

BUILDING A FREE INTERNET OF THE FUTURE



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We are extremely grateful to all the interviewees who kindly gave us their time and generously shared their insights and learnings.

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Introduction

How can we be independent from big corporations and their cloud servers? Can we build digital technologies for the common good while advancing user freedom? Is it possible to secure access to vital information for isolated communities and in places of confinement? Or to extend the life of consumer electronics? Can we share our online videos without relying on the major commercial platforms?

If key questions like these pique your interest, you've come to the right place. In this publication, you'll find a collection of interviews from the series "Building a Free Internet of the Future",ⁱ published monthly by the Association for Progressive Communications (APC) between 2024 and 2025. This series focuses on the experiences and perspectives of individuals and communities supported by the NGI Zero (NGI0) grants for free software, open data, open hardware and open standards projectsⁱⁱ – who are often absent from dominant technological narratives.

Aiming to foster a more inclusive and accessible digital future, NGI0 provides financial and practical support to individuals, non-profit or for-profit organisations, research groups and collectives in different ways, including mentoring, testing, security testing, accessibility, dissemination and more. Their real-life experiences reveal the concrete challenges of digital exclusion and the innovations they have developed to overcome them. Rather than focus on abstract technological ideals, each interview highlights practical, community-based initiatives, tangible actions and replicable models that others can learn from and adapt.

Here you will find conversations about access to vital information anywhere; balancing accessibility and privacy for secure digital collaboration; a printer for embossing texts and plans; how we write our political values into our code; digital accessibility as a human right; an alternative to YouTube; the urgency of offering services to civil society; open source software in healthcare; free software for self-organising and local communities; access to information when websites are experiencing technical difficulties or are being blocked; extending the life of consumer electronics and much more. They reflect on the challenges, limitations, power relations and labour relations that permeate the field of free technologies – seeking to avoid a simplistic or solutionist approach, and instead create necessary conversations.

i. <https://www.apc.org/en/tags/building-free-internet-future>

ii. <https://www.ngi.eu/ngi-projects/ngi-zero/>

By bringing these conversations together, this publication becomes yet another way to share information about alternative services and infrastructures, as well as reflections on the political choices behind technologies. It documents a visionary, grounded, creative and diverse movement for an internet that serves everyone, not just those with the most power or wealth. Hopefully, sharing these voices will help us broaden necessary debates and identify steps to build digital futures in which the technologies that permeate the daily lives of millions of people are not only those based on extractivism, intensified surveillance and warfare, concentration of power, and accentuated inequalities.

Xavier Coadic, a free/libre and open source software activist with 15 years of experience in free and open source cultures and communities, was in charge of leading the interviews that you will find here. He once said:

“The code we create and the tools we use can help or harm humanity. We embed our political values in our code,” Esther Payne told me during an interview for the “Building a Free Internet of the Future” series. [...] Sharing is caring. I put a bit of myself into what I shared. And I will continue to ensure that things that cause problems are done differently. I will continue to try to work with others to create the conditions for the creation and implementation of technology that can belong to everyone. And I am not doing it alone. We are doing it together.

We hope these conversations inspire you and ignite a renovated hope in concrete and potential possibilities for all people, particularly the marginalised, to use and shape the internet and digital technologies to create a just and sustainable world. For us at APC, they certainly support this broader vision, while reinforcing our commitment to promoting a free, open and inclusive internet.

CryptPad on how
it balances
accessibility
and privacy for
secure digital
collaboration



CryptPad on how it balances accessibility and privacy for secure digital collaboration

16 July 2024

We are excited to launch Building a Free Internet of the Future, a new monthly series of interviews with **NGI Zero (NGIO)**¹ grantees. With funding from the European Commission, NGIO supports open source, open data, open hardware and open standards projects. It provides both financial and practical support in a myriad of ways, including mentoring, testing, security tests, accessibility, dissemination and so on.

1 <https://www.apc.org/en/project/next-generation-internet-zero>

We begin the series with an interview with CryptPad.

Next Generation Internet (NGI) is a European Commission initiative shaping an internet that responds to people's fundamental needs, including trust, security and inclusion. NGI0 is a non-profit coalition that provides the NGI an effective funding mechanism, with a mission to support the development of free/libre/open source software and hardware, open standards and open data. NGI0 coordinates several NGI Research and Innovation Actions (RIAs), including NGI Zero Review, NGI Zero Entrust, NGI Zero Core and NGI Zero Commons Fund.

APC is a member of the NGI0 consortium led by the **NLnet Foundation**² that implements a range of actions to provide a funding mechanism for over EUR 50 million granted to hundreds of independent researchers and open source developers working on and for a better internet. In addition to receiving a grant, funded projects are supported by domain experts in various fields such as diversity, security, accessibility and licence compliance, among others.

Launched in 2017 by open-source French company XWiki SAS, **CryptPad**³ provides a full suite of end-to-end encrypted tools for work collaboration. Their applications have grown from a simple editor to include rich text, spreadsheets, code/markdown, kanban, slides, whiteboard and forms. You can either use the service provided by CryptPad.fr, host a CryptPad suite yourself, or find access to the suite from other providers.

Since 2019, CryptPad has received **funding**⁴ from NGI Assure, NGI0 Pet and NGI0 Entrust, enabling it to work on a number of **developments**⁵ and improvements around security, accessibility and others. The latest funding, which focused on the use of **cryptography**⁶ on the platform, ended in May 2024.

APC spoke to David Benqué, graphic designer in charge of UI/UX [user interface and user experience], and Mathilde, deployment engineer who also does community and support.

This interview has been edited for clarity and length.

2 <https://nlnet.nl/>

3 <https://cryptpad.org/about/>

4 <https://nlnet.nl/search/static.html?q=cryptpad&submit=Search>

5 <https://cryptpad.fr/kanban/#/2/kanban/view/PLM0C3tFWvYhd+EPzXrbT+NxB76Z5DtZhAA5W5hG9wo/>

6 <https://nlnet.nl/project/CryptPad-Blueprints/>

There are several services across the world comparable to CryptPad with different human rights and ICT governance orientations. These orientations are linked to politics, laws and local and international regulations. How does CryptPad act in these entanglements?

Benqué: There are end-to-end encrypted (e2ee) services [that] are good at messaging (e.g. Signal), personal note-taking (without collaboration, e.g. Joplin) or document storage (without editing, e.g. Proton Drive). [However,] there are actually not many products in the Venn diagram of e2ee + document editing + real-time collaboration.

As an e2ee product, one of our challenges is knowing who uses it, since we don't collect data. We know that CryptPad is used in the EU Commission, for example, and in many NGOs. Recent developments in the EU that make US products such as Office 365 technically illegal in public administration and education should mean that more and more people are seeking alternatives, but in practice I don't think many people are adhering strictly to these guidelines. Companies like Microsoft are also deploying counter-strategies, such as basing some servers in the EU.

The larger projects we are involved in via XWiki, our parent company, often rely on some notion of "sovereignty", meaning EU countries recognising the need to have IT solutions that they "own", and open-source as a good way to do this. However, in our host country France, the government is also unrolling the red carpet for Microsoft data centres and storing everyone's healthcare data on Amazon Web Services, so it's hard to find a rational logic behind all of this.

How has CryptPad benefited from the NGIO grants it received from 2019 to 2022 (including NGIO Entrust in 2022)?

Benqué: These grants were really crucial in getting CryptPad off the ground. They each added features to CryptPad, such as team drives, helping to build a product that was credible in the market. In my previous role in academia, I was involved in EU funding as part of the FP7 programme (before H2020), and I remember being impressed with how lightweight the bureaucracy was on the NGI grants. They were quite efficient and targeted at delivering tangible improvements.

Coexisting with Google Drive and Microsoft Teams and others, how do you see CryptPad's influence on end users (both individuals and organisations)?

Benqué: For individuals, communities and small businesses, we hear more about complete replacement of big-tech solutions with people "moving to CryptPad".

When talking with potential enterprise clients, however, it seems pretty hard to dislodge them from GSuite or Office 365, so what we are seeing is a use of CryptPad alongside these solutions, perhaps for extra-sensitive documents, or for C-suite professionals, a kind of extra secure enclave within the company's existing infrastructure.

It can be disheartening to be against such giants, to be honest: it's not just **GAFAM**⁷ but anyone who is funded by venture capital. Basically any one of our competitors operates on budgets that are at least one order of magnitude more than ours, if not more. Over the years, CryptPad has accrued functionality to the point that it aims to be usable as a complete office suite solution (with the exception of email, which I doubt we will ever enter).

7 <https://fr.wikipedia.org/wiki/GAFAM>

There is a “CryptPad for non-profits” plan, where testimonials from justice and climate activists, journalists, human rights defenders, etc. can be seen. Is CryptPad a useful tool to reduce the digital divide and the impact of digitisation, when marginalised populations are not taken into account in decision-making processes?

Benqué: We’d like to think CryptPad is useful to marginalised populations and groups. I’d have to [qualify] this, however, as CryptPad relies on the client to encrypt/decrypt everything – the person’s device is a key part of our product. So the better your laptop and internet connection, the better your experience of CryptPad will be. At the moment, for example, CryptPad is very hard to use if your only access to the internet is a smartphone.

How do you define accessibility within CryptPad? How do you your work on this technically?

Benqué: It’s one of our focuses. For the record, I joined the team in 2019 as a UI/UX designer. So in that capacity, in fact, a lot of things already existed; the product more or less already existed in its current form. There are a few things that have changed since then in terms of functionality; but there was a huge debt in terms of design and accessibility that just hadn’t been taken into account at all until that point. Personally, I didn’t have a lot of experience with that either, but I did learn about it through the feedback we got on NGI projects. I applied for a position with XWiki as an employee, and I took some training courses to find out how I could push this forward.

At the moment we have a part-time junior called Daria working in the team. She’s been doing just that since her internship last summer. We have a huge debt. I think anyone who can audit an application can see quite quickly that CryptPad isn’t great in terms of accessibility. We have a huge technical debt here.

Google Docs recently [cut off access](#)⁸ for a romance writer to all her works in progress. What does CryptPad do with the content of people who use it? Does it, with its general terms of use, have access to what people write or post on CryptPad.fr?

Mathilde: There are two different things here. There's the CryptPad product itself, the software, and then there's the server that we host, CryptPad.fr. It's important to make a distinction between the two. The CryptPad product is governed by a code of conduct [while] the CryptPad.fr service is governed by general terms and conditions of use, a privacy policy, etc.

You can find our privacy policy on CryptPad.fr, which states that everything is end-to-end encrypted, so we don't have access to the content of the documents (see the section "What we know about you and how we use this information").

We also have a lot more information in our [Terms of Service](#).⁹ We define rules that form a framework that will enable us to work on moderation and then on content. For example, we define that "people using CryptPad are not allowed to publish racist, xenophobic, homophobic, transphobic, ableist or classist content." There's a whole list of things in detail.

It's interesting that you should ask this question, because we've been contacted several times recently by people who are involved in erotic literature and who were worried about this, whether CryptPad could be a solution for their work, or simply for respecting their privacy. Which in the end also more or less touches on the sex work environment, in a way. We've revised our terms and conditions of use several times, the last on 27 March 2024 when, thanks to feedback from several users, we amended [them] to make them clearer and explicitly permit the use of the platform and service for this type of action.

8 <https://www.wired.com/story/what-happens-when-a-romance-author-gets-locked-out-of-google-docs/>

9 <https://cryptpad.fr/code/#/2/code/view/j18D9zbfY98cwWPGHPv91vIIeYOy0tCGk1gCD5UOzlk/present/>

We used to say something along the lines that we couldn't publish content [pertaining to] any physical or sexual abuse. Typically, this is a clause that can be used by service providers to block access, to delete content, particularly from people who write erotic stories where there may be things that could be interpreted [as] abuse, even if that part of the content [contained] consent. Since then, we've changed the sentence saying that the user agrees not to publish content that promotes physical or sexual abuse in the real world. This is for the French version, because the English translation has always been a bit complicated on these terms. Typically, victims' stories and any documentation about abusers can be published on the service, no problem.

These issues are important because they are extremely political and extremely intimate, but they are rarely put on the table of discussion in the area of free software.

Mathilde: Quite often, yes. I've been in the free software world for 15 years [and] what I've noticed is that there is a very legalistic vision of free software. We talk about software neutrality and refer to the legal framework, saying "I don't want to do anything wrong with moderation a priori because I don't want to risk being sued for defamation." In short, "I'll do what the police or a judge orders me to do."

We are trying to go a little further than that, especially as we have a particular responsibility in the sense that the product we've created, and which we use to run our service, prevents us from accessing the content that is put online, that is written by people. So there is a whole new issue around moderation: how to act, how to pass on information, how people can contact us, report undesirable content. And we deal with it upstream.

BrailleRAP on
how it is
enabled most by
the links made
due to open
licensing



BrailleRAP on how it is enabled most by the links made due to open licensing

23 August 2024

We present the second in the Building a Free Internet of the Future series, where we publish a monthly interview with NGI Zero (NGI0) grantees. With funding from the European Commission, NGI0 supports open source, open data, open hardware and open standards projects. It provides both financial and practical support in a myriad of ways, including mentoring, testing, security tests, accessibility, dissemination and more.

This month, we have an interview with **BrailleRAP**,¹⁰ an open source printer that produces documents in **Braille**.¹¹ In 2016 in France, the **My Human Kit**¹² association organised a hackathon called Fabrikarium in collaboration with Airbus Industries. During the Fabrikarium, several projects modified 3D printers to emboss Braille onto 160g paper. One such project was BrailleRAP, an open source embosser that can output Braille text in dozens of languages and can emboss contours, including building plans, animal shapes and maps. They also provide an application to transcribe Braille.

In 2024, BrailleRAP received **NGIO Entrust funding**.¹³ APC spoke to Stéphane Godin, creator of BrailleRAP.

This interview has been edited for clarity and length.

BrailleRAP has been around since 2016 and this year it received a grant from NGIO. What does this change for you?

The grant from the **NGIO Entrust**¹⁴ programme of the NLnet Foundation will allow us to devote time to developing the software associated with the use of the Braille embosser. Like many open source projects, BrailleRAP started without funding. In these conditions, it is difficult to make the project known and to develop it in a coherent way to have a real impact in the field.

10 <https://www.braillerap.org/en/index.html>

11 <https://en.wikipedia.org/wiki/Braille>

12 <https://myhumankit.org/en/home/>

13 <https://nlnet.nl/entrust/>

14 <https://nlnet.nl/thema/NGIOEntrust.html>

Embossing text with a printer is an important way of providing access to various communications such as cultural content, education, legislation, etc. Your project is under a free licence, which means it can be contributed to, reproduced, reused, modified and marketed. Who makes BrailleRAP?

Today BrailleRAPs are made by **fab labs**¹⁵ (fabrication laboratories) or universities, but also by individuals concerned by visual disability in their surroundings.

To date, I know of just over 30 BrailleRAP machines built around the world. On the other hand, some of them are built completely independently without me being informed, which is normal, as the licence allows it. So I discover new ones from time to time in a post on social media.

BrailleRAP is a project with reproductions and contributions in India since 2018 and in Cameroon since 2022. How did these international links happen?

Cameroon is a special case. It's linked to a meeting between My Human Kit, the Climate Change Lab and ANIAAC-Intégration et Accommodation des Personnes Aveugles au Cameroun (Integration and Accommodation of Blind People in Cameroon), an association of visually impaired people in Cameroon, at a forum organised by AIMF (l'Association Internationale des Maires Francophones/the International Association of French-Speaking Mayors). This meeting led to a three-week mission to Cameroon where we organised four assembly workshops in four different towns. Above all, **BrailleRAP Cameroon**¹⁶ provided an opportunity for day-to-day collaboration with an association of visually impaired people. This long-term collaboration had a major influence on the project's specifications.

15 https://en.wikipedia.org/wiki/Fab_lab

16 <https://forgecc.org/?BraillerapCameroun>

For the other contributions, it was a matter of chance encounters at events or during internet searches. It's a chance meeting that brings together a need for Braille with the world of makers,¹⁷ fab labs and universities.

A “classic” Braille embossing machine costs EUR 4,000 to EUR 5,000. For BrailleRAP you estimate a working time of 16 to 22 hours and a material supply cost of EUR 100 to EUR 200, provided you have access to certain digitally controlled manufacturing machines (laser cutting and 3D printing equipment, in particular). It seems that BrailleRAP is not just about making things, it's also about access to resources and social links to get support. How is this materialising in the development of the BrailleRAP project?

This touches on our perception of the world in a consumer society. We tend to think that if the solution to a problem isn't offered by the market, or if that solution is too expensive, we don't have a solution. As if an abstract entity proposed and had always proposed all the solutions in the world. There is another way, not necessarily contradictory but complementary, which consists of bringing together resources and skills to propose solutions. In a way, fab labs have highlighted this phenomenon by encouraging the mixing of populations, and therefore of needs on the one hand and skills on the other. All in the midst of a set of tools that enable experimentation and prototyping.

This is the story of BrailleRAP, where a few people meet a visually impaired person and try to produce Braille. Other people took up this work and produced a prototype machine, the first BrailleRAP. BrailleRAP then crossed paths with Liblouis,¹⁸ a long-standing project in the free software world, which enables text to be translated into Braille in most of the world's languages. And then we begin to see a solution for producing Braille in a family, an association or a small school in a rural environment.

17 https://en.wikipedia.org/wiki/Maker_culture

18 <https://liblouis.io/>

In the end, the common thread running through the BrailleRAP adventure is the documentation of the project and its distribution via the internet. It's really the wide dissemination under open licence that makes it possible to establish links between the various players. Players who will then have an impact locally through their day-to-day activities.

BrailleRAP also allows you to learn how to use the tactile writing that is Braille. Learning and sharing are important mechanisms in our social life. Is BrailleRAP working on the inclusion of individuals in these mechanisms?

Yes indeed, in a number of ways. Firstly, BrailleRAP is a digital machine, so it can be used to organise introductory workshops in which we'll be looking at digital manufacturing through laser cutting and 3D printing. A bit of mechanics, a bit of electronics and software to control it all. These workshops are interesting because, on the one hand, they demystify the complexity of these machines and of digital technology and, on the other hand, the social aspect of the project illustrates the use of digital technology from an angle that is not very often highlighted: inclusion. It helps to raise awareness or train people in digital technologies, while also making them aware of the fact that digital is a tool. And a tool does not define the meaning of its use, so we can make digital social, environmental, inclusive or just useful.

The second area is raising awareness of inclusion in our societies. BrailleRAP started out as a technical project, with the challenge of coming up with plans for a functional machine that would be easy to reproduce. But as the project evolved, I realised that Braille is a real problem. It is often taken as a symbol of accessibility, even though it affects around 10% of blind and partially sighted people. To illustrate, if you put Braille signs in a lift, they will be used by 10% of blind and partially sighted people, with the other 90% getting by. And from time to time we find Braille signs mounted upside down, i.e. illegible for a blind person.

The third area is education. In terms of everyday inclusiveness, Braille is competing with more recent audio technologies. On the one hand, these discussions neglect multiple sensory disabilities, i.e. the blind and hard of hearing. On the other hand, for school-age children, Braille is the mastery of the written word, in other words, the minimum condition for being able to attend a normal school.

