
SSN	Space Surveillance Network
SSO	Sun-Synchronous Orbit
SST	Space Surveillance and Tracking
STM	Space Traffic Management
SW	Software
SWR	Standing Wave Radio
TAS	Technical Achievement Summary
TBD	To Be Described
TC	Tele-command
TC&C	Tele-command & Control
TCP	Transmission Control Protocol
TCXO	Temperature-compensated crystal oscillator
TDM	Tracking Data Message
TDMA	Time Division Multiple Access
TDP	Technical Data Package
TID	Total Ionizing Dose
TJD	Truncated Julian Day
TLE	Two Line Element set

TM	Telemetry
TML	Total Mass Loss
TMR	Triple Mode Redundancy
TMTC	Telemetry & Tele-control
TN	Technical Note
TRL	Technology Readiness Level
TRR	Test Readiness Review
TT&C	Telemetry, Tracking and Command
TTL	Transistor-transistor logic
TVAC	Thermal Vacuum Chamber
TWT	Travelling-wave Tube
TX	Transmit
UART	Universal Asynchronous Receiver - Transmitter
UAS	Unmanned Aircraft Systems
UHF	Ultra High Frequency (0.3 - 3 GHz)
UI	User Interface
UNOOSA	United Nations Office for Outer Space Affairs
USB	Universal Serial Bus
USLP	Unified Space Link Protocol
USRP	Universal Software Radio Peripheral
UTC	Universal Time Co-ordinated

UX

User Experience

V&V

Verification and Validation

VAT

Value Added Tax

VBat

Voltage of Battery

VCO

Voltage - Controlled Oscillator

VGA

Variable Gain Amplifier

VIES

VAT Information Exchange System

VHF

Very High Frequency (30 - 300 MHz)

VNA

Vector Network Analyzer

VOLK

Vectorized Library of Kernels

VHDL

VHSIC Hardware Description Language

VPL

Visual Programming Language

WBS

Work Breakdown Structure

WP

Work Package

WPD

Work Package Description

WRC

World Radiocommunication Conferences

YAML

YAML Ain't Markup Language

ZMQ

ZeroMQ

LICENSE

Libre Space Foundation documentation is licensed under a [Creative Commons Attribution-ShareAlike 4.0 International License](#) license:

Attribution-ShareAlike 4.0 International

=====

Creative Commons Corporation ("Creative Commons") is not a law firm and does not provide legal services or legal advice. Distribution of Creative Commons public licenses does not create a lawyer-client or other relationship. Creative Commons makes its licenses and related information available on an "as-is" basis. Creative Commons gives no warranties regarding its licenses, any material licensed under their terms and conditions, or any related information. Creative Commons disclaims all liability for damages resulting from their use to the fullest extent possible.

Using Creative Commons Public Licenses

Creative Commons public licenses provide a standard set of terms and conditions that creators and other rights holders may use to share original works of authorship and other material subject to copyright and certain other rights specified in the public license below. The following considerations are for informational purposes only, are not exhaustive, and do not form part of our licenses.

Considerations for licensors: Our public licenses are intended for use by those authorized to give the public permission to use material in ways otherwise restricted by copyright and certain other rights. Our licenses are irrevocable. Licensors should read and understand the terms and conditions of the license they choose before applying it. Licensors should also secure all rights necessary before applying our licenses so that the public can reuse the material as expected. Licensors should clearly mark any material not subject to the license. This includes other CC-licensed material, or material used under an exception or limitation to copyright. More considerations for licensors: wiki.creativecommons.org/Considerations_for_licensors

(continues on next page)

(continued from previous page)

Considerations for the public: By using one of our public licenses, a licensor grants the public permission to use the licensed material under specified terms and conditions. If the licensor's permission is not necessary for any reason--for example, because of any applicable exception or limitation to copyright--then that use is not regulated by the license. Our licenses grant only permissions under copyright and certain other rights that a licensor has authority to grant. Use of the licensed material may still be restricted for other reasons, including because others have copyright or other rights in the material. A licensor may make special requests, such as asking that all changes be marked or described. Although not required by our licenses, you are encouraged to respect those requests where reasonable. More considerations for the public:

wiki.creativecommons.org/Considerations_for_licensees

=====

Creative Commons Attribution-ShareAlike 4.0 International Public License

By exercising the Licensed Rights (defined below), You accept and agree to be bound by the terms and conditions of this Creative Commons Attribution-ShareAlike 4.0 International Public License ("Public License"). To the extent this Public License may be interpreted as a contract, You are granted the Licensed Rights in consideration of Your acceptance of these terms and conditions, and the Licensor grants You such rights in consideration of benefits the Licensor receives from making the Licensed Material available under these terms and conditions.