Some people see collaborative manufacturing as a means of empowerment by putting oneself into a project.¹⁹ Do you have any examples of “power development” and “self-projecting” experienced through BrailleRAP?

In the midst of the multitude of open source projects, BrailleRAP has a real distinctive feature. The “beneficiaries” of the machine can’t make it – it’s still too complex to be accessible. On the other hand, the people who assemble the embossing machine cannot read Braille. This means that everyone is partially disabled:

The beginner **maker**²⁰ realises that they can make a useful machine with strong social significance.

The experienced maker realises that they need someone to validate the operation of the machine they have just finished.

The blind person who validates the Braille impresses the makers with their ability to decode Braille with touch.

Starting up a BrailleRAP at the end of the workshop is always a moment of catharsis when all the participants realise the power of the collective. Without their personal contribution, it doesn’t work, and without the contribution of others, it doesn’t work either. We go completely beyond the technical object that is BrailleRAP to move into the human, the awareness of ourselves and others.

19 <https://theses.fr/2021REN20021>

20 https://en.wikipedia.org/wiki/Maker_culture

What are BrailleRAP's plans for the near future?

Ever since we started working seriously on embossing graphics, I realised that the A4 format of the historical BrailleRAP was a bit limited. So BrailleRAP now comes in two models, the historical BrailleRAP which can emboss up to A4 format, and the BrailleRAP XL which can emboss up to A3 format. As for software, funding from NGI means that we can concentrate on development. DesktopBrailleRAP can now be used to create page layouts by mixing vector graphics and Braille text.

In the short term, there will be Linux versions of both AccessBrailleRAP and DesktopBrailleRAP, which will broaden the range of possibilities and subjects that can be addressed in workshops. The projects also include software for downloading OpenStreetMap data under free licences and producing tactile maps of underground stations, campuses and crossroads.

In terms of major events, we're currently preparing a mission to Réunion Island in partnership with local associations and a local fab lab. And we're looking for funding to carry out experiments as an extension of BrailleRAP Cameroon, in Congo, Senegal, Tanzania, etc. We're also in regular contact with associations for the visually impaired in France and Europe, so there's certainly a lot to explore.

Librecast on building the next-generation internet: “The code we create and the tools we use can help or harm humanity. We write our political values into our code”0



BUILDING A FREE
INTERNET OF
THE FUTURE

Librecast on building the next-generation internet: “The code we create and the tools we use can help or harm humanity. We write our political values into our code”

14 September 2024

This is the third instalment of APC’s Building a Free Internet of the Future series, in which we publish a monthly interview with the beneficiaries of the NGI Zero (NGI0) grant. Funded by the European Commission, NGI0 supports free software, open data, open hardware and open standards projects. It provides both financial and practical support in a myriad of ways, including mentoring, testing, security tests, accessibility, dissemination and more.

This month we speak to Esther Payne, community manager and privacy advocate at **Librecast**.²¹ The organisation develops free and open source (FOSS) software to enable **multicast**²² transmitting data to groups simultaneously without depending on a centralised structure. The project began in 2016, and in 2019 they successfully applied for the first NGI0 programme called **Search and Discovery**.²³ Librecast Live, a multicast live-streaming, conferencing and remote collaborative work environment, was also eventually funded by the NGI Assure Fund. As the team leaders **say**,²⁴ Librecast is a “human rights project masquerading as a technology project”, and we were eager to explore how and why this might be the case.

This interview has been edited for clarity and length.

How did you hear about NGI0?

We’ve always been on the lookout for research and development (R&D) funding, but very often those funds were tied to being available for institutions and businesses rather than individuals or small FOSS projects just getting started. So the ease of the NLnet process for small starter allocations really made a difference to us. It helped us to get started and expand the concept from our initial **multicast IoT updater proof of concept**.²⁵

We were also fortunate to get a small grant allocation for testing our IoT software updates over IPv6 multicast (IoTup) code with **Fed4FIRE**.²⁶ What we’ve always loved about NGI Zero is that the selection committee does take the time to understand each application, and will contact the applicants to see how prepared they are to undertake a project. The NGI Zero approach with its various partners really gives us support and helps with project sustainability. NLnet also takes care to interact with the FOSS community so that we know what services and potential funding and support programmes are available.

21 <https://librecast.net/>

22 <https://en.wikipedia.org/wiki/Multicast>

23 <https://nlnet.nl/discovery/>

24 <https://nlnet.nl/project/LibreCastLiveStudio/interview.html>

25 <https://librecast.net/iotupd.html>

26 <https://web.archive.org/web/20231130005822/https://www.fed4fire.eu/demo-stories/cc/librecasttesting/>

In a 2023 essay titled “Five Years of NGI Zero”,²⁷ you affirm your collaborations with other NGI0 members, encourage others to apply to NGI0 and also invite them to ask you for assistance. What makes you so committed?

I’m committed to my project Librecast, and beyond that to NGI because of where it starts from – human rights. Our current landscape online is dominated by walled gardens, like Facebook, Instagram, Microsoft and Google. All of these firms are American. They provide a service to people but human rights, specifically, the right to privacy, are left at the door.

Our society and our government have enabled the rights of corporations over the rights of humans to live in safety, privacy and dignity. We also see access to the internet being curtailed by some regimes to stop communication with the rest of the world with net blockages. There’s a copy of the Universal Declaration of Human Rights hanging on my office wall. Every time I look at it, it helps me to reaffirm my commitment to helping others safeguard their human rights.

The code we create, and the tools we use, can help or harm humanity. We write our political values into our code and the communities we create around our projects. So the code we write must start from the concept of human rights, specifically the right to privacy and freedom of association. All of the projects that NGI Zero has funded do encode that concept of human rights in some way. I want to help other people join NGI Zero as a funded project because this means they are committed to those values as well. With more of us, there are more ways we can work together to build the **Next Generation Internet (NGI)**.²⁸

27 <https://www.onepict.com/20231103-5years.html>

28 <https://ngi.eu/>

The NGI0 grant budget is dedicated to features and R&D work. Which activities has NGI0 enabled you to execute?

I'm fortunate that my co-founder Brett Sheffield recognises my work for Librecast and outside Librecast. Partly that's because we've worked together for over 15 years. The funding has enabled both of us to work on Librecast full time, Brett codes and I help him stay focused on the code. I write grant proposals for additional work, run the community-facing tasks, liaise with other projects and help keep the focus on our goals. Very often individual developers are working alone and a bit overwhelmed, looking for additional funding or ways for their software to be distributed. This is the social aspect, the community aspect. I'm happy to provide that support, but I'm very aware that work is often underappreciated in other project communities.

NGI Zero gives projects additional resources to build on community and security, but the fund also offers developers the discretion to distribute a portion of the grant to the support around them. When you are funded, it does take away the worry [of money]. This in turn means you can help other projects if they have a shortfall in skills, or even if they just need some advice with funds or resources they can apply for. I feel that I need to give back in any way that I can. There's a saying, "A rising tide lifts all boats"; I want to ensure that more of us get on the boat, or better yet, build more boats. I want to help projects build healthy communities together. NGI Zero lets me do this.

Do you collaborate with other projects extended grants by NGI0?

Librecast is still a fairly small, young project. For the first few years of NGI Zero, it's mostly been social coordination with fellow NGI0 grantees. We have one project in particular that we are close to – **Interpeer**²⁹ – which offers technologies for open and distributed software architectures. They aim to provide a secure and efficient human-centric networking stack that protects human rights by design. Both of our projects are focusing on human rights and how that applies to the whole stack. Librecast and Interpeer have very similar, explicit goals for designing software and networks, starting from human rights. Both projects are aiming to design networks with the freedom of speech and association explicitly built in from the beginning. This is where the political coordination begins. Designing software that anyone can run, study, modify and distribute is a political action. Choosing to reject proprietary software development is an explicit political and social act. You're choosing to give your work to the community.

We are working to integrate Librecast into Interpeer. We've always aimed to provide tools (like LCRQ and liblibrecast) as software libraries so that other developers can create multicast applications. We build small tools so that others can easily see our code and adapt it.

We recently said in our **NGI interview**,³⁰ "We don't do this alone. We have no competitors. Everyone who is working to improve and protect human rights is our ally. There are many paths to the top of this mountain." We also recently signed the NGI open letter which Petites Singularities created in response to NGI being dropped from Cluster 4 funding. It's wonderful to see so many projects and organisations step up and be visible. NGI funding has made a huge difference to so many projects. I hope we can collaborate with other projects in the future the way we are with Interpeer.

29 <https://interpeer.org/>

30 <https://ngi.eu/ngi-interviews/esther-payne-and-brett-sheffield-librecast/>

There is no guarantee that the NGI0 cascade funding mechanism will be renewed.³¹ As you mentioned, you signed an open letter³² [also signed by APC] asking for continued financial support for free software. What is your view of this case?

We have to look at the current context of the wider tech world. AI investment is hot right now. NGI Zero was told there was no space in the budget as most of it was invested in AI. If you look at the open letter, you will see that AI projects signed it. So there's something more complex going on here than AI hogging all the attention and funding.

Horizon EU is focused on industrial R&D. It wants to help create large unicorn organisations in the mould of Google, Facebook, Microsoft, etc. I have a few issues with this goal. Most innovation tends to happen in very small teams or among individuals. When you create large organisations, they will often end up headquartered in large cities. Conversely, the EU wants to stop the depopulation of certain empty parts of Europe that have been traditionally agricultural. But the EU isn't a monolithic organisation: it has to serve citizens and residents who have different goals. FOSS has the potential to decentralise this so that people can work from home and collaborate remotely, which could mean that more of us could live in these depopulated spaces. It would also be better for the environment.

Taking it back to NGI Zero, cancelling the cascade funding will make life harder for projects. The impact of this cut won't be felt in 2025. It will be felt from 2026 onwards as the current NGI programme, NGI Zero Core, and then other NGI programmes, close in 2027. The potential for FOSS funding will be reduced in 2025 with the recent news that the RIPE Community Projects Fund is taking a break for a year.³³ While we have the Sovereign Tech fund,³⁴ it will not cover new ideas or new projects.

31 <https://netzpolitik.org/2024/next-generation-internet-eu-apparently-set-to-end-open-source-programme/#netzpolitik-pw>

32 <https://www.apc.org/en/pubs/european-union-must-keep-funding-free-software>

33 https://labs.ripe.net/author/alastair_strachan/ripe-ncc-community-projects-fund-paused-for-2025/

34 <https://www.sovereign.tech/>

There will be less money to go around and projects that need additional money to fund continued development won't have that.

The internet and web that we have today is a result of years of work and huge amounts of investment. Development on projects in the **Fediverse**³⁵ in comparison has been on a shoestring budget. We give a huge amount of value. We're spread across Europe and the world. The cancellation of cascade funding would be a disaster for the FOSS community. Which is ridiculous when you consider how much of our systems run on FOSS. Without that funding, you risk more **XZ security attacks**³⁶ and potentially another **CrowdStrike**.³⁷

The EU needs to consider longer term investment, as in decades, not three-year programmes. Otherwise, if any projects do become unicorns they will just decamp to California where their VCs (venture capitals) tell them to go. In order to build that next-generation internet, you need to have people from different backgrounds, orientations and lived experience to build it. The NGI Funds, particularly NGI Zero, are unique because of the openness of the calls.

35 <https://www.apc.org/en/glossary/fediverse>

36 https://en.wikipedia.org/wiki/XZ_Utils_backdoor

37 https://en.wikipedia.org/wiki/2024_CrowdStrike_incident

Accessibility
Foundation on how to
be at the forefront
of digital
accessibility as
a human right



BUILDING A FREE
INTERNET OF
THE FUTURE

Accessibility Foundation on how to be at the forefront of digital accessibility as a human right

15 October 2024

We are delighted to continue Building a Free Internet of the Future, a monthly series of interviews with beneficiaries and consortium members of NGI Zero (NGI0) grants. Funded by the European Commission, NGI0 supports free software, free data, free hardware and free standards projects. It provides both financial and practical support in a myriad of forms, including mentoring, testing, security testing, accessibility, dissemination and more

This month we present an interview with Eric Velleman, a professor at the **HAN University of Applied Sciences**³⁸ and co-founder of the **Accessibility Foundation**.³⁹ The university's department of Inclusive Design & Engineering is a member of the NGIO consortium, where its main role is to provide accessibility audits and other support for projects awarded a grant by the consortium. The Accessibility Foundation also collaborates on NGIO.

Eric Velleman has been working on digital accessibility for decades. With his research on the implementation of digital accessibility in Dutch municipalities he obtained a PhD from the University of Twente in 2018. He has also studied digital accessibility in sectors such as the Dutch government, business and healthcare, including case studies for the Ministry of the Interior and the Dutch Institute for Human Rights. He has built a large international network in the field of inclusive digital design and engineering.

This interview has been edited for clarity and length.

What is at stake in your work as an expert and scientist on digital accessibility?

Digital tools have become an indispensable part of our daily lives. They influence the way we work, learn, travel and shop. And they are developing at lightning speed. But what if you can't take part in the digital society or have trouble doing so because of a visual, motor or auditory impairment?

If we want the new digital world to be inclusive, we need to ensure that new media and technology applications are made accessible from the start. This means that we have to stand at the forefront of innovation. We need innovators to be aware of accessibility and include persons with disabilities from the start of their innovation process.

38 <https://www.hanuniversity.com/en/research/research-center/inclusive-digital-design-engineering/>

39 <https://www.accessibility.nl/>

Reaching this goal requires time and attention. Time and attention for the individual citizens with a disability, so they can get the support they need to effectively use all these digital tools. Time and attention for companies to develop accessible digital products, so that everyone can use them. Time and attention for public authorities and institutions, so that all citizens, including those with disabilities, can be part of the next generation internet from the start.

Digital inclusion needs awareness and constant attention. By providing this for all NGI0 projects in the form of guides, audits, student assignments and presentations, we try to ensure accessibility from the start. But we need everyone's help! Because without this support, we have seen that accessibility is quickly forgotten, with dramatic results for inclusion.

What do you do at NGI0 and what are the projects you work on?

We are looking into the many different technologies and subjects that have found their way into the NGI funding programmes that we support. For example, we have worked on accessibility of digital currencies, augmented reality, virtual reality, low code platforms, video and audio platforms, hardware and software for privacy and security, and more than 450 projects till now. Just have a look at the **long list of projects that have been awarded grants**⁴⁰ to understand the variety of innovations we support with accessibility audits and other contributions.

Why did you decide to join NGI0?

The hundreds of projects funded as part of NGI0 would otherwise maybe not spend part of their budget on or be aware of accessibility, security, privacy, packaging, etc. The consortium offers them this support without them having to use their own budget or resources. This offers the unique opportunity to make an impact in every project

40 <https://nlnet.nl/project/index.html>

and save overall budget because all guides and information are being shared with all projects.

Every two months or so, around 40 projects receive a grant from NGIO. And there are 12 organisations involved in the NGIO consortium. It can't be easy to get everyone on the same track towards digital accessibility. Would you have an ideal plan of action in this kind of context?

This is well organised in the consortium. Once a project receives funding, they also receive information about the support possibilities, guides, etc. If necessary, we [at HAN University] contact funded projects and ask at what moment they would best benefit from our help. We are at the forefront of technology, so sometimes we do not have guidelines and have to work with the projects and with persons with disabilities to find the most accessible solutions for their projects.

Creating awareness is an important task for the Accessibility Foundation and HAN University. NGIO has been in existence for just over five years. Can you see that your work in raising awareness is bearing fruit?

Yes, we see that this concept is working well and that we have found a good way to support funded projects in different phases of their work. HAN is assisted by the Accessibility Foundation with expertise for the audits. They have the experts in the field of web accessibility. The end results are actually more inclusive and accessible than at the start. And we also learn ourselves, because a lot of technology is so new that we have to develop best practices on the fly.

What's the biggest surprise you've had since taking part in NGIO?

That we need to actively develop best practices because in many cases there are no existing and ready-to-use guidelines that are directly applicable to the technologies developed by the funded projects. We work together with the projects and persons with disabilities to develop them.

We can read or hear a lot of figures (statistics, percentages) about digital services that are said to be accessible, or that have accessibility problems. What exactly are digital accessibility issues?

That is an interesting question. Most accessibility issues can be covered by involving persons with disabilities in the different phases of your project. Problems include buttons without labels, images without description, bad contrast, strange element order, etc.

How many people in Europe are affected by digital access problems? What are the consequences for their daily lives?

It is estimated that there are around 87 million people in the EU with some form of disability. This influences schools, workplaces, infrastructures, products, services and information. Only about 50% of persons with disabilities are employed compared to about 75% persons without disabilities. A larger part of persons with disabilities are at risk of poverty or social exclusion. They have fewer opportunities in education and in many cases miss the feeling of being included in general.

If we want to work on digital accessibility and we're not in Europe, who can we turn to?

Give me a call at the HAN University of Applied Sciences. Seriously. In many countries, there are knowledgeable organisations that can help. Also, disability organisations in many countries can provide help. And I know that the Accessibility Foundation also helps organisations in other countries. Also, the **AccessibleEU resource centre**⁴¹ funded by the European Commission can help organisations wishing to comply with the European Accessibility Act, Digital Markets Act (DMA), Digital Services Act (DSA) and Web Accessibility Directive (WAD). They provide information and learning. HAN is a national expert for AccessibleEU.

41 https://accessible-eu-centre.ec.europa.eu/index_en

What are the relationships between digital accessibility and human rights?

Digital accessibility is a human right!

As part of the NGI0 consortium working alongside the granted projects with the Accessibility Foundation, what are your work priorities and what are your plans for the future?

Fixing accessibility afterwards (retrofitting) is expensive, time consuming and demotivating for developers and innovators. That is why we are working with the projects on best practices, guides and guidelines for new technologies. Also we continuously link users with disabilities and higher education – university students and professionals – with projects in a way that stimulates new initiatives and innovation. That way, we can support them and other innovation projects and initiatives to make future products and services accessible from the start.

Making the world more inclusive for everyone is a huge challenge with enormous work in progress. Do you have any secrets for doing this without getting totally exhausted?

Never give up!

PeerTube, a network
of independent,
self-managed and
interconnectable
platforms



BUILDING A FREE
INTERNET OF
THE FUTURE

PeerTube, a network of independent, self-managed and interconnectable platforms

21 November 2024

We are continuing Building a Free Internet of the Future, a monthly series of interviews with recipients and consortium members of NGI Zero (NGI0) grants. Funded by the European Commission, NGI0 supports free software, open data, free hardware and free standards projects. It provides financial and practical support in a myriad of forms, including mentoring, testing, security testing, accessibility, dissemination and more.

This month we are featuring the **PeerTube**⁴² project, a decentralised, peer-to-peer, distributed online video-sharing application that has been in existence for seven years. PeerTube received an NGIO grant in 2023, along with other people who have developed features for the platform.

We spoke to Pouhiou, one of the co-directors of Framasoft (which developed PeerTube), who acts as a liaison between external parties who have an interest in the project and the development team around tasks and expectations. He is PeerTube's **product owner**,⁴³ focusing on the dissemination aspect of product development.

You have been working on the development and maintenance of this broadcasting tool, a video platform, for seven years. The things we create and the tools we use can help or harm humanity, as we embed our political values in them. What does PeerTube bring to people's daily lives?

I hate to be that guy, but (to us) "The People" doesn't exist. It is usually a trope or a placeholder to hide our own biases ("people like me"). That being said, in our digital space, PeerTube brings the demonstration that another internet has existed (I was privileged enough to enjoy it) and that we can still choose to make it happen. Nowadays, surveillance capitalism companies (Big Tech, etc.) have shaped the way we think of our digital tools. But we can develop another way of connecting with each other and being a society.

PeerTube is strong on very technical features and each implies very different values from those imposed by Google's YouTube or Amazon's Twitch.

42 https://joinpeertube.org/en_US

43 [https://en.wikipedia.org/wiki/Scrum_\(project_management\)](https://en.wikipedia.org/wiki/Scrum_(project_management))

When I tell you about free/libre licences, federated protocols, **peer-to-peer**⁴⁴ plus classic broadcasting, voluntary redundancy, remote transcoding, optional content monetisation, etc., I am actually telling you that PeerTube has technically implemented, community-driven trust and autonomy; self-managed spaces that can choose to interact; resilience, volunteer solidarity, efficiency that can be shared; and sharing content without being shaped by attention-grabbing economic models.

Long story short: PeerTube empowers people (yes, them!) to create their video platforms, and be the Google of their own YouTube. PeerTube is not another video platform. PeerTube is a network of independent, self-managed and interconnectable platforms.

Criticism of tech, particularly Big Tech, is often very much based on a vision of a Western “counterculture”, as Payal Arora writes in [From Pessimism to Promise: Lessons from the Global South on Designing Inclusive Tech](#).⁴⁵ Are you also working on “decentralised” diversities of approaches and needs when you develop PeerTube?

Full disclosure: I haven’t read Payal Arora’s book yet, just a synthesis that really makes me want to dig deeper. But yes, our Northern/Western counterculture is full of our own biases and at Framasoft, we are no exception. Such a book is really important and eye-opening.

From what I’ve gathered, part of the book questions the right-or-wrong moralism that can happen in all activist communities, and that we encountered in FOSS [free and open source software] activism. At Framasoft we tend to distance ourselves from binary views such as “Use GNU/Linux or GTFO”, “If you use Google you’re doomed/wrong/a bad human”, etc.

44 <https://en.wikipedia.org/wiki/Peer-to-peer>

45 <https://payalarora.com/from-pessimism-to-promise/>

Obviously I'm exaggerating, but in reality we have had to send a public service announcement (PSA, in French [here](#)⁴⁶) to enthusiasts who were aggressively recommending PeerTube to content creators without taking into account their needs, use cases, aspirations, etc. Behaving as "PeerTube's witnesses" isn't helpful to anyone.

The point here is that we all need to stay humble and listen to people we aim to serve. We try to do that with PeerTube, with issues, our **feedback tool**,⁴⁷ our **forum**,⁴⁸ our social media. Several features that mainly serve non-Northern/Western users have been added this way, for example with the 144p resolution (useful in countries with slow bandwidth infrastructure).

And even with all that, we know that our work won't cover all needs. If you live in an under-represented country and need to raise awareness on a very popular social network, PeerTube (whose goal is not to grab attention and make content viral) is not the tool for you. And that's OK: we have limited means so we must know the limits of our work.

46 <https://framablog.org/2020/10/29/message-aux-youtubeurs-youtubeuses-et-surtout-a-celles-et-ceux-qui-aiment-leurs-contenus/>

47 <https://ideas.joinpeertube.org/>

48 <https://framacolibri.org/c/peertube/38>

Over the past seven years, have you seen any changes in behaviour and/or practices in broadcasting via PeerTube?

Yes, lots. First, it was mainly a tool that tech-savvy FOSS enthusiasts were happy to toy with. Then it became popular among content creators that wanted a self-hosted mirror of their YouTube/Twitch channels; and among communities who wanted to create and regulate their safe space (deaf people, queer people, etc.).

Unfortunately, we have also had far right extremists and propagandists, banned from mainstream platforms, who started to use PeerTube and wanted to spread their filth in the federation. Obviously, they are free to use our software, but **we have made clear**⁴⁹ that we have and will keep on working to give the federation tools to isolate them in their hate bubble (and studies show it mainly works).

Nowadays, PeerTube is experiencing increasing success among content creators who publish original content (or exclusive content for their community), alternative media, and institutions: colleges, ministries of education, national television and radio archives, etc. Public structures often need to share video content without attention-grabbing mechanisms or data exploitation. To us, this is a new step in the evolution of PeerTube's audiences.

The funny thing is that it was our initial strategy. We knew our small not-for-profit, which already hosts 20 online services for millions of users, wouldn't be able to develop a YouTube/Twitch alternative in a snap. We decided, seven years ago, to grow PeerTube at a slow but steady pace, and plan improvements so we can widen the circle of users one step at a time.

49 <https://joinpeertube.org/news/isd-study>

How have you been financing your projects for the last seven years?

There are two main sources of funding for PeerTube, and a secondary one.

Mainly, PeerTube is funded through grassroots donations. We have had specific crowdfunding (for PeerTube v1 in 2017, v3 in 2020), or we have used (and are still using) Framasoft's funds to finance PeerTube. **Framasoft**⁵⁰ (a French non-profit association) funds come (at ~75 %) from grassroots donations for all of our 50+ projects. If you can and want to support PeerTube and Framasoft, please use **support.framasoft.org**.⁵¹ it is always needed and welcome.

The other main source of funding for PeerTube has been NGI grants programmes, managed in our case by the **NLnet**⁵² team. These also count as donations; but big donations from a foundation (they manage programmes funded by the European Commission). Such funding was and still is a game changer for small actors such as us: paperwork is minimal, we communicate with pros who know development and FOSS – they bring lots of advice and resources... We know that those programmes are being questioned nowadays, and if they were not to be continued, it would be a terrible blow not only for PeerTube but also for the **fediverse**⁵³ and the FOSS community, which in Europe is a great source of digital innovation and independence.

The third source of funding for PeerTube comes from specific developments services. It is a secondary and really smaller source of funding as we have very limited time to devote to such tasks, and we only accept orders for features that match our vision/plans for PeerTube.

50 <https://framasoftware.org/en/>

51 <https://soutenir.framasoftware.org/en/>

52 <https://nlnet.nl/NGI0/>

53 <https://en.wikipedia.org/wiki/Fediverse>

That being said, people seldom know that PeerTube has been developed with EUR 650,000 over seven years (2018-2024), with only one paid developer for the first six years. Our current two developers have been assisted by some who have dedicated time on strategy and communication, some external designers, and the many contributions of the community (thanks y'all!).

The result is a great piece of technology, and the support we give (once again: for free) is on par with paid support from established IT companies.

But when you compare the funding of PeerTube to that of “regular” IT companies (not even Big Tech ones), we actually have a meagre budget and an understaffed workforce. I don’t think I exaggerate when I say our means over seven years would represent, to those companies, barely six months of a side project.

Don’t get me wrong: we know we are very lucky to have been able to gather such means and support for a FOSS project. The problem is FOSS initiatives are dramatically disregarded, and underfunded. A consequence is that great talents usually have to go work for companies that develop toxic software, because those are the ones that get funds and recognition.

I think very few people understand that technology has a cost, and that software developed to serve humans cannot be compared to software developed to exploit them and print money. If we want ethical alternatives to blossom and thrive, we need to find the will and ways to fund them and get them resources. That, in itself, is a huge undertaking.

PeerTube is decentralised, which also means that people other than you are involved and that there are many hearts in the project, just like side features in development. And also there are some other developments funded in the NGI0 Open Calls, such as Remote Transcoding (2022-2024); Popularisation of PeerTube (2023) and others; NGI0 Discovery, by NGI0 Entrust; NGI Commons. Why did you come here and how did you use these funds?

I think it was in 2019 that we got an email from NLnet, whom we didn't know beforehand. They had noticed our work, and wanted to present to us the grants they manage from EU funds.

Truth be told, we were very sceptical at first. In our experience, applying to (and then getting funds from) national or international programmes is a huge workload, you need to get specialised in how to answer these calls (with specific strategies), build a bulletproof application, etc. and it means dedicating one employee to this in the hope that you get the grant, and get more than the time it takes to manage it.

But we saw that NLnet already had a reputation in the FOSS community and seemed to know the reality of small not-for-profits like us, so we said, "OK, let's talk and see if those programmes are the same overcomplicated programmes that don't fit small structures like ours."

And NLnet told and showed us and we learned, it wasn't: those programmes and funds are specifically adapted to small structures and managed by people who know the realities of FOSS development, so it changed everything.

As for how the funds were used, it was mainly for paying for development. A small proportion was used for project management, design services, etc. but all in all, I'd say at least 75% of the funds were dedicated to developments, i.e. paying developers.

For PeerTube, it funded features and improvements that are harder to promote through crowdfunding. Improvements in livestreaming, menus, filters, the API (to facilitate plug-in developments), performance, telemetry and stats, accessibility, moderation. And also new features such as two-factor identification, remote transcoding (which is a huge undertaking), user data export and import tool, comment moderation... and soon a complete UI/UX remodel and a mobile app.

Such a financial support also has side benefits: as our roadmap is supported, we get more time and energy for the community. That is how we can take time to perfect and integrate code contributions, and offer quite a high level of (free) support within our forum or the issues of our code repository.

PeerTube can be hosted by individuals, associations, companies, public authorities; it can be offered as a service by what are called instances that can be linked together. How is this an interesting option for minorities who are oppressed and downtrodden?

I think it all boils down to one thing: giving control back to people. PeerTube is a tool meant to serve, and not to exploit content creators. You can administer your own video platform, choose your content policy, choose and enforce the rules for your moderation, pick and choose whether you want your platform to federate or not with others... I have so many examples: there is a PeerTube platform dedicated for deaf people to learn and share in French Sign Language. As this language has been historically oppressed in France, deaf people have developed a culture they want to protect, with needs for safe spaces. That's why they chose not to federate their PeerTube platform with others (and they have a zero tolerance policy about ableism, obviously).

On the other hand, getting the power to "be the Google of your own self-hosted YouTube" means you also get the duties. Choosing what content belongs on your platform, how to treat that conflict or moderation problem, which federation request to omit or to accept... It's hard work! And naturally, people who are oppressed usually have less time and energy to manage their own space.

I, for one, am sad that Queermotion (a PeerTube platform that was managed by and for queer content creators) had to shut down. But I understand that managing a community and a platform was too much work, and could have burned out the nice people who maintained it.

So yes: we mean PeerTube as a tool, hopefully a useful one, to give back power for managing one's own video content. And even though we aim to improve it year after year, and to simplify... managing a PeerTube platform... taking your power back from a tech giant will always mean less comfort and more efforts.

Now, whenever people tell me they're intent on opening their PeerTube platform, I always give the same advice:

1. Don't go alone, find your peers.
2. Consider your platform as your first home: you are getting out of Mommy Google and Daddy Amazon's nest; it is huge and scary.
3. Now you host your content... but it's OK to go on other platforms to reach people so they can find the way to your home.
4. Yes, managing your own space is a challenge, but the freedom is worth it. Just imagine that you could stop saying things like "unalive", "seggs", "please subscribe and click the notification bell", "Thanks for your subs/bits", "comment for the algorithm".

Sounds freeing, doesn't it?

Decidim
Association on the
urgency of service
to civil society
where freedoms and
rights are being
rolled back



Decidim Association on the urgency of service to civil society where freedoms and rights are being rolled back

19 December 2024

We are continuing Building a Free Internet of the Future, a monthly series of interviews with recipients and consortium members of NGI Zero (NGI0) grants. Funded by the European Commission, NGI0 supports free software, open data, free hardware and free standards projects. It provides financial and practical support in a myriad of forms, including mentoring, testing, security testing, accessibility, dissemination and more.

For this last month of 2024, we talk to Carolina Romero who works on **Decidim**,⁵⁴ “a digital platform for citizen participation with free, open and secure technology and democratic guarantees.” Romero is a technologist with two decades of experience in information technology projects and one of the co-founders of Decidim, and is currently the product manager of the **NGIO project that Decidim began**⁵⁵ in June 2024.

This interview has been edited for clarity and length.

What does “Decidim” mean and what is the political significance?

Decidim means “we decide” in Catalan, reflecting its aim to go beyond traditional consultative participation, where feedback is gathered at most and little else happens.

From a political standpoint, this carries significant weight. In fact, the very definition of Decidim – an open, free digital infrastructure for participatory democracy – hints at this. By “participatory democracy” we mean a system of governance where individuals engage as equals.

The term stems from the Latin *pars capere*, meaning “to take part,” emphasising that people claim their rightful share of power as equal members of a political community. This share must be equally distributed among everyone. Furthermore, participation also encompasses the autonomy to shape social and political life, fostering the ability to create, coordinate and commit to a thriving collective existence.

54 <https://decidim.org/>

55 <https://nlnet.nl/project/DecidimRevamp/>

In June 2024, you were granted the NGIO Commons fund. How does this fit in with your principles and activities?

This is our first time applying for a grant of this kind, so the process has been filled with some uncertainty. However, when we came across the call for proposals, it was clear to us that our project aligned perfectly with its focus: helping to reclaim public ownership of the internet and making it healthier and more open, both as an infrastructure and as an ecosystem.

For **the Association**,⁵⁶ it's important to work on software improvements that may not be the most flashy, trendy or immediately appealing but are absolutely critical for ensuring a robust and secure framework. This is particularly vital as Decidim increasingly serves as critical infrastructure for many organisations. Thanks to the NGIO grant, we'll be able to thoroughly review functionalities that aren't working as they should and make significant strides in improving accessibility, among other things.

What do you do on a day-to-day basis?

The Decidim Association oversees the platform's core codebase and manages the governance of the community surrounding the project. Daily tasks range from technical work, carried out by the product team and maintainers (refining the roadmap and coordinating contributions to the code repository) to facilitating and energising the project's ecosystem.

56 <https://meta.decidim.org/assemblies/our-governance>

How do governments, public institutions, social organisations and companies, which are in 30 countries across four continents, use Decidim's infrastructure?

The functioning is actually quite decentralised and autonomous in many cases. Many of the services are provided by companies of the ecosystem to organisations that may not have the resources, or perhaps even the interest, to actively engage in the project's governance. For instance, the government of Brazil began using the platform two years ago as part of a political initiative to make Decidim the digital participation infrastructure not only for the federal government, but eventually for its municipalities as well. Essentially, it has been a way to test whether an architecture initially designed for a local government can meet the demands of larger-scale administrations.

We're also in regular contact with our official partners, companies that provide a variety of services based on Decidim, from software companies offering installation and maintenance services to facilitation and engagement companies that use Decidim as part of their tech stack. These partners are official because they contribute a percentage of the profits generated through their services back to the association, helping sustain the commons.

As a last example, we collaborate with other open-source communities, such as Codeando México or Code for Japan. These communities, in turn, foster and promote local networks within their regions.

Your services are used around the world, by many types of organisations and social groups and with different cultural backgrounds. How does Decidim address diversity in its participatory processes?

Cultural factors are crucial to consider because perceptions of what constitutes a high-quality and democratically sound process vary greatly depending on the cultural context. For instance, in countries like Finland or Sweden, where public trust in institutions is relatively high, some features of Decidim that aim to prevent misuse or abuse by the “authorities” managing an instance can seem surprising or unnecessary. This contrasts sharply with what activist groups in Belarus have shared with us, where ensuring participants’ privacy is an absolute necessity.

In another example, a community member working to promote Decidim in Cameroon explained that the main challenge there is connectivity, similar to what some communities in the Amazon face. The priority in these cases is enabling the platform to function with low connectivity or even offline.

How do we address this? Primarily through communication and by actively gathering feedback to incorporate into the roadmap. Over time the platform has evolved to become even more flexible and customisable than it was initially. In fact, the modularity of its architecture is what has allowed organisations from vastly different contexts to adapt it to their specific needs. This is why it’s becoming increasingly clear to us that the role of the Decidim Association is to build and maintain a shared, basic digital infrastructure that is flexible enough to accommodate the diversity of its users.

Reports indicate⁵⁷ that about 5.7 billion people (72% of the world's population) now live under authoritarian rule, a trend measured over two decades. Could Decidim be a tool for people who have to cope with these types of regimes?

This is, in fact, one of the most politically stimulating challenges for us. Let's not forget that many of the innovative democratic practices that gave birth to this project emerged in 2011, when people gathered in public squares to denounce that we were not living in a real democracy.

In a context of relative democratic normalcy, it's easy to find use cases for Decidim, particularly within institutional settings. However, one of the questions we've been asking ourselves recently is why social movements and civil society organisations haven't adopted the tool to the same extent. In a world where freedoms and rights are increasingly being rolled back in many places, we feel it's urgent to also be of service to self-organised civil society.

We suspect that some of the reasons are purely technological. For example, there's currently a relatively steep technical learning curve for a collective to easily set up its own instance, which creates a clear barrier to access. This is something we want to work on next year to reduce it as much as possible. Privacy and security for participants – principles embedded in the project's ethical code – are also areas that we want to further improve.

We're also reflecting on how to prevent "participation washing" by authoritarian governments that attempt to project a democratic image while acting otherwise. We've already faced a precedent with the government of Chile under Piñera, which requested support services during the social uprising while simultaneously repressing its citizens in the streets. This situation sparked a debate within our community about how we should position ourselves in such cases.

57 https://v-dem.net/documents/29/V-dem_democracyreport2023_lowres.pdf

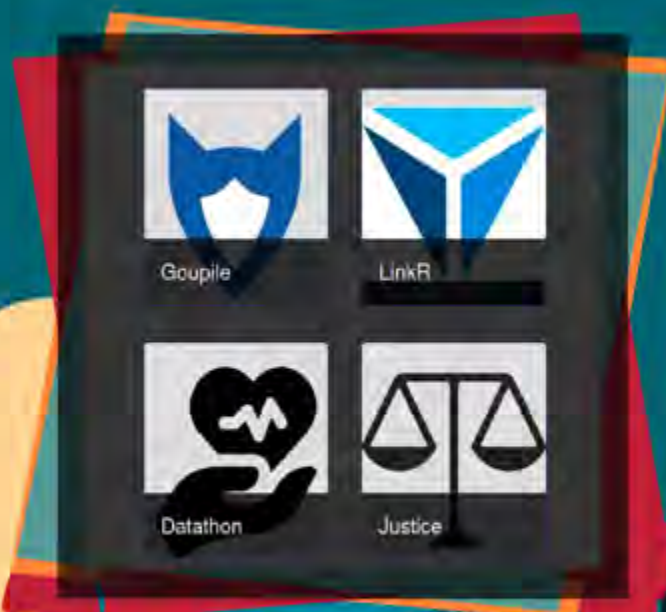
Do you have a special souvenir from the Decidim adventure? Why is it significant for you?

I must confess that I'm not particularly fond of keeping or collecting objects, but there's one poster and a true story that I hold dear, and a premonition of my own journey with this project. The poster announced a conference in Barcelona where Arnau Monterde and Xabier Barandiaran (both later co-founders of the project) were speaking. I found their technopolitical ideas so inspiring that I remember thinking, "I'd love to work with these people someday."

A year later, I heard that the Barcelona City Council was developing open-source participation software. I started looking for the right contact to interview and to find out whether the software could be extended for use in other municipalities. The name I was given was Arnau Monterde. That marked the beginning of not just a great friendship but also a collaboration that led to the complete rewriting of the code, making it reusable for any organisation.