Section 1 -- Definitions.

- a. Adapted Material means material subject to Copyright and Similar Rights that is derived from or based upon the Licensed Material and in which the Licensed Material is translated, altered, arranged, transformed, or otherwise modified in a manner requiring permission under the Copyright and Similar Rights held by the Licensor. For purposes of this Public License, where the Licensed Material is a musical work, performance, or sound recording, Adapted Material is always produced where the Licensed Material is synched in timed relation with a moving image.
- b. Adapter's License means the license You apply to Your Copyright and Similar Rights in Your contributions to Adapted Material in accordance with the terms and conditions of this Public License.
- c. BY-SA Compatible License means a license listed at creativecommons.org/compatiblelicenses, approved by Creative Commons as essentially the equivalent of this Public License.

(continues on next page)

(continued from previous page)

- d. Copyright and Similar Rights means copyright and/or similar rights closely related to copyright including, without limitation, performance, broadcast, sound recording, and Sui Generis Database Rights, without regard to how the rights are labeled or categorized. For purposes of this Public License, the rights specified in Section 2(b)(1)-(2) are not Copyright and Similar Rights.
- e. Effective Technological Measures means those measures that, in the absence of proper authority, may not be circumvented under laws fulfilling obligations under Article 11 of the WIPO Copyright Treaty adopted on December 20, 1996, and/or similar international agreements.
- f. Exceptions and Limitations means fair use, fair dealing, and/or any other exception or limitation to Copyright and Similar Rights that applies to Your use of the Licensed Material.
- g. License Elements means the license attributes listed in the name of a Creative Commons Public License. The License Elements of this Public License are Attribution and ShareAlike.
- h. Licensed Material means the artistic or literary work, database, or other material to which the Licensor applied this Public License.
- i. Licensed Rights means the rights granted to You subject to the terms and conditions of this Public License, which are limited to all Copyright and Similar Rights that apply to Your use of the Licensed Material and that the Licensor has authority to license.
- j. Licensor means the individual(s) or entity(ies) granting rights under this Public License.
- k. Share means to provide material to the public by any means or process that requires permission under the Licensed Rights, such as reproduction, public display, public performance, distribution, dissemination, communication, or importation, and to make material available to the public including in ways that members of the public may access the material from a place and at a time individually chosen by them.
- l. Sui Generis Database Rights means rights other than copyright resulting from Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the legal protection of databases, as amended and/or succeeded, as well as other essentially equivalent rights anywhere in the world.
- m. You means the individual or entity exercising the Licensed Rights under this Public License. Your has a corresponding meaning.

(continues on next page)

(continued from previous page)

Section 2 -- Scope.

a. License grant.

1. Subject to the terms and conditions of this Public License, the Licensor hereby grants You a worldwide, royalty-free, non-sublicensable, non-exclusive, irrevocable license to exercise the Licensed Rights in the Licensed Material to:
 - a. reproduce and Share the Licensed Material, in whole or in part; and
 - b. produce, reproduce, and Share Adapted Material.
2. Exceptions and Limitations. For the avoidance of doubt, where Exceptions and Limitations apply to Your use, this Public License does not apply, and You do not need to comply with its terms and conditions.
3. Term. The term of this Public License is specified in Section 6(a).
4. Media and formats; technical modifications allowed. The Licensor authorizes You to exercise the Licensed Rights in all media and formats whether now known or hereafter created, and to make technical modifications necessary to do so. The Licensor waives and/or agrees not to assert any right or authority to forbid You from making technical modifications necessary to exercise the Licensed Rights, including technical modifications necessary to circumvent Effective Technological Measures. For purposes of this Public License, simply making modifications authorized by this Section 2(a)(4) never produces Adapted Material.
5. Downstream recipients.
 - a. Offer from the Licensor -- Licensed Material. Every recipient of the Licensed Material automatically receives an offer from the Licensor to exercise the Licensed Rights under the terms and conditions of this Public License.
 - b. Additional offer from the Licensor -- Adapted Material. Every recipient of Adapted Material from You automatically receives an offer from the Licensor to exercise the Licensed Rights in the Adapted Material under the conditions of the Adapter's License You apply.
 - c. No downstream restrictions. You may not offer or impose any additional or different terms or conditions on, or apply any Effective Technological Measures to, the

(continues on next page)

(continued from previous page)

Licensed Material if doing so restricts exercise of the Licensed Rights by any recipient of the Licensed Material.