The rest is Decidim's history. But every time I look at that poster (which I recently hung up at home), I smile and think to myself, what a journey – and what's still to come!

InterHop on
digital freedoms
and open source
software in
healthcare



BUILDING A FREE
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THE FUTURE

InterHop on digital freedoms and open source software in healthcare

19 February 2025

We are continuing the APC series Building a Free Internet of the Future, in which we publish a monthly interview with beneficiaries of the NGI Zero (NGI0) grant. This time, we will learn more about the non-profit association InterHop, which promotes the development and use of free/libre and open source software for health research. InterHop brings together activists of free software and self-managed use of health data on a local scale.

In 2024, **InterHop**⁵⁸ received and **NGIO grant for Goupile**,⁵⁹ an open source form editor designed for data collection in research, particularly in health, replacing traditional paper case report forms (CRF) with electronic versions (eCRF). Funded by the European Commission, NGIO supports free software, free data, free hardware and open standards projects. It provides financial and practical support in a variety of forms, including mentoring, testing, security testing, accessibility, dissemination and more.

Find out more about InterHop's work in this interview, answered collectively by the association.

This interview has been edited for clarity and length.

What motivated you to set up the InterHop non-profit association?

InterHop is the initiative of engineers working in several French hospitals. At the beginning, in the years 2018-2019, we were a simple informal collective. We got together to discuss our practices, interoperability and, more broadly, open source software in healthcare.

In 2019, members of the association were interviewed as part of the **Health Data Hub**'s prefiguration mission.⁶⁰ When a technical choice had to be made, we realised that Microsoft's cloud, Azure, was likely to be chosen. For a number of reasons, we were against this choice and decided to raise the alarm internally in our hospitals, then to **write an article in Le Monde**.⁶¹

The following year, we joined forces with other organisations to appeal to the **Council of State**.⁶² We needed a legal structure and decided to create the association **InterHop.org**.⁶³

58 <https://interhop.org/en/nous/>

59 <https://nlnet.nl/project/Goupile/>

60 https://fr.wikipedia.org/wiki/Health_Data_Hub

61 <https://interhop.org/2019/12/10/donnees-de-sante-au-service-des-patients>

62 <https://interhop.org/2020/10/08/attaque-du-secreet-medical>

63 <http://interhop.org/>

What fundamental problems are caused by these political choices of digital solutions?

Our association defends digital freedoms in the field of health. We are therefore not addressing the economic problems that these decisions may cause.

From a legal point of view, our concerns are mainly linked to the extraterritorial nationality of these cloud services operators, in this case, based in the United States. A whole raft of US laws (the **CLOUD Act**,⁶⁴ **Foreign Intelligence Surveillance Act**,⁶⁵ **Executive Order 12333**)⁶⁶ expose health data to the risk of being communicated to the public authorities in the United States. Like the **National Commission on Informatics and Liberty**⁶⁷ (CNIL), we believe that health data **“should not be subject to the risk of unauthorised access by authorities in third countries.”**⁶⁸ And also in line with the CNIL, we urge our decision makers to “use a service provider that is exclusively subject to European law and offers an adequate level of protection.”⁶⁹

From a moral point of view, the problem is more profound and directly affects the healthcare relationship. InterHop has stated, **“In concrete terms, patients could be subjected to a breach of medical confidentiality, which constitutes a danger that is as personal as it is symbolic, with the integrity of the Hippocratic Oath being called into question.”**⁷⁰

For us, the greatest risk is a loss of trust in the healthcare system. The trust that underpins the relationship between patients and caregivers is based on a number of factors, including secrecy, which is essential.

64 https://en.wikipedia.org/wiki/CLOUD_Act

65 https://en.wikipedia.org/wiki/Foreign_Intelligence_Surveillance_Act

66 https://en.wikipedia.org/wiki/Executive_Order_12333

67 https://en.wikipedia.org/wiki/Commission_nationale_de_l'informatique_et_des_libertés

68 <https://www.cnil.fr/fr/cloud-les-risques-dune-certification-europeenne-permettant-lacces-des-autorites-etrangees>

69 Ibid.

70 <https://interhop.org/2019/12/10/donnees-de-sante-au-service-des-patients>

Furthermore, these architectural choices are built on centralising models (as opposed to federation or decentralisation). In the event of hacking, the consequences will be greater in terms of the extent of the data potentially compromised.

Finally, free/libre software should be the norm in e-health. The **Declaration of Geneva**⁷¹ highlights doctors' responsibility to share knowledge and states: "**I WILL SHARE my medical knowledge for the benefit of the patient and for the advancement of healthcare.**"⁷²

It is difficult to imagine how a healthcare professional involved in healthcare innovation could oppose the opening up of his or her work without being in conflict with his or her medical ethics. On the contrary, we must propose that clinicians and the medical community take active steps to prevent the private ownership of the software of digital medicine. Open source must become the norm in medicine. And this applies to all areas: governance, infrastructures, ontologies, algorithms, software, etc.

71 https://en.wikipedia.org/wiki/Declaration_of_Geneva

72 <https://www.conseil-national.medecin.fr/medecin/devoirs-droits/serment-dhippocrate>

Faced with these problems and threats, in addition to your advocacy efforts, you have started to develop free software for the healthcare sector. What is your objective in this work?

The InterHop association publishes free software for health research. “Free software”, according to the Free Software Foundation, means software that respects users’ freedom. Basically, it means that **“users have the freedom to run, copy, distribute, study, change and improve the software.”**⁷³

We publish **Goupile**,⁷⁴ which is software for creating forms for collecting data for research. We also publish a **LinkR**⁷⁵ for low-code analysis, i.e. without (or with few) computer coding skills. Finally, we have just set up **LibreDataHub**,⁷⁶ an open source platform that brings together a number of data science software packages (such as Jupyter, RStudio and LinkR) and allows you to manage a project space for teamwork. All these tools are available directly online on the certification of **health data hosting providers (HDS)**⁷⁷ on servers rented by the association.

With this software, we hope to combine a legal commitment, i.e. the litigation we are conducting, with a practical and technical application of our ideas. We are showing that it is possible, with very limited resources – all our members are volunteers, for example – to carry out health research using free digital tools hosted by companies that are strictly subject to European law.

73 <https://www.gnu.org/philosophy/free-sw.en.html>

74 <https://interhop.org/projets/goupile>

75 <https://interhop.org/projets/linkr>

76 <https://interhop.org/2024/09/08/libredatahub>

77 <https://interhop.org/projets/hds>

Digital technology, personal and medical information, the right to privacy and access to healthcare in conditions of trust – the problems you outline and the solutions you develop are not restricted to France alone. Could you tell us more about this?

The technical solutions that we are developing can be used in a broad, European or even global context. This is undoubtedly why we have received European funding from the NLnet Foundation, and therefore from the European Commission,⁷⁸ to improve Goupile, the tool we use to create forms for research purposes.

As far as the legal issues of the extraterritoriality of US law are concerned, all Europeans are affected. This is why, like the CNIL, we are urging publishers to use cloud providers whose head offices are strictly located in Europe.

In fact, the only French specificity is the “Hébergeur de Données de Santé” HDS certification. The aim of this certification is to reinforce the technical protection of personal health data. It is also potentially a regulatory brake on the use of open source software in healthcare, as servers are more expensive. That’s why we are proposing to install open source software on these HDS servers, which are rented by the association. We deliver our own software such as Goupile, LinkR and LibreDataHub; we also deliver other open source software such as Cryptpad.⁷⁹

78 <https://interhop.org/2024/11/11/goupile-nlnet>

79 <https://www.apc.org/en/news/cryptpad-how-it-balances-accessibility-and-privacy-secure-digital-collaboration>

How do Interhop and your digital projects work financially?

InterHop is a non-profit association under the French Law 1901. Our funding therefore comes partly from membership fees and donations (tax-exempt). In the context of health research, when we make our tools available on our HDS servers, we ask for a **financial contribution**.⁸⁰ Finally, we regularly respond to calls for public funding. **Our first success**⁸¹ was via the aforementioned NLnet Foundation.

Did you hesitate to apply for an NGIO grant via the NLnet Foundation?

Not really. We found the selection process, especially compared with other calls for projects, rather simple and straightforward.

This money will enable us to greatly improve the tool. Our objectives are **available online**.⁸² We also support the petites singularités association's **call for the European Union to continue funding free software**.⁸³

How, in the current political context, can we take part in defending our rights in terms of health, privacy and access to care and medicine?

Some would say that democracies seem to be in decline, that nations are closing in on themselves. On the other hand, free software and the InterHop association stand for transparency and openness to others. We promote discussion and exchange, and run a wide network to enable researchers to work together more effectively.⁸⁴

80 <https://interhop.org/dons/>

81 <https://nlnet.nl/project/Goupile/>

82 <https://www.apc.org/en/news/cryptpad-how-it-balances-accessibility-and-privacy-secure-digital-collaboration>

83 <https://interhop.org/2024/09/10/open-letter-to-the-commission> and
<https://www.apc.org/en/pubs/european-union-must-keep-funding-free-software>

84 <https://interhop.org/projets/interchu>

We are doing our bit to ensure that (digital) health is accessible to as many people as possible at the right cost. We promote mutual aid as the driving force behind the development of societies, rather than proprietorship and competition.

On a day-to-day basis, we defend the digital autonomy of healthcare players. Digital autonomy can be understood at several levels: individuals, institutions (social security, regions, departments, towns, hospitals, etc.), nations, Europe, platform states or even humanity. It is defined as the capacity for self-determination in the cyber environment.

All our digital tools (Goupile, LinkR, LibreDataHub) can therefore be used directly on the association's HDS servers without the need for installation. However, some hospitals have decided to go further by installing our digital tools locally. They are on the road to greater digital autonomy.

Finally, one of the fundamental principles of the GDPR – the EU's General Data Protection Regulation – is the minimisation of data collection with regard to the purposes for which it is to be processed.⁸⁵ Far from the centralising US and Chinese platforms, we are trying, like others before us, to offer a less mercantile and more decentralising vision. Whenever possible, we use technologies that can be federated, such as fediverse.⁸⁶ Also, to guarantee the secrecy of exchanges, we advocate the widest possible use of end-to-end encryption.

85 <https://www.cnil.fr/fr/definition/minimisation>

86 <https://www.radiofrance.fr/franceinter/podcasts/veille-sanitaire/veille-sanitaire-du-vendredi-08-septembre-2023-8005700>



LibResilient on
human rights in
the digital
context and
“the right side
of history”

BUILDING A FREE
INTERNET OF
THE FUTURE

LibResilient on human rights in the digital context and “the right side of history”

5 March 2025

We are continuing with the APC series Building a Free Internet of the Future, our monthly series of interviews with NGI Zero (NGI0) grant recipients and consortium members. Funded by the European Commission, NGI0 supports free software, open data, open hardware and open standards projects. It provides financial and practical support in a myriad of forms, including mentoring, testing, security testing, accessibility, dissemination and more.

In 2023, the LibResilient project **received an NGL Assure grant**⁸⁷ to create a “browser-based decentralized content delivery network”, which is linked to the issues of access to information and the digital human rights space.

This month, we talk to Michał “rysiek” Woźniak, the project leader. Michał is an information security and infrastructure expert and digital human rights activist (**read more on his blog**).⁸⁸

This interview has been edited for clarity and length.

What does “digital human rights space” mean for you?

One way to look at it is: people and organisations working towards preserving and advancing human rights in the digital context. Another way to look at it is: the problem space around human rights in the digital context.

Please note that I am not talking about “digital human rights”, but about “human rights in the digital context”. Universal human rights are relevant regardless of the means with which we communicate or the tools we use to exercise them. I strongly believe the work that is done in this space has to be grounded in the universal ideas about humanity.

87 <https://nlnet.nl/project/libresilient/>

88 <https://rys.io/>

**In relation to human rights in the digital context, you're working on LibResilient.
What is LibResilient for people unfamiliar with cybersecurity?**

LibResilient⁸⁹ is a tool to help websites stay available to their visitors even if they are experiencing technical difficulties or are being blocked.

On a technical level, LibResilient is a JavaScript library. When a website that uses this library loads for the first time for a given visitor, it loads this JavaScript code along with its configuration defined by the website's administrator, and instructs the browser to cache them – keep a copy for a longer period of time.

Now, when that visitor visits the website again and the website happens to be unavailable for whatever reason – overwhelmed by traffic, experiencing technical difficulties, or perhaps being blocked – that cached piece of JavaScript code tries to retrieve the content from other places, based on the cached configuration.

In other words, if you're visiting example.com, and it uses LibResilient, when you visit again and example.com happens to be down, you might not even notice – the piece of JavaScript code might pull the contents of the website from other places. Or, depending on the configuration, it might outright redirect you to a new domain set up by the website administrator just in case.

If you are a website administrator, LibResilient gives you a way to keep your website available to your visitors in case of technical difficulties or blocking, without relying on centralised gatekeepers like large **CDNs [content distribution networks]**,⁹⁰ which come with their own set of problems.

89 <https://resilient.is/>

90 https://en.wikipedia.org/wiki/Content_delivery_network

So if I take the example of the [GenderIT.org](https://genderit.org/)⁹¹ website, which could be censored and/or made difficult to access by private companies and/or states, LibResilient could help internet users to access the website's content?

LibResilient would help returning internet users to continue accessing the website's content. Yes, even if the website is blocked.

Because LibResilient relies on the website telling the browser to cache a piece of JavaScript, the website needs to have been loaded at least once in a given browser. So it only works for returning readers.

My experience managing web infrastructure for the **Organized Crime and Corruption Reporting Project (OCCRP)**⁹² during the **Panama Papers**⁹³ investigation and beyond taught me that most of the time it's the returning readers that website admins care about.

The other thing I learned is that if the reader is required to change anything in their set-up – download **Tor Browser**,⁹⁴ install a browser extension, change their **DNS**⁹⁵ settings, and such – only a very small portion of readers will actually do that.

LibResilient does not require anything of the readers, apart from having visited the site once within the previous month or so (that limitation is related to how browsers handle caching of relevant JavaScript code). This means that for any returning readers, the website will “just work”, even if it is blocked, or otherwise unavailable.

91 <https://genderit.org/>

92 https://en.wikipedia.org/wiki/Organized_Crime_and_Corruption_Reporting_Project

93 https://en.wikipedia.org/wiki/Panama_Papers

94 <https://www.torproject.org/>

95 https://en.wikipedia.org/wiki/Domain_Name_System

The only other piece of the puzzle is for the website administrator to make the website content available under other domain names or through other protocols (LibResilient supports **IPFS [InterPlanetary File System]**,⁹⁶ for example, though it's slow in the browser), and then create the LibResilient configuration file referencing these alternative sources of content. This is covered in the **Quickstart guide**⁹⁷ for website administrators.

In your professional career you've been involved in a number of organisations with a tech/information access as politics angle – among them the Organized Crime and Corruption Reporting Project (OCCRP). Now you're developing – alone for the time being – your own tech project with an NGI Assure grant. Why this choice?

I decided to start developing LibResilient because I felt I found a potentially powerful solution to a problem I had been dealing with time and again at OCCRP – website blocking, or websites otherwise becoming unavailable to their readers.

At the time – and that was about five years ago – I have not seen any other project that was focusing on this particular way of solving this problem.

Getting the NGI grant was of course very important: it not only allowed me to focus more time on the project, but also I got some great input from Michiel Leenaars from **NLnet**,⁹⁸ for which I am very grateful and which helped get the project out of the proof-of-concept stage and into the current stable beta stage.

I also feel strongly about dealing with the problem of centralised gatekeepers like large CDNs, **which I hope LibResilient can help with.**⁹⁹

96 https://en.wikipedia.org/wiki/InterPlanetary_File_System

97 <https://resilient.is/docs/QUICKSTART/>

98 <https://nlnet.nl/>

99 <https://media.ccc.de/v/mch2022-198-trusted-cdns-without-gatekeepers>

Broadly speaking, there are limited options for website administrators experiencing downtime or blocks, and these huge companies [CDNs] made it their business model to convince them that their services are the only way. I believe they are not, and in fact I believe that in the long term these centralised CDNs will create more problems than they solve.

LibResilient offers an alternative that can work here and now, today.

It is not my main focus, however, as it is not able to financially support me currently. I have a day job, and I also have some other side projects. I would very much like LibResilient to garner some interest and get deployed in production on some serious website, as that's the necessary next step for the project now.

Finally, while I am the main developer, I got a lot of input and help (and some code) from a few other people. These contributions were important and very much appreciated.

In 2024 you wrote, “We are more interconnected, yet more misinformed. At ease with more advanced technologies, but more easily misled by them.” So how can we collectively set up “digital human rights spaces” and take care of them?

I strongly believe we need to recognise that technosolutionism¹⁰⁰ and individualism, the kind peddled by cryptocurrency folks, for example, are dead ends. “Zero trust” is a dead end.

We need trust, we need communities.

Technology is important, but it's just a tool, and can be built and wielded in many different ways. Or, as Melvin Kranzberg¹⁰¹ put it, “Technology is neither good nor bad; nor is it neutral.”

100 https://en.wikipedia.org/wiki/Technological_fix

101 https://en.wikipedia.org/wiki/Melvin_Kranzberg

Think of a knife – it’s a pretty simple piece of technology we’re all familiar with. But it’s design defines what it can be used for and how it affects us when it is in our immediate environment. A knife in and of itself is neither good nor bad, but having a butter knife around is very different from having a butcher’s knife.

When we’re talking about human rights in the digital context, we’re talking about human rights intermediated by technology. Our freedom of speech is mediated by the internet messenger service we use, or the social media platform we’re on, for example.

How are the tools and technologies that create the digital spaces in which we exercise our human rights designed? Do they make **dogpiling**¹⁰² easy? Do they make surveillance easy? Do they give agency to the person using them, to the community that person belongs to, or somebody else? These are questions that were also very much **on my mind when I created LibResilient**.¹⁰³

Note that I am avoiding the word “user”. “User” defines a person through the service they use – I think that’s a dangerous proposition. I am not a “user” of a particular service, I am a person who happens to use a particular service. This might not sound like a huge difference, but I believe it really is.

We must recognise that our own personal choices with regards to technology are political and have a moral dimension to them. And that yes, sometimes we will need to choose a less convenient tool, if we want our community to be built in a long-term resilient way.

Some popular instant messengers (IMs) might be easier to use than more privacy-preserving IMs, but that is often the case because doing certain things in an end-to-end encrypted way is genuinely more difficult and will have certain kinds of friction that an unencrypted IM will never have to deal with.

102 [https://en.wikipedia.org/wiki/Dogpiling_\(Internet\)](https://en.wikipedia.org/wiki/Dogpiling_(Internet))

103 <https://resilient.is/docs/PHILOSOPHY/>

Some popular centralised social network platforms might be easier to use than federated, agency-preserving ones, but that is in no small part related to the fact that doing certain things in a federated, decentralised way is genuinely more difficult and will introduce certain kinds of friction that a centralised social network will not ever have to solve.

These unencrypted IMs and these centralised social networks come with other, more sinister issues – issues of surveillance, issues of giving power over our communication to specific companies that have shown themselves to be outright malicious. Issues that directly affect our ability to exercise our human rights in the digital context. And we know that at this point it is pretty clear to anyone who's paying attention.