6. No endorsement. Nothing in this Public License constitutes or may be construed as permission to assert or imply that You are, or that Your use of the Licensed Material is, connected with, or sponsored, endorsed, or granted official status by, the Licensor or others designated to receive attribution as provided in Section 3(a)(1)(A)(i).

b. Other rights.

1. Moral rights, such as the right of integrity, are not licensed under this Public License, nor are publicity, privacy, and/or other similar personality rights; however, to the extent possible, the Licensor waives and/or agrees not to assert any such rights held by the Licensor to the limited extent necessary to allow You to exercise the Licensed Rights, but not otherwise.
2. Patent and trademark rights are not licensed under this Public License.
3. To the extent possible, the Licensor waives any right to collect royalties from You for the exercise of the Licensed Rights, whether directly or through a collecting society under any voluntary or waivable statutory or compulsory licensing scheme. In all other cases the Licensor expressly reserves any right to collect such royalties.

Section 3 -- License Conditions.

Your exercise of the Licensed Rights is expressly made subject to the following conditions.

a. Attribution.

1. If You Share the Licensed Material (including in modified form), You must:
 - a. retain the following if it is supplied by the Licensor with the Licensed Material:
 - i. identification of the creator(s) of the Licensed Material and any others designated to receive attribution, in any reasonable manner requested by the Licensor (including by pseudonym if designated);
 - ii. a copyright notice;

(continues on next page)

(continued from previous page)

- iii. a notice that refers to this Public License;
 - iv. a notice that refers to the disclaimer of warranties;
 - v. a URI or hyperlink to the Licensed Material to the extent reasonably practicable;
 - b. indicate if You modified the Licensed Material and retain an indication of any previous modifications; and
 - c. indicate the Licensed Material is licensed under this Public License, and include the text of, or the URI or hyperlink to, this Public License.
2. You may satisfy the conditions in Section 3(a)(1) in any reasonable manner based on the medium, means, and context in which You Share the Licensed Material. For example, it may be reasonable to satisfy the conditions by providing a URI or hyperlink to a resource that includes the required information.
 3. If requested by the Licensor, You must remove any of the information required by Section 3(a)(1)(A) to the extent reasonably practicable.

b. ShareAlike.

In addition to the conditions in Section 3(a), if You Share Adapted Material You produce, the following conditions also apply.

1. The Adapter's License You apply must be a Creative Commons license with the same License Elements, this version or later, or a BY-SA Compatible License.
2. You must include the text of, or the URI or hyperlink to, the Adapter's License You apply. You may satisfy this condition in any reasonable manner based on the medium, means, and context in which You Share Adapted Material.
3. You may not offer or impose any additional or different terms or conditions on, or apply any Effective Technological Measures to, Adapted Material that restrict exercise of the rights granted under the Adapter's License You apply.

Section 4 -- Sui Generis Database Rights.

Where the Licensed Rights include Sui Generis Database Rights that apply to Your use of the Licensed Material:

(continues on next page)

(continued from previous page)

- a. for the avoidance of doubt, Section 2(a)(1) grants You the right to extract, reuse, reproduce, and Share all or a substantial portion of the contents of the database;
- b. if You include all or a substantial portion of the database contents in a database in which You have Sui Generis Database Rights, then the database in which You have Sui Generis Database Rights (but not its individual contents) is Adapted Material, including for purposes of Section 3(b); and
- c. You must comply with the conditions in Section 3(a) if You Share all or a substantial portion of the contents of the database.

For the avoidance of doubt, this Section 4 supplements and does not replace Your obligations under this Public License where the Licensed Rights include other Copyright and Similar Rights.

Section 5 -- Disclaimer of Warranties and Limitation of Liability.