So, we have to be able to make these hard choices. We have to be open to choosing a tool that might have a bit more friction, but does not create a direct threat to the human rights we want to exercise and communities we want to nurture. And we have to be ready to support such projects, including financially or with our own time and effort.

Otherwise, as Twitter and Facebook debacles show, we are building our castles in the sand.

The floor is yours: a wrap-up that doesn't end but opens up. What kind of message would you pass on to activists?

That their work is more important than ever. That even if it feels like they're not able to make any progress, that's not true – every bit does count, a lot. That the most important “digital competency” skill is empathy.

And that the fact that every now and then we win, even though we are all working on a shoestring budget, against gigantic organisations that have all the resources and power in the world, is proof positive that we're on the right side of history.



Karrot.world on
what free software
can mean to
self-organising
and local
communities

BUILDING A FREE
INTERNET OF
THE FUTURE

Karrot.world on what free software can mean to self-organising and local communities

31 March 2025

We are continuing with the APC series Building a Free Internet of the Future, our monthly series of interviews with NGI Zero (NGI0) grant recipients and consortium members. Funded by the European Commission, NGI0 supports free software, open data, open hardware and open standards projects. It provides financial and practical support in a myriad of forms, including mentoring, testing, security testing, accessibility, dissemination and more.

Karrot¹⁰⁴ is a free/libre and open source tool for grassroots initiatives and groups of people who want to coordinate face-to-face activities on a local, autonomous and voluntary basis. Karrot Has received two NGIO grants: an **NGIO Entrust grant**¹⁰⁵ in 2023 and an **NGIO Discovery grant**¹⁰⁶ in 2022.

This month we talk with Nathalie Szycher, an engineer, sociocratic facilitator and member of the Karrot team. “Community building is key when I think of alternatives – how to connect, how to organise, how to do economy. And this comes alive in the projects around food saving, gardening, co-housing, commoning, maker spaces and political groups. This is the direction Karrot is aligned with,” she explains. Find out more.

This interview has been edited for clarity and length.

Why the name Karrot?

Before, it was simply called “foodsaving tool”, which speaks of our roots in the European food-saving movement. The decision to name it Karrot was made before I joined the team. As the story goes, there was a voting process in the early days. The logo already existed and was taken as inspiration. For me as a native German speaker, I see the name as a blend of the English carrot and the German translation “Karotte” – a reflection of how the team has always crossed nations. The image also found its way into one of our core features, as you can give each other trust within the software – symbolised by a carrot button.

104 <https://karrot.world/#/welcome>

105 <https://nlnet.nl/project/Karrot-customroles/>

106 <https://nlnet.nl/project/Karrot/>

In the “pyramid of needs” (Maslow),¹⁰⁷ food is both a physiological need and a need for security. Your logo, a carrot-triangle with external arrows sprouting from it, reminded me of this. Is Karrot first and foremost a “community-building and support” project – especially before tech?

It is a good reminder to look at our basic needs in order to stay resilient and active. Especially when we aim to challenge current oppressive systems and search for alternatives. Community building is key when I think of alternatives – how to connect, how to organise, how to do economy. And this comes alive in the projects around food saving, gardening, co-housing, commoning, maker spaces or political groups. This is the direction Karrot is aligned with.

We in the Karrot team ask ourselves: How can digital technology support these efforts?

We often see how groups start with using a messenger app or a spreadsheet. Whereas for some this might suffice, the functionality often reaches its limitations. It wasn't designed for this purpose. We hope to offer a tool that is useful for the groups, that aligns with their values, and which they can shape to their needs. Over time, Karrot moved away from a focus on food, aiming to be more generalised and applicable in many contexts.

When it comes to what we do, it is a lot about tech! A lot of work goes into developing and maintaining the software as well as designing new features. We established a close connection to academia, in particular the field of HCI (human-computer interaction). But it's true, from some of our meetings you wouldn't guess Karrot is about tech. We often discuss how to support groups beyond software, leaning into social practices around decision making or group facilitation. And we are exploring what it means for ourselves to build and steward a “Karrot community”.

¹⁰⁷ https://en.wikipedia.org/wiki/Maslow's_hierarchy_of_needs

To do this, you need technical know-how, social know-how and interpersonal skills, and you also need money. How do you operate financially?

The Karrot team currently consists of six people with various backgrounds and a different range of availability to contribute to the project. We also welcome contributions (coding, design, graphics, feedback, to name a few) from those not in the core team, but connected to the project. Whereas we do operate with money, currently none of us has Karrot as their only income source. There is a richness to this approach and at the same time a growing wish to increase financial capacities.

The project receives donations from individuals and groups; we recently moved to Open Collective (**Karrot – Open Collective**).¹⁰⁸ Whenever Karrot receives funding, like the grant from **NGIO Entrust**,¹⁰⁹ that's a huge help as well. When it comes to who gets what, we meet together in a "money circle" (see more on **money distribution in Karrot**)¹¹⁰ and decide on the amounts using consent decision making. It's an invitation for us to go beyond hourly rates and look at needs, contributions and where we come from – always a great conversation!

Looking into the future, we are exploring a **community-supported software**¹¹¹ model, similar to CSA (**community-supported agriculture**).¹¹² Not only could this be a way to become economically sustainable, but it could also provide a structure to bind us more intentionally to the groups and users.

108 <https://opencollective.com/karrot>

109 <https://nl.net.nl/project/Karrot-customroles/>

110 <https://community.karrot.world/t/money-distribution-in-karrot/918>

111 <https://community.karrot.world/t/design-process-on-community-supported-software-css/1667>

112 https://en.wikipedia.org/wiki/Community-supported_agriculture

Providing a service that helps diverse individuals and groups to organise themselves locally – in the geographical sense of the term – is a big challenge. Questions of hospitality, of moderation, of “rules” defined by the groups themselves as well as Karrot’s “rules” of inclusion, have to arise on a daily basis. How do you handle that?

From a governance perspective: groups are their own units, defined organisations. That means the groups will need to define their set of rules and find answers to questions that arise. Each group will have a specific vision and aim they’re working towards. Basically when you create a Karrot group, this sets a boundary: you only see what happens inside once you have applied and been accepted. Daily operations are organised by configuring places with corresponding activities. As we improve the software, we’ve been adding more features addressing the group’s governance. It’s a good practice to have written rules and policies, easy to access by members. So that’s what our agreement feature does.

It’s a bit of a dance we’re doing when designing the software: having enough flexibility to allow different modes of organising (still talking about self-organising here), while nudging groups towards a direction that supports peaceful collaboration, connection and equity.

We try to include our knowledge – from experience and theory – into software, like the agreements feature. The whole way we think about permissions and the admin role is meant to discourage behaviour of “power over” and hierarchies between people.

We recommend that established groups host their own instance, so we spread responsibility and ownership. We provide a main instance too, **karrot.world**.¹¹³ For the most part, we encourage the groups to resolve issues within the community itself or by using the features of Karrot. We do have an agreement about which cases the Karrot team might intervene in, but thankfully that rarely happens.

113 <https://karrot.world/#/>

So-called Big Tech, and the services it produces and provides, are often not inclusive, neither in terms of human diversity nor equity (DEI). How does Karrot address those issues?

Within the team, we have established practices to make sure everyone is heard. We start each meeting with a check-in round and end with a check-out. Generally I advocate for rounds, making sure everyone has a chance to speak. The same applies to how we make decisions, which in our case is by consent. However, there is much more to be done!

For me it's an interplay between personal development and collective processes, which eventually transfer into the product (software). My own journey started from an environmental perspective via queer and feminist ideas through to intersectional approaches. In the team, whenever a topic became alive for us, I loved the emerging conversations, be it around how we think of care within the project or deconstructing a sense of urgency as a facet of white supremacy. The latter influenced our way of approaching work and funding deadlines. As a project, we would certainly benefit from making our intentions and commitments more explicit and actively including more voices that we currently don't represent.

Any wishes for Karrot in a few months' time?

What first came into my head: more attention! It would be lovely to see Karrot applied by more groups and get a sense that it's useful for them. The obvious one is to successfully finish our current round of funding and release the new features coming with it, which will hopefully land well with everyone. I am curious to see where the community-supported software idea will lead and I wish for Karrot to take the next step in becoming more economically sustainable. We're also very open to more collaboration with other community software projects, to bundle resources and see how we can strengthen each other.

postmarketOS on
developing free and
open source software
to extend the life of
consumer electronics



BUILDING A FREE
INTERNET OF
THE FUTURE

postmarketOS on developing free and open source software to extend the life of consumer electronics

23 April 2025

We are continuing with the APC series Building a Free Internet of the Future, our monthly series of interviews with NGI Zero (NGI0) grant recipients and consortium members. Funded by the European Commission, NGI0 supports free software, open data, open hardware and open standards projects. It provides financial and practical support in a myriad of forms, including mentoring, testing, security testing, accessibility, dissemination and more.

postmarketOS¹¹⁴ is an operating system (OS) primarily for smartphones, based on the Alpine Linux distribution.

It was launched on 26 May 2017 and its source code is under a free/libre licence. With a large community of volunteer contributors, they develop free and open source software to extend the life of consumer electronics. Their aim is empowering people to have full control of their devices, and they promote a healthier and more sustainable society.

This month we talked with **Pablo Correa Gomez**,¹¹⁵ one of the core contributors to postmarketOS, **Oliver Smith**,¹¹⁶ a board member, and **Clayton Craft**,¹¹⁷ a full-time postmarketOS worker.

This interview has been edited for clarity and length.

In 2017, postmarketOS declared that it was “aiming for a 10-year life cycle for smartphones.” Where do you stand today?

We now support some devices like the Nokia N900 that are much older than 10 years, but there is much work to be done. Every device out there will be 10 years old at some point, and the chances of them continuing to work on our stack remain high. Even if recent focus has been on not-so-old devices (OnePlus 6 or Pixel 3a are “just” around six or seven years old), people in our community are also interested in running postmarketOS on older devices to keep them useful (or for whatever other reasons volunteers have!). As postmarketOS is a full Linux distribution, it allows using old phones not only as phones, but also for more or less everything that could be done with a Raspberry Pi – with an integrated screen and battery.

114 <https://postmarketos.org/>

115 <https://postmarketos.org/core-contributors/#pablo-correa-gomez-pabloyoyoista>

116 <https://postmarketos.org/core-contributors/#oliver-smith-ollieparanoid>

117 <https://postmarketos.org/core-contributors/#clayton-craft-craftyguy>

Although the “10-year life cycle” was a clear and objective measure, we also realised that we did not want to be limited by it. With many phones reaching that milestone, what would happen to them? Should they stop being supported past that landmark? Should they be supported, but receive less attention? Should people stop working on features? Those questions did not have straightforward answers. So we took a stand, and throughout 2024 we discussed in length a new mission for the project. We ended up with a bit more generic statement that still clearly determines our priorities: “postmarketOS develops free and open source software to extend the life of consumer electronics. By empowering people to have full control of their devices, we promote a healthier and more sustainable society.”

postmarketOS was always more than just “making phones live for a long time.” There’s an intrinsic mentality of being respectful of users, and trying to build on patterns that respect people and avoid the attention economy. There is certainly an incredible amount of work ahead to be able to make an impact in a way that the mission is fulfilled. But we believe this is a good way to guide us forward.

postmarketOS is a fully volunteer community. How do you manage to “subsist” in a world dominated by Big Tech, especially in the mobile device operating system sector?

There are a few things that are critical to our success, despite having virtually no money compared to such Big Tech:

We have heavily invested in easing the work of people contributing not just to postmarketOS, but to the larger Linux mobile ecosystem, by making it easy to get devices ported, building tooling to support people doing development, and endorsing collaboration over a “just works in postmarketOS” mentality. We believe that the only way to be successful is acting as multipliers by collaborating with related projects, and avoid gate-keeping as much as possible.

We are supported by the **GPLv2 License**¹¹⁸ of the Linux Kernel, which forces Big Tech companies to provide us with the basic code for their devices, even if compliance is not always perfect. Life would be a lot harder if everything had to be reverse-engineered from scratch. That is unfortunately the case for most Apple devices. It is also fair to say that there is some alignment between some of the Big Tech policies and ours. Android has sustainability problems that are obvious to everybody, and part of the work of some vendors upstream greatly benefits our community.

The postmarketOS mission and community are greatly appealing to a lot of people – we now have over 500 different devices to which postmarketOS has been ported, and over 700 contributors in our main repository. We put a lot of effort into highlighting the great work the community is doing, for example, by writing a long blog post at least once a month about all the development efforts that have been going on, listing in detail which improvements were made and who exactly has made them.

Furthermore, we clearly communicate the state of the project. At this point, it is for enthusiasts and hackers, not for people who rely on their phones. With that being said, we are working on more reliability and other improvements needed to make postmarketOS work for people who just want a polished smartphone operating system, and we are slowly getting there with our fast-growing project and community. Even though we do not have an “ETA” to get the project into the hands of less technical people, we do not depend on Big Tech, which in our opinion is clearly a long-term advantage.

118 <https://www.gnu.org/licenses/old-licenses/gpl-2.0-faq.en.html>

Would you like to talk about postmarketOS in the Majority World, which some refer to as the Global South?

We have some contributors and members of the team from the Global South. However, the current nature of our project, for the most part volunteering without any return outside personal joy, is certainly a blocker for a greater adoption outside Europe and the US. We are aware of the good that a project like ours could do in such areas of the world if expanded outside hacker groups. However, for anything like that to work, we would need powerful local communities, or support from entities that could help us bring the benefits to an area that is hard for us to access. This would probably also come attached with a greater professionalisation of the project, maybe some legal entity that could support funding for the benefit of Global South communities. It totally aligns with our mission (to promote a healthier and more sustainable society), but to be able to have a real impact, we cannot do it alone. It is something we would be very willing to work on, if the opportunity would arise.

postmarketOS has benefited from several NGIO grants (NGIO Core, NGIO PET). How does this help you?

NGIO has helped us immensely with moving critical parts of postmarketOS forward. While postmarketOS is largely a volunteer-driven project, funding from NGIO allows us to ensure that people working on postmarketOS can have enough time to get critical parts done – such as the recent integration of **systemd**¹¹⁹ [a software suite] that was partially funded by NGIO, or the release engineering for major versions that NGIO has often funded. In addition to very critical parts, funding from NGIO has also been useful in areas that require very specific technical skills that we just could not find volunteers for, especially within a time frame of months. One example for that is the Collation + i18n support in the musl libc project, which benefits not only postmarketOS, but also upstream musl libc and Alpine Linux projects and the wider free software ecosystem which uses them (for example, through docker/podman containers).

119 <https://wiki.archlinux.org/title/Systemd>

In addition to a financial grant, NGI0 offers a range of support services (security audits, accessibility, mentoring, etc.). Does this help you too?

The support services have been very helpful and it is great that they come with the grants without any extra costs. We have done a security audit that helped us to be confident in the code that was audited. Of course we try to write secure code with minimal attack surfaces where we can, but having a third party review it for potential security holes is incredibly valuable. Besides that, we also did an accessibility audit, were able to talk to translation experts and had **FOSS**¹²⁰ [free and open source software] business and legal consulting. We also took part in diversity and inclusion meetings that were very helpful in, for example, code of conduct-related discussions, and where we learned that when other people ask them how to grow their communities and find new maintainers, they actually use postmarketOS and the way we did it there as an example. We have also received FOSS-friendly business and legal consulting, which was very helpful to give us a bit of direction and perspective on how other people grow their projects. A few times it's been a bit hard to follow up with providers of those services unless it's directly done through **NLnet**,¹²¹ so we might benefit even more if those services were a bit more available.

120 <https://www.apc.org/en/glossary/floss>

121 <https://nlnet.nl/>

What are your next big steps?

Throughout the last year and a half we have focused on growing our community and outreach. We have also started increasing our work on planning and executing with a longer-term vision in mind. One of our main goals for the mid term will be to increase the reliability of our system, so we can start reaching out to new groups of less technical people. We are also starting to see an explosion in the amount of events where postmarketOS is represented, be it by the team (when organisers reach out to us), or when community members go and present about us. This is something that fills us with joy, and that we want to continue moving forward.

The floor is yours. Do you have a message you'd like to pass on?

Thank you everybody that has supported postmarketOS and all the Linux stack specifically tailored to phones. From our donors in **Open Collective**¹²² to low-level musl libc hackers, Alpine, UIs like Plasma Mobile, SXMO, Phosh, GNOME Mobile, and anything in between. Building a complete piece of software for it to work in one of the most complex pieces of hardware that exists, phones, and doing it using it exclusively FOSS is an extraordinary feat. We all share this success. We wouldn't be able to achieve this without the rest of the community. Thank you for your work!

122 <https://opencollective.com/postmarketos>

Kiwix on access
to vital
information
anywhere,
including places
of confinement
and isolated
communities



Kiwix on access to vital information anywhere, including places of confinement and isolated communities

27 May 2025

We are pleased to present a new interview in APC's Building a Free Internet of the Future series, our monthly feature focusing on NGI Zero (NGI0) grant recipients and consortium members. Funded by the European Commission, NGI0 supports free software, open data, open hardware and open standards projects. It provides financial and practical support in a myriad of forms, including mentoring, testing, security testing, accessibility, dissemination and more.

Kiwix¹²³ started as a free and open source offline web browser created by Emmanuel Engelhart and Renaud Gaudin 18 years ago. Now it's a non-profit organisation and a free and open source software project dedicated to providing offline access to free educational content. Its software is available in 100 languages and deployed in more than 200 countries and territories, in facilities including schools and universities, prisons, community centres, libraries and much more.

In 2025, **Kiwix received an NGI Zero Core grant**.¹²⁴ This month we talk to its CEO Stephane Coillet-Matillon.

This interview has been edited for clarity and length.

Kiwix was released in 2007, 18 years ago. The original intent was that the content of Wikipedia should be accessible to anyone, even without internet access. Why was this accessibility so important?

The short and idealistic answer is that access to knowledge should not be limited by physical or monetary constraints. The more prosaic answer is that back then, Wikipedia was still fairly new and we thought it was awesome to be able to check out the Sum of Human Knowledge anywhere, anytime.

123 <https://kiwix.org/>

124 <https://nlnet.nl/project/MWOffliner/>

In the realm of communications technology and software, 18 years is a long time. What have been the biggest challenges for Kiwix between the early days and now?

In tech, 18 years feels pretty much like two lifetimes – we started with DVDs! Weirdly enough, though, our challenges have remained almost the same: we're still fighting for a better compression. Storage has never been really expensive and in fact, now a medium-range Android phone can store the entirety of Wikipedia – for example, almost seven million entries, along with images, will “only” take 100 GB. But, how do we get these to the end user's device, if they're in a refugee camp, in Antarctica or in prison? What if they live next to a 5G tower but can't pay for data? We always need to find new ways to share content, for the smallest possible cost.

There are also issues such as the risk of censorship, manipulation of information, blocking access to networks, legal consequences for accessing or contributing to information resources, and retaliation for helping others gain access. These actions involve a variety of different actors. How do you go about it?

Well, censorship never really was on our roadmap; Kiwix's statutes (we're a registered non-profit) are about freedom of access to education. But, it turns out that knowledge really is power and that a lot of folks have taken to Kiwix to get access to things they were prevented from reading: whenever Wikipedia is blocked, people will turn to us – be it in China, Russia, Turkey, and as far as North Korea, as it happens.

Our software is free and people will find ways to get their hands on it without needing to ask. There are many ways to make this happen (torrents, VPNs, smuggling flash drives... even beaming via satellite into Iran), and in a way, it's as much their problem to figure out what works best as ours. As far as we are concerned, the best way to keep our users safe is to know as little as possible about them. We do not collect or store any personal data, feel no need to do it, and plan to keep it that way.

You focus on creating a local offline instance (in HTML format) of any online knowledge, for example, about water access and treatment, or an emergency medicine library, educational resources, and so on. You were recently a grantee of the NGI0 consortium. Why did you apply for this cascade-funded programme?

Everyone takes software maintenance for granted, but the fact is that technical debt is an issue that needs to be tended to from day one. We can't just write a great piece of code, say it's awesome and have everyone agree on that, and then call it a day and move on to the next big shiny thing. Software is a living product and the only reason for it not to need maintenance and fixes would be if no one used it. (Un)fortunately, with a growing base of millions of users around the world, there's always something to do or to fix, both in the Kiwix reader itself and our content scrapers. This is exactly where the NGI0 programme is coming to help.

With millions of users around the world, you also seem to be taking action on digital accessibility and the digital divide. Do you have any examples or stories from the field to illustrate this?

If there's one thing we've learnt over the years, it is that the digital divide can take many forms: in no particular order, this can mean rural schools in Africa, or refugee camps in the Middle East or South Asia; but also prisoners in the US or Europe, North Korean dissidents, or simply Chinese, Turkish or Iranian citizens trying to circumvent censorship. Or nuclear research facilities that are **air-gapped**¹²⁵ or Antarctic bases that only get polar satellites to fly overhead five hours a day.

¹²⁵ [https://en.wikipedia.org/wiki/Air_gap_\(networking\)](https://en.wikipedia.org/wiki/Air_gap_(networking))

There are various forefronts of digital accessibility as a human right. What about webs of alliances in this field?

Accessibility is an issue that has been nagging at us for a while now. We're a very small team and in constant firefighting mode, so it's easy for this to take a back seat. Kiwix has been a lot of hacking for most of its life, and we had to build a user base first in order for people to get interested in it and be there to let us know how we could do better. We had to have blind users to tell us that screen readers perform pretty poorly on Kiwix for Windows/Linux overall. The good news is that these issues are now documented (kudos here to the folks at **Emmabuntüs**).¹²⁶ Now that our tech stack is under control, our firefighting times are (probably? maybe? hopefully?) over. The next step is a redesign/rethink of our UI/UX, and accessibility will be part of this equation.

Once you've completed your NGI0 grant project, what are your next big steps?

As far as we're concerned, torrents (or any decentralised distribution) are the future. Bandwidth isn't cheap, and downloading a very large file from a mirror is a drag. How people can access content needs to disappear from our users' list of problems, and that's where we see a lot of room for progress.

The floor is yours. Anything you want to bounce out of the box?

I think UI/UX is a fight that very few people have been taking seriously in the free software world, and this has been annoying me to no end. I wish people would be more vocal about having less powerful features if they can be easier to use instead.

126 <https://en.wikipedia.org/wiki/Emmabuntüs>

Giving the floor to voices driving real-world change for an internet that serves everyone



BUILDING A
FREE INTERNET
OF THE FUTURE

Giving the floor to voices driving real-world change for an internet that serves everyone

10 June 2025

“Building a Free Internet of the Future” is a monthly interview series published by the Association for Progressive Communications (APC), highlighting the experiences and perspectives of individuals and communities supported by NGI Zero (NGI0) grants.

NGI0 supports free software, open data, open hardware and open standards projects, aiming to foster a more inclusive and accessible digital future. It provides financial and practical support in different ways, including mentoring, testing, security testing, accessibility, dissemination and more.

To date, the “Building the Free Internet of the Future” series has featured 11 conversations. In them, we talked about **balancing accessibility and privacy for secure digital collaboration**,¹²⁷ **a printer for embossing texts and plans**,¹²⁸ **how we write our political values into our code**,¹²⁹ **digital accessibility as a human right**,¹³⁰ **an alternative to YouTube**,¹³¹ **the urgency of offering services to civil society**,¹³² **open source software in healthcare**,¹³³ **free software for self-organising and local communities**,¹³⁴ **access to information when websites are experiencing technical difficulties or are being blocked**,¹³⁵ and **extending the life of consumer electronics**.¹³⁶

We think this series is significant because it documents a visionary, grounded and diverse movement for an internet that serves everyone, not just those with the most power or wealth. These interviews underline APC’s commitment to promote a free, open and inclusive internet, and support its broader vision for all people, particularly the marginalised, to use and shape the internet and digital technologies to create a just and sustainable world.

Practical, community-based solutions

This series amplifies the voices of individuals and communities often absent from dominant technological narratives. Their real-life experiences reveal the real challenges of digital exclusion and the innovations they have developed to overcome them.

Rather than focus on abstract technological ideals, each interview highlights practical, community-based initiatives funded by NGI Zero. In this way, the series is based on tangible actions and replicable models that others can learn from and adapt.

127 <https://www.apc.org/en/news/cryptpad-how-it-balances-accessibility-and-privacy-secure-digital-collaboration>

128 <https://www.apc.org/en/news/brailrap-how-it-enabled-most-links-made-due-open-licensing>

129 <https://www.apc.org/en/news/librecast-building-next-generation-internet-code-we-create-and-tools-we-use-can-help-or-harm>

130 <https://www.apc.org/en/news/accessibility-foundation-how-be-forefront-digital-accessibility-human-right>

131 <https://www.apc.org/en/news/peertube-network-independent-self-managed-and-interconnectable-platforms>

132 <https://www.apc.org/en/news/decidim-association-urgency-service-civil-society-where-freedoms-and-rights-are-being-rolled>

133 <https://www.apc.org/en/news/interhop-digital-freedoms-and-open-source-software-healthcare>

134 <https://www.apc.org/en/news/karrotworld-what-free-software-can-mean-self-organising-and-local-communities>

135 <https://www.apc.org/en/news/libresilient-human-rights-digital-context-and-right-side-history>

136 <https://www.apc.org/en/news/postmarketos-developing-free-and-open-source-software-extend-life-consumer-electronics>

Building bridges between Europe and the Majority World¹³⁷

By showcasing the collaboration between European funding and concrete projects led by politically engaged people, the projects featured in the series challenge technological colonialism and promote more equitable partnerships in the construction of the internet infrastructure.

For policy makers, technologists and activists, the series serves as a thoughtful resource that informs and inspires. It encourages readers to think differently about what a free, open and inclusive internet really means.

Many participants present internet access not just as a technical issue, but also as a human rights imperative. Issues such as digital accessibility, decentralisation and autonomy are directly linked to social and environmental justice, giving the series ethical weight.

How to get involved

Are you a supporter of initiatives like these? Learn more about the **stories in our series**¹³⁸ and share them with others who may be interested or are even considering applying for a grant.

Are you working on a free/libre and open source project that contributes to the digital commons? **Consider applying for NGI Zero funding.**¹³⁹ A **new call for projects**¹⁴⁰ opened on 1 June 2025 and will receive proposals until 1 August 2025. We offer grants between USD 5,000 and USD 50,000 and grantees can also request practical support.

Are you an NGI0 grantee working to make the internet more open, inclusive and accessible? Your work is shaping the future and your story deserves to be told. We invite you to be featured in our “Building a Free Internet of the Future” interview series – a platform amplifying the voices of NGI0 grantees driving real-world impact through innovative, community-centred digital development.

137 <https://www.apc.org/en/glossary/majority-world>

138 <https://www.apc.org/en/tags/building-free-internet-future>

139 <https://www.apc.org/en/project/next-generation-internet-zero>

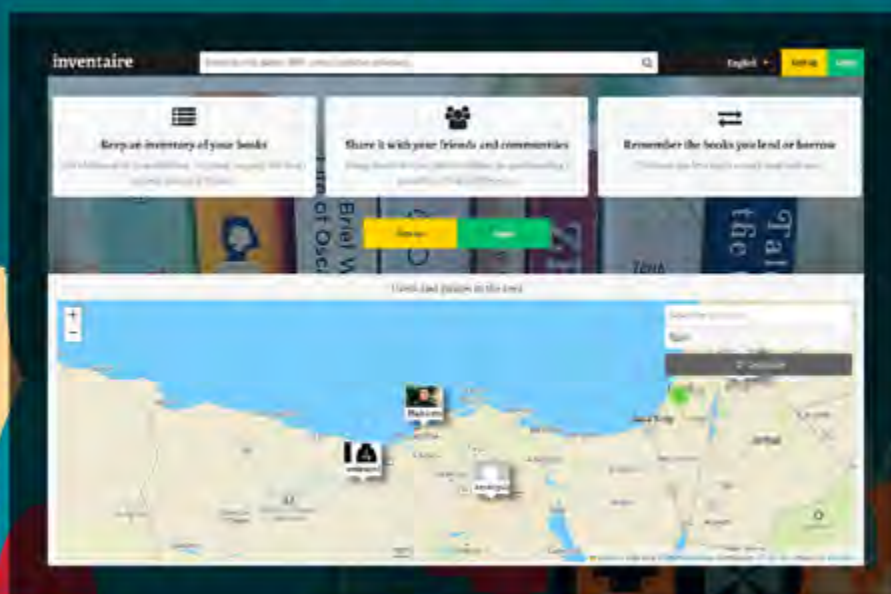
140 <https://nlnet.nl/commonsfund/>

By sharing more about your initiatives, you will be starting important conversations. This is also an opportunity to reach global audiences invested in digital rights and internet freedom, and to engage in meaningful conversations with a network of technologists, activists and researchers. Showing how your project creates tangible change for communities is also a powerful way to inspire action.

Whether you're improving digital accessibility, building community networks, promoting privacy, or enabling free/libre and open source infrastructure – your experience matters!

Ready to share your journey?

Inventaire.io on services and infrastructures for peer-to-peer book sharing



Inventaire.io on services and infrastructures for peer-to-peer book sharing

8 July 2025

“Building a Free Internet of the Future” is a monthly interview series published by the Association for Progressive Communications (APC), highlighting the experiences and perspectives of individuals and communities supported by the NGI Zero (NGI0) grants.

Funded by the European Commission, NGI0 supports free software, open data, open hardware and open standards projects. It provides financial and practical support in a myriad of forms, including mentoring, testing, security testing, accessibility, dissemination and more.

For this instalment, we talked to MaxLath, who dedicates most of his time to developing **inventaire.io**,¹⁴¹ a web app that allows you to do an inventory of your books to inform your network of which books you can give, share or sell, while contributing to the web of **linked open data**¹⁴² on resources. For him, **citizens' empowerment**¹⁴³ is the mission, libre software and open knowledge is the way.

With inventaire.io you can keep an inventory of your books, share it with your friends and communities, and remember the books you lend or borrow. But there are far more possible uses, challenges and technologies involved.

Inventaire is a **French non-profit association**.¹⁴⁴ Since 2020 they have received several NGI0 grants, the backlog of which they document in their **wiki**.¹⁴⁵ Now let's highlight this practical, peer-to-peer based initiative.

This interview has been edited for clarity and length.

What can people do with inventaire.io?

The primary proposition of inventaire.io is to let people make the inventory of their books, and let their friends and communities know what's available for giving, lending or selling. The tool is also more and more used by small libraries run by collectives interested in a specific topic (parenting, feminism, role-playing games, etc.) or a specific language. This inventory feature is powered by a bibliographic database built on top of knowledge commons, in particular **Wikidata**¹⁴⁶ and Wikipedia.

141 <https://inventaire.io/>

142 <https://maxlath.eu/projects/wikidata/>

143 <https://maxlath.eu/posts/accelerate-the-ecological-transition-economic-darwinism/>

144 <https://wiki.inventaire.io/wiki/Statuses>

145 https://wiki.inventaire.io/wiki/NGI_Zero_Discovery_grants

146 https://www.wikidata.org/wiki/Wikidata:Main_Page

What is Wikidata? And what is the tie-in with inventory.io?

Wikidata is a collaboratively edited database where people can gather knowledge about the world in the form of structured data. Whereas in a Wikipedia article, we might write “Porto is a city in Portugal” as text to be read by humans, in Wikidata we will link the “Porto” entity (Q33707919) to “city of Portugal” (Q15647906) via the “instance of” (P31) property. This structured data can then be used by programs to display that information in different places, in different languages. The primary goal was to support Wikimedia projects (Wikipedia and the others), but other projects can also make use of the data: we use this database in inventaire.io as the base for our bibliographic database, as it already knows a lot about authors, their works, the subjects of those works, etc. We also extend this database with local entities that are created for the needs of inventaire.io’s users. As we use the same data model as Wikidata, those local entities can then be transferred to Wikidata by bibliographic data contributors.

Where did the idea for inventaire.io come from?

The idea for Inventaire progressively emerged between 2011 and 2013 from a desire to experiment on mapping resources with libre software and open knowledge. I was finishing my studies and playing with ideas from people like **Bernard Stiegler**¹⁴⁷ and **Gilles Deleuze**,¹⁴⁸ on the need to look for alternatives to neoliberal and consumerist nihilism, or **Doc Searls**¹⁴⁹ and the **Cluetrain Manifesto**,¹⁵⁰ on what opportunities digital tools offered to reshape vendor/consumer relations. I then got involved in the **collaborative consumption movement**,¹⁵¹ which gave me the idea to tweak D. Searls' VRM (Vendor Relationship Management) into P2PRM (Peer-to-Peer Relationship/Resources Management). I turned to the topic of books by accident, but it rapidly appeared like a great object to start experimenting with on P2PRM. That's how; for years, we had the claim on the website that we were "starting with books", though it now appears much harder to generalise than we then were anticipating. The singularity of the book object as a means for telling stories, for emancipation and politicisation, solidified the project's now well-established focus on books, and the people who love and share them.

147 https://en.wikipedia.org/wiki/Bernard_Stiegler

148 https://en.wikipedia.org/wiki/Gilles_Deleuze

149 https://en.wikipedia.org/wiki/Doc_Searls

150 https://en.wikipedia.org/wiki/The_Cluetrain_Manifesto

151 https://en.wikipedia.org/wiki/Collaborative_consumption

Recently you brought up an important issue: “Why do we have to pay organisations in the US for standardised access to public library information?” Can you explain this problem?

At the start of the project, the idea was to map all the available books, be it on people’s bookshelves, or also in public libraries, or even bookshops. Unfortunately, getting public libraries’ data on their available books isn’t that easy, or at least we didn’t find the right entry door. One of the existing global entry doors is **WorldCat**,¹⁵² a global catalogue hosted by **OCLC**,¹⁵³ a US foundation. Public libraries around the world pay to appear on WorldCat, and then external services are asked to pay a fee to access this same data: when I reached out back in 2015, I was offered the price of “\$1,000 for up to 40,000 **API**¹⁵⁴ calls per year” [API stands for application programming interface]. I don’t know if that’s a good price, but I really don’t think we should have to pay a service in the US to access public data from European institutions. Since I mentioned this issue, I was informed of the existence of the **Catalogue collectif de France**,¹⁵⁵ which seems to have some of the desired features for France, but I still haven’t found an HTTP API to fetch the data we would need to display that info within Inventaire.

152 <https://en.wikipedia.org/wiki/WorldCat>

153 <https://en.wikipedia.org/wiki/OCLC>

154 <https://en.wikipedia.org/wiki/API>

155 <https://ccfr.bnf.fr/portailccfr/jsp/public/index.jsp>

You are a small non-profit organisation. To develop this technology, which also has features other than interoperability with Wikidata, at inventaire.io you have received three NGIO grants since 2020. What have you learned from these engineering experiments supported by European public funds delivered by a consortium like NGIO?

Experimenting in commons infrastructure, without the backing of a pre-existing established organisation, is hard. To us, building the web we want means building without bombarding users with advertising or selling their data, so we needed to find other sources of revenue, ideally without making those sources of revenue take too much time and focus from what we really want to work on. The first five years of the project would not have been possible without social welfare and a frugal lifestyle, as we were still learning what we were doing as we were going. Even as we got more confident and experienced, the project was just too small to be sustained by crowdfunding, and it would have been hard to sustain a project like this in the long term. So it came as a great relief that we could get NGIO grants!

I think it's amazing that European public funding can be used to explore non-capitalist solutions: with the current wave of carbo-masculine-fascism delivered directly to your smartphone, be it via Silicon Valley or Chinese infrastructure, I hope this kind of funding will help plant the seeds for more alternatives, more Wikipedias, OpenStreetMap, Fediverse, more libre services and commons infrastructures to emerge, and maybe offer a way out of this rotten, enshittified, dystopic web. It will be hard to do without political support though.

How can an organisation that researches, documents and issues challenges about domination and violence use inventaire.io? Or perhaps install inventaire.io on a server to have its own instance?

A collective that would prefer to not have their library inventory on inventaire.io could self-host an Inventaire instance. As Inventaire is libre software, it had always been technically possible to self-host it, but that would mean losing access to the bibliographic data on Inventaire (all the data on authors, works, publishers not yet transferred to Wikidata). Thank to the developments made during our last NGI0 grant, that self-hosted instance could now re-use and contribute to the Wikidata+Inventaire bibliographic database. More details on that topic can be found on [our wiki](#).¹⁵⁶

Last but not least, the floor is yours. Is there anything you'd like to say to our readers?

A possible next step for Inventaire would be to split the project in two: on one side, the book sharing app, and on the other side, the bibliographic database. The idea would be to make it clearer that it's a knowledge commons that can be used beyond just the inventories use case: we have already seen book review tools such as [BookWorm](#)¹⁵⁷ reuse the Wikidata+Inventaire bibliographic data. Maybe other use cases could be explored!

156 <https://wiki.inventaire.io/wiki/Self-hosting>

157 <https://joinbookworm.com/>

Every Door on
going from a map
user to an open
source map
creator



Every Door on going from a map user to an open source map creator

1 August 2025

Here we are with a new interview in our “Building a Free Internet of the Future” monthly series, published by the Association for Progressive Communications (APC), highlighting the experiences and perspectives of individuals and communities supported by the NGI Zero (NGI0) grants and also of its consortium members.

This month we are talking to Ilja Zverev from the **Every Door project**¹⁵⁸ to discuss maps, cartographic data and mobile applications. Have you ever tried mapping for the OpenStreetMap, a free, editable map of the whole world that is being built by volunteers? Every Door is a mobile app that lets you create and edit objects in it. The project **received an NGIO Commons grant**¹⁵⁹ in 2025. “With Every Door, I feel like [we are] bringing power and control to people,” highlights Ilya in this interview. Find out more.

This interview has been edited for clarity and length.

You’ve been involved with [OpenStreetMap](#)¹⁶⁰ for at least 15 years. Why are maps/mapping important to you?

There are three answers to that. I had maps lying around since childhood, and I like reading them. It’s like travelling: when you pay attention enough, you see not only roads and labels, but the culture, language, habits, history, weather reflected in how things are laid out. Nothing on the map is random, but has appeared over centuries as a series of human decisions and natural phenomena. Presented in a dense package so you can’t get bored and you find something new every time.

For neocartography [map making by people who may not have come from traditional mapping backgrounds], the modern geography with a digital framing, and OpenStreetMap in particular, I like that it challenges different parts of my brain. There is the science part with classification and algorithms and building on centuries of knowledge. And the technical part, with coding, using and contributing to open source libraries, inventing user interface approaches, because nothing is established. And a humanitarian part: writing documentation and learning to teach, talking to people from every part of the world and looking for common ground.