- a. UNLESS OTHERWISE SEPARATELY UNDERTAKEN BY THE LICENSOR, TO THE EXTENT POSSIBLE, THE LICENSOR OFFERS THE LICENSED MATERIAL AS-IS AND AS-AVAILABLE, AND MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND CONCERNING THE LICENSED MATERIAL, WHETHER EXPRESS, IMPLIED, STATUTORY, OR OTHER. THIS INCLUDES, WITHOUT LIMITATION, WARRANTIES OF TITLE, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT, ABSENCE OF LATENT OR OTHER DEFECTS, ACCURACY, OR THE PRESENCE OR ABSENCE OF ERRORS, WHETHER OR NOT KNOWN OR DISCOVERABLE. WHERE DISCLAIMERS OF WARRANTIES ARE NOT ALLOWED IN FULL OR IN PART, THIS DISCLAIMER MAY NOT APPLY TO YOU.
- b. TO THE EXTENT POSSIBLE, IN NO EVENT WILL THE LICENSOR BE LIABLE TO YOU ON ANY LEGAL THEORY (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE) OR OTHERWISE FOR ANY DIRECT, SPECIAL, INDIRECT, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY, OR OTHER LOSSES, COSTS, EXPENSES, OR DAMAGES ARISING OUT OF THIS PUBLIC LICENSE OR USE OF THE LICENSED MATERIAL, EVEN IF THE LICENSOR HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH LOSSES, COSTS, EXPENSES, OR DAMAGES. WHERE A LIMITATION OF LIABILITY IS NOT ALLOWED IN FULL OR IN PART, THIS LIMITATION MAY NOT APPLY TO YOU.
- c. The disclaimer of warranties and limitation of liability provided above shall be interpreted in a manner that, to the extent possible, most closely approximates an absolute disclaimer and waiver of all liability.

Section 6 -- Term and Termination.

- a. This Public License applies for the term of the Copyright and Similar Rights licensed here. However, if You fail to comply with this Public License, then Your rights under this Public License

(continues on next page)

(continued from previous page)

terminate automatically.

- b. Where Your right to use the Licensed Material has terminated under Section 6(a), it reinstates:
 - 1. automatically as of the date the violation is cured, provided it is cured within 30 days of Your discovery of the violation; or
 - 2. upon express reinstatement by the Licensor.

For the avoidance of doubt, this Section 6(b) does not affect any right the Licensor may have to seek remedies for Your violations of this Public License.

- c. For the avoidance of doubt, the Licensor may also offer the Licensed Material under separate terms or conditions or stop distributing the Licensed Material at any time; however, doing so will not terminate this Public License.
- d. Sections 1, 5, 6, 7, and 8 survive termination of this Public License.

Section 7 -- Other Terms and Conditions.

- a. The Licensor shall not be bound by any additional or different terms or conditions communicated by You unless expressly agreed.
- b. Any arrangements, understandings, or agreements regarding the Licensed Material not stated herein are separate from and independent of the terms and conditions of this Public License.

Section 8 -- Interpretation.

- a. For the avoidance of doubt, this Public License does not, and shall not be interpreted to, reduce, limit, restrict, or impose conditions on any use of the Licensed Material that could lawfully be made without permission under this Public License.
- b. To the extent possible, if any provision of this Public License is deemed unenforceable, it shall be automatically reformed to the minimum extent necessary to make it enforceable. If the provision cannot be reformed, it shall be severed from this Public License without affecting the enforceability of the remaining terms and conditions.
- c. No term or condition of this Public License will be waived and no failure to comply consented to unless expressly agreed to by the Licensor.

(continues on next page)

(continued from previous page)

- d. Nothing in this Public License constitutes or may be interpreted as a limitation upon, or waiver of, any privileges and immunities that apply to the Licensor or You, including from the legal processes of any jurisdiction or authority.

=====

Creative Commons is not a party to its public licenses. Notwithstanding, Creative Commons may elect to apply one of its public licenses to material it publishes and in those instances will be considered the "Licensor." The text of the Creative Commons public licenses is dedicated to the public domain under the CC0 Public Domain Dedication. Except for the limited purpose of indicating that material is shared under a Creative Commons public license or as otherwise permitted by the Creative Commons policies published at creativecommons.org/policies, Creative Commons does not authorize the use of the trademark "Creative Commons" or any other trademark or logo of Creative Commons without its prior written consent including, without limitation, in connection with any unauthorized modifications to any of its public licenses or any other arrangements, understandings, or agreements concerning use of licensed material. For the avoidance of doubt, this paragraph does not form part of the public licenses.

Creative Commons may be contacted at creativecommons.org.

INTRO

Welcome to Libre Space Foundation documentation. In these pages you can find operational principles, definitions, processes, and best practices for various internal workings of the Foundation.

- [search](#)

INDEX

A

AB, [93](#)
ABCL, [93](#)
AC, [93](#)
ACI, [93](#)
ACS, [93](#)
ACU, [93](#)
ADC, [93](#)
ADCS, [93](#)
AFSK, [93](#)
AFT, [93](#)
AGC, [93](#)
AGPL, [93](#)
AI, [93](#)
AIT, [93](#)
AIV, [93](#)
AM, [94](#)
AMSAT, [94](#)
AOCS, [94](#)
AOS, [94](#)
AoV, [94](#)
API, [94](#)
APT, [94](#)
ARM, [94](#)
ARRL, [94](#)
ARTES, [94](#)
ASIC, [94](#)
ASW, [94](#)
AXI, [94](#)

B

B2B, [94](#)
B2C, [94](#)
BaLun, [94](#)
BER, [94](#)
BMU, [94](#)
BOM, [94](#)
BPbis, [95](#)
BPF, [94](#)
BPSK, [95](#)
BR, [94](#)
BSD, [95](#)

C

CAD, [95](#)
CAN, [95](#)
CAN-FD, [95](#)
CC-BY-SA, [95](#)
CCD, [95](#)
CCI, [95](#)
CCSDS, [95](#)
CDR, [95](#)
CEPT, [95](#)
CERN, [95](#)
CERN-OHL, [95](#)
CFDP, [95](#)
CI, [95](#)
CI/CD, [95](#)
CIDL, [95](#)
CNC, [95](#)
COLDSUN, [95](#)
COMMS, [95](#)
CONOPS, [96](#)
COTS, [96](#)
CPLD, [96](#)
CPU, [96](#)
CRC, [96](#)
CSP, [96](#)
CSS, [96](#)
CV, [96](#)
CVCM, [96](#)
CW, [96](#)

D

D, [96](#)
DAC, [96](#)
DB, [96](#)
dB, [96](#)
DC, [96](#)
DDR, [96](#)
DL, [96](#)
DM, [96](#)
DMSA, [96](#)
DP, [96](#)
DR, [96](#)

DSN, [97](#)
 DSP, [97](#)
 DTN, [97](#)
 DUT, [97](#)
 DUV, [97](#)
 DVB-RCS, [97](#)
 DVB-S2, [97](#)

E

E2E, [97](#)
 Eb/N₀, [97](#)
 ECC, [97](#)
 ECCS, [97](#)
 ECSS, [97](#)
 EDAC, [97](#)
 EDEN, [97](#)
 EDRS, [97](#)
 EDV, [97](#)
 EGSE, [97](#)
 EIRP, [97](#)
 EM, [97](#)
 EMC, [97](#)
 EMI, [97](#)
 eMMC, [98](#)
 EMS, [98](#)
 ENBW, [98](#)
 ENOB, [98](#)
 EO, [98](#)
 EPS, [98](#)
 Es/N₀, [98](#)
 ESA, [98](#)
 ESOC, [98](#)
 ESR, [98](#)
 ESSB, [98](#)
 ESTEC, [98](#)
 ETA, [98](#)
 EUR, [98](#)

F

FAR, [98](#)
 FDIR, [98](#)
 FEA, [98](#)
 FEC, [98](#)
 FFT, [98](#)
 FITS, [98](#)
 FM, [98](#)
 FMC, [99](#)
 FOC, [99](#)
 FOR, [99](#)
 FORTH, [99](#)
 FOSDEM, [99](#)
 FOV, [99](#)
 FP, [99](#)
 FPGA, [99](#)

FR, [99](#)
 FSK, [99](#)

G

G/T, [99](#)
 GB, [99](#)
 GCC, [99](#)
 GEO, [99](#)
 GESTRA, [99](#)
 GFSK, [99](#)
 GHz, [99](#)
 GLONASS, [99](#)
 GMAT, [99](#)
 GmbH, [99](#)
 GNSS, [99](#)
 GNU, [100](#)
 GPCPU, [100](#)
 GPL, [100](#)
 GPS, [100](#)
 GPSd, [100](#)
 GPSDO, [100](#)
 GRAVES, [100](#)
 gRPC, [100](#)
 GS, [100](#)
 GSE, [100](#)
 GSoC, [100](#)
 GSPS, [100](#)
 GUI, [100](#)