158 <https://every-door.app/>

159 <https://nl.net.nl/project/EveryDoor/>

160 <https://en.wikipedia.org/wiki/OpenStreetMap>

And I just like things organised and accounted for, plus I like being outdoors. I am content knowing that every amenity and every walking path around my house is discovered and mapped. When I ride my bike and pass forest roads and small cafes, I feel uneasy if I don't add them to the map. That's why I made the Every Door editor: so that the knowledge does not get lost, but is recorded immediately. And being lazy, I'm making it as non-demanding as possible, so that I offload my findings onto the map in seconds, and do not think about that any more.

Maps are very often created and transformed as part of political struggles.¹⁶¹ Putting devices running Android or iOS (Apple) or any other operating system (OS) in the hands of a huge number of people means immersing yourself in the hills and valleys of technology, with theoretical reflections and concrete actions, issues of power relations; and bringing others along for the ride. What are your views on this?

Maps are definitely instruments of control and sources of power. Until a century ago, maps served mostly political and military goals. If you have something mapped, you have control over it, especially when mixed with other kinds of power. For example, mapping LGBT bars in some countries might ruin lives. And mapping shelters and clinics might save lives – which the **Humanitarian OSM Team**¹⁶² does at scale.

Political discussions and most disputes happen around administrative borders on the map. OpenStreetMap is not free from that: we regularly get angry letters that some line should go differently from what people on the other side of this line, or the UN, think. Thankfully, when we get down to the ground, where people with phones walk, those issues become ephemeral: what matters more is whether you can find a library, or a good forest road to cross the bog.

161 <https://notanatlas.org/book/>

162 <https://www.hotosm.org/>

And with Every Door, I feel like [we are] bringing power and control to people. There is something magical and empowering going from a map user to a map creator. You are no longer at the whim of a US-based corporation, but you decide for yourself what is important on the map.

Not just streets, but also sidewalks and cycling roads. Not just shops, but also tailors and shoe repairmen working out of their basements. Only you can make a map of playgrounds with running water, because there is no money in that for commercial mappers, but tons of enjoyment for regular people.

Making map editors is an exercise of finding new ways to interact with a map. When people discover **StreetComplete**,¹⁶³ which splits the tedious process of mapping into hundreds of simple questions that never overwhelm you, it feels groundbreaking: you don't have to learn anything to answer, whether a post box is still there, or which surface does a sidewalk have. When you put a finger to the screen to draw a missing road in Every Door, it's like an electric charge goes through your hand: with a plain movement that kids learn in their first years, you are affecting the map that thousands will use.

You never forget that maps are power, and by default, they have long been controlled by governments and corporations, skewing their presentation, even their ontology, and thus affecting our reality.

For example, car-oriented streets overshadow pedestrian infrastructure – look at commercial maps! Bringing the map to millions of people with Androids and iPhones in their hands is naturally liberating, and I cannot wait to see how people by themselves reimagine the city map and its purpose in the coming century.

163 <https://streetcomplete.app/>

What issues does Every Door’s contribution/edition to OpenStreetMap, and the data, attempt to address? And how?

OpenStreetMap has grown rapidly since a decade ago because it was super fun to turn white spots into a map. We mapped everything from scratch and felt the job well done. The time for discovery has passed, and none of our tools were ready for the next step.

Every Door addresses two issues, and the most important one is map maintenance. It is super easy to add a missing road or a shop, but much harder to check if the road and the shop are still there two years on. That requires many eyes “on the ground”, walking the streets, and I’m very happy that an app with a similar goal, StreetComplete, has become that popular. Two apps come at it differently, but we all want OpenStreetMap to be not just the most rich, but also the most recent map of all.

The second issue is mapping points of interest: shops and restaurants, and benches and playgrounds. There are too many of those, and mapping each one is hard because of the number of attributes to record, and tags (object classes) to remember. When you have to spend a few minutes on each, mapping a street of shops or a mall becomes a task too tedious to even think of.

Every Door solves this by splitting the map into thematic layers, and focusing on things immediately around you. Not a map full of markers, but just a few things at your fingertips. When the objects are few, you can be creative with displaying them: for example, display all the info on the screen so you won’t have to tap markers to know if anything needs updating (first explored in the **OSMfocus**¹⁶⁴ app a decade ago). Not having distractions means mapping faster, and allows for tackling bigger tasks, like entire malls.

164 <https://wiki.openstreetmap.org/wiki/OSMfocus>

To develop Every Door, you recently received an NGIO grant. How will this grant help you?

In product terms, the grant helps me make progress on things that many people have asked for, but which require a major code restructuring, and are hard to execute when you're working on the app a couple of days a month.

To achieve that, I basically needed to leave my well-paying remote job, so that it frees up my mental resources. While remote work is excellent for time management, it fills up your brain 24/7, never ending, so you can't switch between projects. The NGIO grant basically helped me exist for half a year after leaving that job: it took me a couple of months to restore, and the work has sped up after that.

I'm really proud with the basic plugin and imagery features and the documentation I've completed, and I'm very excited going forward with the programmable plugins. It's something virtually nobody has done before in **Flutter**,¹⁶⁵ and I'm sure it will be fun having it in a popular map editing app, allowing anybody to customise buttons and data pipelines to their needs. Maybe even make a few silly games. Hoping to demonstrate this at the **State of the Map 2025**¹⁶⁶ conference!

165 [https://en.wikipedia.org/wiki/Flutter_\(software\)](https://en.wikipedia.org/wiki/Flutter_(software))

166 <https://stateofthemap.eu/>

Today, so-called “artificial intelligence” is finding its way with a bang into the collaborative web and contributive applications. What problems, or even threats, does this bring?

I believe that the web, like Nokia, was created to connect people. Some create things, some watch or read those, and connections are formed. LLMs [large language models] destroy the human element of the web, and of the real world too, because those are too interconnected now. The entire point of art is to connect to another human being, and that’s being destroyed right now. I cannot fathom how tech people do not see that.

AI (LLMs) also produce incorrect results almost always. In human terms, AI lies, all the time, because it cannot tell truth from lies (it is not sentient obviously, it’s just an autocomplete with huge context). By using LLMs in a collaborative context, you cheat: you introduce errors and invite everybody to find them, not telling – and often not knowing – that there are any. Lack of documentation, like in OpenStreetMap, makes it worse.

That puts a huge strain on communities. A machine can produce stuff much faster than people can check it. So people just give up and leave. I have seen it everywhere, including OSM. Our project is constantly under a threat from technical people, who see it as a database, or a fixed structure, or an **API**¹⁶⁷ to work with – and not as a community of people with specific knowledge who make the map as a by-product of understanding the world.

¹⁶⁷ <https://en.wikipedia.org/wiki/API>

Last but not least, the floor is yours. Is there a message you would like to convey to our readers?

To open source developers who are curious about the NGIO Fund and projects the NLnet Foundation supports: Do not hesitate to apply! I was positively surprised with the application process, with the sensible and insightful questions I've got discussing my project and the plan for it, and with every communication I've had with the Foundation employees. I feel seen and understood, and frankly, that's rare in the general open source community. Thank you, folks; this fund is basically the only one in the EU that's made for everyone.

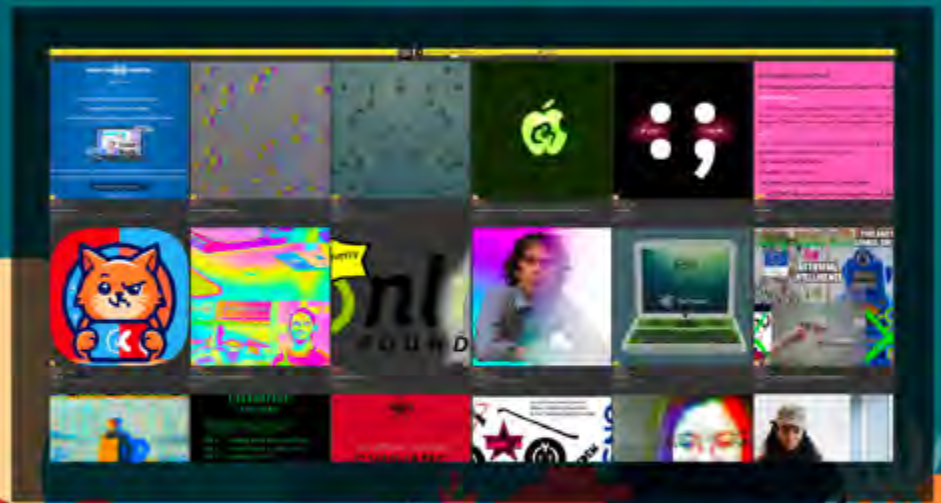
And for everyone: Have you tried mapping for the OpenStreetMap? You might think, "That sounds tedious and hard to get into." All those projections, feature classes, precision and quality, hundred-button applications and certification? Well, the modern mapping has none of that! Just install Every Door and **StreetComplete**,¹⁶⁸ and have a walk with an app open. The latter will ask you easy-to-answer questions, and each reply makes the global map a bit more useful for everyone. And when you get into it, Every Door can make you feel super productive and bring your attention to things you rarely notice, like how power poles and street lamps are all numbered, or that a venue's opening hours can be really silly sometimes.

Mapping is often positioned as "sit at home, click on satellite imagery, save remote lives." Sounds important – and dull. Look outside, the weather is (or will be) amazing! Go out there and start exploring the world.

That's what mapping is about: not just documenting things you see, but also learning what's in an alley you always walk past, or which kinds of trees grow in your area. It makes you more mindful, makes you notice where you are, what is around, and what other people are doing.

Some people with that kind of attention get an urge to paint or to write novels, and for me, my art is mapping. Try our apps, maybe you'll find out yours is too.

168 <https://streetcomplete.app/>



26 August 2025

104

In August, we interviewed Lio Novelli, one of **regional representatives**¹⁶⁹ for NGI0 Slovenia and co-host of a monthly tech-critical radio show, **Techno Enema at Radio Student**.¹⁷⁰ Lio works with several of the **Fediverse**¹⁷¹ services we have been **discussing since the beginning of our series**,¹⁷² such as Mastodon, Pixelfed, PeerTube, Mobilizon, BookWyrms and Gancio. He's a community organiser of **self-hosting collective Kompot**,¹⁷³ and also a **Drupal/PHP developer**¹⁷⁴ and member of **Emacs user group Slovenia**.¹⁷⁵

In this interview, we delve into the development of technologies that serve the common good, the importance of strengthening user freedom and control, as well as reflections on the gender and cultural barriers that keep people away from this field – and concrete ways to gain support through the NGI0 programme.

This interview has been edited for clarity and length.

What is your purpose as a regional representative?

As a regional representative, I promote NGI0 calls, encourage developers to apply for funding, and assist them in the application process when needed. Additionally, I help raise awareness of NGI0 projects and advocate for their adoption among FLOSSH (Free, Libre and Open Source Software and Hardware) and privacy-focused organisations, while also working to strengthen collaboration between them.

My motivation for applying for the role of regional representative stems from my commitment to improving user freedom and control over technology. Recent developments in the IT sector have only tightened the grip that multinational corporations hold over their user base. Market and political forces often push these companies toward actions that are far from beneficial to the general public.

169 <https://nl.net.nl/NGI0/regional/>

170 <https://radiostudent.si/druzba/tehnoklistir>

171 <https://www.apc.org/en/glossary/fediverse>

172 <https://www.apc.org/tags/ngi0-talks>

173 <https://kompot.si/>

174 <https://www.drupal.org/u/useernamee>

175 <https://emacs.si/>

For example, gatekeepers protect their vast stores of data – data that, it must be emphasised, is generated collectively through our everyday use of technology, such as browsing the web, commuting, or placing online orders – and profit from exclusive access to it.

I believe in a different vision. Instead of access-controlled checkpoints, information and knowledge should flow freely. Instead of atomised users being herded through tightly controlled digital pathways, the internet should be open and accessible to everyone. Users should have real control over the software and technology they use. For that change to happen, the way technology is developed and produced must also change.

It needs to become more inclusive – open to diverse interest groups, not just those focused on extracting profit. NGIO offers an opportunity to support the development of technology that serves the common good, independent from dominant market forces that increasingly resemble a tech dystopia.

Could you explain further about “the common good”?

When I speak of FLOSSH as a common good, I see it as part of the public knowledge that benefits everyone. Knowledge is a resource that doesn't diminish through use – it grows – and the same is true for FLOSSH.

A useful analogy is to compare FLOSSH to a public well in a village, where everyone can draw water according to their needs. In much the same way, FLOSSH can be freely used, shared, studied and improved by anyone. In turn, public access to source code benefits the software (and hardware) itself, as more people can identify bugs or vulnerabilities and contribute to fixing them.

While FLOSSH can, in theory, be used and improved by anyone, one key obstacle remains: not all of it is easily accessible to the broader public yet. Not everyone has the time or capacity to switch from proprietary software and hardware to FLOSSH alternatives. Historically, FLOSSH has been the domain of geeks and hackers, and the user experience was often secondary – understandably so, given the limited resources of many FLOSSH projects. But as FLOSSH enters the mainstream, usability and accessibility are receiving increasing attention.

As a common good, I believe that wide and easy access to FLOSSH is of great importance.

Are there (still) gender biases and geographic/cultural biases here?

Thank you for this question. I've spent a fair amount of time researching gender bias in FLOSSH. The gender gap in FLOSSH is significant – arguably even wider than in **STEM**¹⁷⁶ fields more broadly. While some studies suggest it's slowly narrowing, the pace of progress is not very encouraging. In the FLOSSH communities where I'm actively involved, we've made efforts to address the gender gap, but so far, with limited success. When I speak to women participating in FLOSSH, they often describe negative experiences – from being patronised by male contributors to being subject to unwanted advances. Research on the gender gap in FLOSSH similarly shows that non-cis-male contributors often feel discouraged from asking questions, as the responses can carry an implicit tone of: "How could you not know that?"

Another, and perhaps even more critical, cause of the gender gap in FLOSSH identified by research is the unequal distribution of care and domestic responsibilities. Women tend to take on more household and caregiving duties than their partners, which directly limits the time and energy they can dedicate to voluntary, unpaid work like FLOSSH contributions. I believe this structural barrier is far harder to overcome, because it involves deeply rooted societal norms.

176 https://en.wikipedia.org/wiki/Science,_technology,_engineering,_and_mathematics

In my personal experience, FLOSSH projects that intersect with arts tend to have a smaller gender gap. Then, I'd also like to highlight the free software project **drip**,¹⁷⁷ a menstrual cycle tracking app that prioritises security and transparency. Most contributors appear to be women, judging by usernames on their **GitLab**¹⁷⁸ repository – which makes sense, given that the software is designed for people who menstruate. I believe projects like this, which are directly relevant to under-represented groups, can serve as effective entry points into FLOSSH for those communities.

A notable exception to the gender gap issue is the diversity I've observed in the **Fediverse**.¹⁷⁹ **Mastodon**,¹⁸⁰ for instance, is known to have collaborated with the queer community in its early stages to design features that would prevent harassment and doxing campaigns, such as those seen on Twitter. This early collaboration is now reflected in both the user and developer base.

As for cultural and geographical biases, I believe much of the disparity comes down to socioeconomic factors – similar in nature to those affecting women, but often more severe. Using, participating in and contributing to FLOSSH typically requires some skills and time, which can represent a significant investment for members of underprivileged communities. Since much of work in FLOSSH is voluntary, there is often little financial compensation available for the time and effort required to learn and contribute. That said, FLOSSH does offer some practical advantages.

For instance, FLOSSH projects often run more efficiently on older hardware than commercial, closed-source software. This is largely because proprietary vendors have little financial incentive to continue supporting outdated hardware. As a result, FLOSSH can offer a more financially accessible path to technological infrastructure. Ultimately, these issues are political.

177 <https://bloodyhealth.gitlab.io/>

178 <https://gitlab.com/bloodyhealth/drip>

179 <https://www.apc.org/en/glossary/fediverse>

180 <https://joinmastodon.org/>

Measures that could help reduce the gender and cultural gap in FLOSSH include public programmes for training and adoption of FLOSSH among underprivileged groups, broader internet access, hardware subsidies, and integration of FLOSSH into public education systems and administration. Unfortunately, these initiatives appear to be losing traction in the EU, where the current political climate favours increased military spending and caters to powerful corporate interests.

NGIO involves more than a thousand projects supported and financed in the EU zone, with a geographical bias. As a regional representative, what's your take on it?

Part of the geographical bias comes from the fact that the NGIO coalition partners are mostly based in the countries of Central and Western Europe, with APC standing out as internationally widespread. It is crucial, however, that free and open source development is encouraged and supported also in Europe's peripheral and semi-peripheral regions. In regions that are not represented in the coalition, the regional representatives are spreading the word on NGIO, encouraging researchers and developers to apply for funding and promoting NGIO-funded projects and their adoption.

As the regional representative for Slovenia, I can speak about our local situation. Given our population size, Slovenia is actually quite well represented among NGIO-funded projects. This is largely thanks to a well-developed free and open source scene that has been evolving here for more than 30 years. For example, in 1999, more than 1,000 people attended a Linux install fest in **Maribor**¹⁸¹ – an impressive number for a country of just two million people. Today, there are several organisations and communities actively working in this area. However, most of the work done in free and open software is volunteer-based and with little to no policy support (as opposed to some Western and Central European countries). Likewise, adoption of FLOSSH is also limited to these niche communities.

181 <https://en.wikipedia.org/wiki/Maribor>

That's why the role of a regional representative is especially important in peripheral countries – to promote NGIO calls and inform developers within FLOSSH communities about them. These calls provide rare opportunities to receive financial support for FLOSSH contributions, which are otherwise hard to come by.

What would you say to people who are on the fence about applying for the NGIO programme?

Of course, I encourage everyone working on a FLOSSH project that enhances the openness and accessibility of the internet to apply. The application process is very straightforward and should take only a few hours to complete at most, so it's not a major time investment – even if your project isn't selected for funding. For a general idea of the kinds of projects that have been funded over the past five years, you can browse the full list here:

<https://nlnet.nl/project/index.html>.¹⁸²

As mentioned, the application is quite simple. You'll need to provide general information about your project and its goals, estimate the amount of work involved, and propose a budget in euros. Another key part of the application concerns the ecosystem your project belongs to, including a comparison with past and current efforts addressing similar challenges.

If you're unsure about anything or have second thoughts – and you're from Slovenia or a nearby region – feel free to contact me at **NGIO Slovenia email**¹⁸³ or on the Fediverse at **@NGIZero_Slovenia@social.ngi.eu**¹⁸⁴ for support. If the reviewers find your project interesting, you'll be invited to an interview, where you might also receive further advice and guidance.

Every project that receives NGIO funding is also eligible for support from NGIO's partner organisations – for example, with testing, security, and accessibility improvements. So don't hesitate!

182 <https://nlnet.nl/project/index.html>

183 slovenia@ngi-0.eu

184 [@NGIZero_Slovenia@social.ngi.eu](https://social.ngi.eu/@NGIZero_Slovenia)

OpenFlexure on
making microscopes
an open and
accessible
technology for the
benefit of many



OpenFlexure on making microscopes an open and accessible technology for the benefit of many

30 September 2025

Continuing our monthly interview series “Building a Free Internet of the Future”, we spoke with the **team behind**¹⁸⁵ the **OpenFlexure open hardware microscope project**,¹⁸⁶ and in particular with **Julian Stirling**,¹⁸⁷ chief executive of the Humanitarian Technology Trust.

¹⁸⁵ <https://openflexure.org/about/people>

¹⁸⁶ <https://openflexure.org/projects/microscope/>

¹⁸⁷ <https://julianstirling.co.uk/>

Now used in over **50 countries across every continent**,¹⁸⁸ the OpenFlexure project uses 3D printers and readily available components to produce open-source, laboratory-grade microscopes at a fraction of the cost of traditional models. Its use outside proprietary platforms has the potential to benefit many, with applications in fields such as pathology, education and training, telemedicine and much more.

“Building a Free Internet of the Future” is published by the Association for Progressive Communications (APC), highlighting the experiences and perspectives of individuals and communities supported by the NGI Zero (NGI0) grants. Funded by the European Commission, NGI0 supports free software, open data, open hardware and open standards projects. It provides financial and practical support in a myriad of forms, including mentoring, testing, security testing, accessibility, dissemination and more.

This interview has been edited for clarity and length.

Where did you hear about NGI0? And why did you decide to apply for a grant?

I first found out about NGI0 from the **NLnet website**,¹⁸⁹ as I regularly check NLnet’s grant calls. I first became aware of NLnet as a funder when my friend Kaspar applied for (and won) an NLnet grant for **Open Know-How search**.¹⁹⁰ At that time I never considered applying with OpenFlexure, as I didn’t feel that the microscope was within the remit of their funding.

More recently, I was one of the team members on their **Open Hardware Manuals project**.¹⁹¹ Working more closely with NLnet, I realised that their vision for the Next Generation Internet is actually very strongly aligned with the work OpenFlexure is doing by creating a microscope interface that complies with the **W3C**¹⁹² (World Wide Web Consortium) **Web of Things**¹⁹³ standard, and with data-sharing of stitched microscopy images.

188 <https://openflexure.org/about/index>

189 <https://nlnet.nl/>

190 <https://search.openknowhow.org/>

191 <https://nlnet.nl/project/HardwareManuals/>

192 <https://www.w3.org/>

193 <https://www.w3.org/WoT/>

From “Microscopy for everyone”¹⁹⁴ to “Reclaim the public nature of the internet”.¹⁹⁵ How do you tie these two aims together?

When we think about the internet, we tend to think of the World Wide Web, but the internet is so much greater than that now. So much of modern life is internet-first, and so many of our interactions with individuals and companies are through online platforms. The OpenFlexure Community itself is a global community that has coalesced around an open design for a microscope, as a community that shares and builds together.

But as the internet has grown, we have seen some worrying walled gardens owned by huge corporations, hence the need for NGI0. One fast growing aspect of the internet, that is generally unseen to the general public, is telemedicine. This could be entirely remote appointments/diagnoses, but telemedicine also includes communication between doctors, allowing for remote consults and second opinions, enabling greater training opportunities for doctors in remote areas to join conferences discussing difficult cases.

In the case of diagnostic microscopy, for effective online communication you need specialised hardware – a robotic microscope that can automatically scan a sample and create huge giga-pixel composite. These proprietary machines are incredibly expensive, they take considerable infrastructure to maintain, but also they create images in proprietary formats that need further proprietary platforms for sharing. The OpenFlexure Microscope is a robotic microscope that can create similar huge composite images, but from an entirely open source hardware design, using entirely open source software, and saving the images in an open format.

194 <https://opg.optica.org/boe/fulltext.cfm?uri=boe-11-5-2447&id=429869>

195 <https://nlnet.nl/commonsfund/>

Used in over 50 countries and on every continent, the project is used for pathology education, learning and teaching, workshops, malaria research, microbiology and plants, water studies, etc. What are you going to do with the NGI0 grant?

The NGI0 grant is going to allow us to focus on the usability and stability of the software that drives the microscope. The microscope started as an academic project and most of the development has been done within academia. However, it is very hard to find time and funding within academia for user-centric design of a UI [user interface], for aspects of software maintenance, testing documentation, etc. – this is software development, not “research”. A number of core technologies that the current version of the software is built on are out of date; we have an alpha version of a new server, but much of the work to date has gone into low-level code (as the camera stack we were using was deprecated!).

The NGI0 grant will not only allow us to make the next software release more reliable and with full features, but it will also help us to ensure that the interface is appropriate and accessible to our target audience, and to improve our processes so that future development is more sustainable.

Network access is required for “telemedicine” to work. This is a point of inequality in terms of access in different regions of the world and also a question of accessibility, which is often unfair. How are you working on this?

Yes, telemedicine requires the internet, but there are many forms of telemedicine requiring different levels of connectivity. We often think of live consultations where there is no doctor nearby and everything happens through an app or device. In many areas internet is available, but may be unreliable for real-time communication. However, if we consider a clinic with a microscope, if the microscope is digital and robotic, it can be left unattended to scan a sample and generate a stitched composite image; this image can be sent when internet is available, or placed on a device and taken to where internet is available.

It is important to stress that often, telemedicine for microscopy is not about off-loading or outsourcing diagnosis. Medical professionals regularly consult with their peers to get second opinions on rare conditions and difficult cases. In rural regions, doctors can be isolated from their peers, making second opinions difficult. The ability to get a remote diagnosis is transformative for patients, as it stops samples or even patients needing to travel long distances for a diagnosis, but it also means that there is no requirement for a stable enough internet connection to stream live microscopy, or to send all data collected from each scan.

OpenFlexure has been used in several countries for medical research. In most places, access to high-quality microscopes is limited by the initial cost and maintenance expenses of the equipment. You are changing the game. What's more, it's an open hardware and free/libre software project. How is the project perceived and received outside the engineering bubble?

It's worth clarifying that, while we have shown that the microscope has the technical capabilities to image malaria parasites, we are still some way from the microscope being used for routine diagnosis. For routine diagnosis, we need to get to the point where local manufacturers can get the microscope certified for diagnostic use.

How it is perceived outside the engineering bubble is a great question. One fun thing about 3D printing is that you can easily make mechanical parts in almost any colour or even multicoloured with rainbow filament. You very quickly then realise that people take you far less seriously if you turn up with a bright pink microscope than a white one with blue highlights. First impressions are incredibly important, and something that it is easy to overlook when you are too close to the engineering side.

We have many enthusiastic collaborators in the medical space (some who do like multicoloured microscopes!), but I think the idea "clicks" with some people better than others. We will always look quite different from a traditional microscope or medical whole-slide imager, but I think we need to work on how we communicate and present the project to make it as familiar as possible to those who the technology is designed for.

What are the next major challenges for the OpenFlexure project?

The next major hurdle is getting the project to the point where manufacturers produce products certified for diagnostic use based on the microscope design. The more time we have spent looking into it, the more we see its value, even if it is a lot of work. It is one thing for a microscope to be able to see a malaria parasite, but it is quite another to ensure that every microscope that a manufacturer makes will be able to identify malaria parasites with the same fidelity routinely every time it is used.

Getting this correct takes a lot of thought about procurement, testing, calibration, self-calibration, self-testing, maintenance, wear and tear. It is essential work, some of which will need to be done on a case-by-case basis by manufacturers. But a lot of the thinking behind it is common to anyone manufacturing the microscope. I think it is quite exiting for an open source hardware project to go down the route of open quality control and open technical files, but it is also a lot of work!

The other huge challenge is working on the reliability and completeness of the software. Something that wasn't helped by **Raspberry Pi**¹⁹⁶ deprecating their old camera stack; though we are happy that the new camera stack is far more open, so in the long run it is a good thing!

196 https://en.wikipedia.org/wiki/Raspberry_Pi

The floor is yours. Is there a message you would like to pass on to our readers?

Open hardware is not dead! There has been a lot of doom and gloom from some prominent open hardware projects. Gloom that hardware communities contribute back like software communities, doom that we are all going to be overshadowed by mass-produced Chinese clones.

Hardware is very different from software; the barrier to entry for contributions is much higher, and the distribution has huge logistical barriers and upfront costs. At the same time, there are lots of exciting things happening in the open hardware space, it is just a much younger community still exploring a much larger parameter space.

In the case of medical technology, there is a great need for collaboration and openness. We see some of this in academia, but as mentioned before, the work to transform a technology from a prototype stage to something that can be produced in quantity and trusted to perform for routine medical use is huge. This gap between prototype and market is normally called the “valley of death”; it is where most projects fail without huge investment that open source projects are generally not able to secure. It is for this reason that we have established a UK charity called the **Humanitarian Technology Trust**.¹⁹⁷ The Trust is supporting the pathway to regulated medical production of OpenFlexure Microscopes; we plan to learn from this process and to apply it to more open source projects in the future.

¹⁹⁷ <https://httrust.org/>

Teamtype on becoming independent of big corporations and their cloud servers



Teamtype on becoming independent of big corporations and their cloud servers

8 January 2026

Continuing our monthly interview series “Building a Free Internet of the Future”, we bring you a three-way conversation with the people from the Teamtype¹⁹⁸ project, which received a NGI Zero Core grant.¹⁹⁹ Teamtype enables real-time collaborative editing of local text files. You can use it for pair programming or note taking, for example. In this conversation with zormit and blinry, as these two project members introduced themselves, we talked about technology, engineering, peer-to-peer collaboration, and a desire to empower people to be independent of big corporations and their cloud servers.

¹⁹⁸ <https://teamtype.org/>

¹⁹⁹ <https://nlnet.nl/project/Teamtype/>

“Building a Free Internet of the Future” highlights the experiences and perspectives of individuals and communities supported by the NGI Zero (NGI0) grants. Funded by the European Commission, NGI0 supports free software, open data, open hardware and open standards projects. It provides financial and practical support in a myriad of forms, including mentoring, testing, security testing, accessibility, dissemination and more.

This interview has been edited for clarity and length.

Designing and building a collaboration tool sounds like a real sweet gig. What motivated you to take this path?

zormit:

We were motivated by our own needs when working together. One initial memory is when we were organising a conference with a good handful of people and wanted to take notes collaboratively. Our best attempt back then was to use interlinked **Hedgedoc documents**,²⁰⁰ but keeping track of all the links seemed like a hassle. Some experiments to “scratch our own itch” followed, and when we later heard about “local-first” as promoted by **Ink & Switch**²⁰¹ we realised that that was one core aspect of what we were missing.

It is indeed really sweet, because we’ve been using the tool for our own collaboration as early as possible and that includes building it. So-called **dogfooding**²⁰² at its best.

blinry:

Also, we were really impressed by how good it felt to **pair program**²⁰³ on web applications using **Glitch**²⁰⁴ (back when that still existed). Allowing that kind of smooth collaboration, but from your own editor, and for a local source code directory, gave us a good vision of what we wanted to build.

200 <https://hedgedoc.org/>

201 <https://www.inkandswitch.com/>

202 https://en.wikipedia.org/wiki/Eating_your_own_dog_food

203 https://en.wikipedia.org/wiki/Pair_programming

204 <https://glitch.com/>

You mentioned a few software programs that enable collaborative writing (text, code, notes, documentation, etc.). There are others, such as the CryptPad software suite.²⁰⁵ So from a tech-savvy engineer point of view, there's a gap to be filled, right?

zormit:

CryptPad is an important piece of software and we're using it too, for example, to create spreadsheets together. As far as I understand, it only works in the browser. The gap that we want to fill is to collaborate on plain text files that reside on your computer with the least friction possible.

So far, Teamtype indeed mostly seems to get attention from tech-savvy people, because they might be used to other tools for collaboratively creating software – like Git.

However, we would love to be as user-friendly as possible, so that you could collaborate with a less-techie friend, for example. We want to make Teamtype easy to use, so that you'll be able to use it, as long as you know what a plaintext file is and what a text editor is.

The vision is a minimalistic piece of software that easily fits in the individual workflow of people who think about their computer workflows and who use more tools than a web browser.

blinry:

In our documentation, we keep a list of **related projects**,²⁰⁶ where we try to document their features, and which text editors they support. We haven't found another tool that quite does what we want. Three other technical aspects set us apart from existing tools:

First, it's important to us that you can also access and work on the project files even when you're not online. So we built in local-first support, using the Automerge library, which uses data structures called CRDTs (conflict-free replicated data type) to enable that kind of synchronisation with offline support.

205 <https://www.apc.org/en/news/cryptpad-how-it-balances-accessibility-and-privacy-secure-digital-collaboration>

206 <https://teamtype.github.io/teamtype/related-projects.html>

Second, we wanted to build Teamtype in a way so that you don't need to trust your data to a central server. Instead, you can use it in a peer-to-peer fashion. For this task, we're using a **Rust**²⁰⁷ library called Iroh that makes it easy to establish peer-to-peer connections, even if the devices that should be connected are in different local networks, or behind a router.

And third, Teamtype is editor agnostic. This means that if you're a **Neovim**²⁰⁸ user, you can still pair program with someone using **VS Code**!²⁰⁹ Several people are already working on more editor plugins, for **IntelliJ**²¹⁰ or **Emacs**,²¹¹ for example. We tried to make it as simple as possible to write new plugins, by designing a simple protocol that gives editors collaboration capabilities.

CRDT is really a wild thing in today's small world of software. How do you explain it to people who aren't experts?

blinry:

For our users, it mostly means that they can make changes to a text file (which, for example, could contain a shopping list) independently, and even while they don't have internet access, and the changes will be integrated with each other the next time they can sync. All participants have their own, full copy of all files and their history – this is where the letter “R” from CRDT comes in: the data structure is replicated among peers. It's very different from the experience of editing web-based notes together, where you usually lose access to the notes without an internet connection.

Users sometimes ask us: “But what happens when two people edit the same line in parallel?” And our response is: The result is as if the insertions and deletions in that line had happened “at the same time”: all insertions will now be present, and all deletions will also have been performed. In practice, the result is often very reasonable.

207 [https://en.wikipedia.org/wiki/Rust_\(programming_language\)](https://en.wikipedia.org/wiki/Rust_(programming_language))

208 <https://neovim.io/>

209 https://en.wikipedia.org/wiki/Visual_Studio_Code

210 https://en.wikipedia.org/wiki/IntelliJ_IDEA

211 <https://en.wikipedia.org/wiki/Emacs>

Version control systems like Git often go a different way, and present a “conflict” to the user, which they need to resolve. This often makes sense when asynchronously collaborating on code, where you want the result to be syntactically correct. But when editing shared notes, or actively pair programming, this is less important. The letter “C” from CRDT stands for conflict-free – users will never be prompted to manually resolve something. Instead, the algorithms make sure that the directory content is consistent between all peers.

zormit:

The idea to be able to collaboratively work on things has been around for probably as long as the internet has existed and there have been a lot of approaches and solutions over time. A CRDT is just one approach. The appealing thing about CRDTs is that they work even if you’re not connected some of the time, as blinry explained. My personal take is that it’s giving some control back to the user to have all data replicated locally. And that’s why it’s so popular in the times where a lot of companies want to nudge you to use their products and make you dependent on them by vendor lock-in.

As for how they work, one really simple example could be collaborative drawing. Imagine two people (say Carmen and Edith) want to draw pixels on a board. Then each position can only have exactly one color. A CRDT is then a smart way to figure out whose pixel get to show eventually on each of the boards. It merges both user’s edits and sorts it out that eventually both users will see the same pixels in the same place. One simple way would be to decide that Carmen always wins, if they’re drawing at the exact same time. There’s a great interactive article by [Jake Lazaroff](https://jakelazaroff.com/words/an-interactive-intro-to-crdts/)²¹² where I got this idea from.

212 <https://jakelazaroff.com/words/an-interactive-intro-to-crdts/>

Note that blinry's example with text is different, because we have a growing space instead of a finite board. If Carmen and Edith both insert some text, in the exact same position and at the exact same time, then we just have to make sure that Carmen's edits are always going in front, and we have consistency, and both have their text in. That's very much simplified, of course, but the fascinating thing is that distributed algorithms work with a lot of these simple tricks that are elegantly interacting to build something complex.

A great deal of engineering goes into a technology that is then used to write and draw the world as we perceive it. It also influences our perceptions. Does Teamtype's philosophy and technique of "local first" have anything to do with your way of thinking about the world and about relationships with people?

blinry:

Pair programming with Teamtype can be a quite intimate experience, and benefits from good communication skills. An analogy we recently drew is cooking together.

You're working in the same place, and on the same medium. You can do different things at the same time, but you still need to coordinate. If one person wants to make soup, and the other one sandwiches, the outcome won't be very good. When we first started programming together that directly, we definitely needed a bit of time to find a good rhythm for it. But I think it's a skill that's worth practising, as it might translate to other areas where you want to attempt close and compassionate collaboration and learn from each other.

The "peer-to-peer" and "local availability of data" aspects doesn't fit so well into our cooking analogy (as long as we don't have food replicators!), but to me, it's about resilience and a desire to empower people to be independent of big corporations and their cloud servers. It's in line with one stance of the "**hacker ethic**"²¹³ as popularised by Steven Levy in the 80s: "Mistrust authority – promote decentralisation".

213 https://en.wikipedia.org/wiki/Hacker_ethic

Why did you choose NGI0 to apply for a grant to work on Teamtype?

zormit:

On a basic level, we deliberately want to make open source software, and that's kind of hard to monetise. Funding like NLnet really helps to bring out such ideas that are good for the public.

On a specific level, NGI0 Core's mission of creating an "open, trustworthy and reliable internet" really was fitting to our idea of an editor-agnostic, peer-to-peer, local-first real-time editing experience. It's open in many ways, you can trust it because you can have everything under your own control and check the source code, and we're doing our best to build something that is reliable.

We're not operating deep down in the internet stack, though, and are rather building something on top of it. In the call we applied to, it seemed that NLnet was happy to fund an actual user-facing application, something that they didn't seem to get a lot for NGI0.

blinry:

Another strength of NGI0 funding is the offered partner services in their network: the HAN University of Applied Sciences helped us improve the accessibility of our software, Radically Open Security did a security scan, a team from NixOS packaged Teamtype for Nixpkgs, and a member of the Free Software Foundation Europe encouraged us to use **REUSE**²¹⁴-compliant licensing. Everyone has been really pleasant to work with, and they've added a lot of value to the project!

Finally, I perceive the team at NLnet as very aligned with our hacker mindset and values. We could tell from their writings even before we applied, and it certainly held true afterwards! To me, instead of trying to receive funding from for-profit companies or venture capitalists, that's a much better fit for us and our project.

214 <https://reuse.software/>

Last but not least, do you have a message to pass on to our audience?

blinry:

Build more bridges instead of silos! :)

zormit:

We're still in a bit of an experimental/prototype phase with Teamtype and there are a lot of concepts to figure out and things to get right, so that users have a good experience using our software. We could need help here in order to find out what works well and what doesn't.

Also we're aiming to create and standardise a way to make editing interoperable through a protocol. If you now feel inspired and desire to contribute to this project, we invite you to get in touch via **Mastodon**²¹⁵ or via the email at the end of our **documentation!**²¹⁶

215 <https://fosstodon.org/@teamtype>

216 <https://teamtype.github.io/teamtype/learn-from-us.html#open-invitation-ask-us-anything>