H

HAL, [100](#)
 HDF5, [100](#)
 HDL, [100](#)
 HEEQ, [100](#)
 HEO, [100](#)
 HFT, [100](#)
 HPA, [100](#)
 HPC, [100](#)
 HQ, [101](#)
 HTML, [101](#)
 HW, [101](#)

I

I2C, [101](#)
 IaC, [101](#)
 IARU, [101](#)
 IC, [101](#)
 ICT, [101](#)
 IDE, [101](#)
 IDLE, [101](#)
 IEEE, [101](#)
 IESL, [101](#)
 IF, [101](#)
 IFFT, [101](#)

IO, [101](#)
 IOCR, [101](#)
 IOD, [101](#)
 IOT, [101](#)
 IP, [101](#)
 IP3, [101](#)
 IPND, [102](#)
 IPv4, [102](#)
 IPv6, [102](#)
 IQ, [101](#)
 ISI, [102](#)
 ISM, [102](#)
 ISON, [102](#)
 ISS, [102](#)
 ITT, [102](#)
 ITU, [102](#)
 ITU RR, [102](#)
 ITU-R, [102](#)

J

JAXA, [102](#)
 JPL, [102](#)

K

KO, [102](#)
 KOM, [102](#)

L

LCNS, [102](#)
 LDPC, [102](#)
 LEDSAT, [102](#)
 LEO, [102](#)
 LEOP, [102](#)
 LFSR, [103](#)
 LGPL, [102](#)
 LNA, [103](#)
 LO, [103](#)
 LOS, [103](#)
 LRPT, [103](#)
 LRR, [103](#)
 LSF, [103](#)
 LSTM, [103](#)
 LSTN, [103](#)
 LTAN, [103](#)
 LVDS, [103](#)
 LVTTL, [103](#)

M

M2M, [103](#)
 MAIV, [103](#)
 MB, [103](#)
 MCC, [103](#)
 MCMC, [103](#)
 MCOR, [103](#)

MCT, [103](#)
 MCU, [103](#)
 MDS, [103](#)
 MEMS, [104](#)
 MEO, [104](#)
 MEX, [104](#)
 MGSE, [104](#)
 MHz, [104](#)
 MIB, [104](#)
 MIMO, [104](#)
 MIT, [104](#)
 ML, [104](#)
 MLRR, [104](#)
 MoM, [104](#)
 MOOC, [104](#)
 MPL, [104](#)
 MPPT, [104](#)
 MPR, [104](#)
 MRG, [104](#)
 MRR, [104](#)
 MS, [104](#)
 MSK, [104](#)
 MSPS, [104](#)
 MSS, [104](#)

N

NASA, [105](#)
 NEC2, [105](#)
 NF, [105](#)
 NIST, [105](#)
 NORAD, [105](#)
 NRZ-M, [105](#)
 NS-3, [105](#)
 NSL, [105](#)
 NTE, [105](#)

O

OBC, [105](#)
 OBSW, [105](#)
 OCS, [105](#)
 ODM, [105](#)
 OEM, [105](#)
 OOL, [105](#)
 OOT, [105](#)
 OpenEMS, [105](#)
 OpenSatCom, [105](#)
 OPS, [105](#)
 OS, [105](#)
 OS3, [105](#)
 OSCW, [106](#)
 OSDLP, [106](#)
 OSI, [106](#)
 OTA, [106](#)
 OTP, [106](#)

P

PA, [106](#)
PAPR, [106](#)
PC, [106](#)
PCB, [106](#)
PCDU, [106](#)
PCIe, [106](#)
PDM, [106](#)
PDR, [106](#)
PL, [106](#)
PLL, [106](#)
PLM, [106](#)
PMIC, [106](#)
PNT, [106](#)
PoC, [106](#)
PoE, [106](#)
POSIX, [106](#)
PQ, [107](#)
PSK, [107](#)
PSLV, [107](#)
PV, [107](#)
PWM, [107](#)
PWP, [107](#)

Q

QA, [107](#)
QPSK, [107](#)
QSFP, [107](#)

R

R&D, [107](#)
RAAN, [107](#)
RAM, [107](#)
RD, [107](#)
REST, [107](#)
RF, [107](#)
RFMC, [107](#)