

NEXT GENERATION INTERNET

NGI FORUM 2021 REPORT Plenary + Workshops

18-19 May



Plenary day 1 -18 May 2021

Welcome and Introduction to the NGI Forum 2021

Olivier Bringer, Head of Unit Next Generation Internet, European Commission

Olivier Bringer welcomed participants to the fourth edition of the annual NGI Forum, this year taking place at Molengeek, Brussels, with participants connecting remotely. Molengeek is a citizen initiative creating a bottom-up tech ecosystem, which helps young people acquire digital coding skills, and helps them to launch their start-ups.

This year the NGI Forum exceeded the number of participants of previous years, with some 800 participants registered for the event, and a growing NGI network.

Olivier Bringer explained that while previous editions had focused on the design stage of NGI, this year there are now results to show, as projects have been running for two years. The NGI Forum is an opportunity for innovators to present themselves and what they have achieved. It is also a chance to look at which areas can be improved to have greater impact, and to examine whether the initiative is meeting expectations.

Olivier Bringer said that human-centric technology development is slowly becoming more mainstream, and that there is a push to translate our values into concrete technological developments.

In terms of the NGI's investment strategy, seed funding has a cumulative and multiplying effect. The Internet is evolving fast and if we choose the right people and right approach, a significant impact is achievable. Olivier Bringer called for a push to innovate, for an Internet which is more in line with European values.

Opening Speech, Thierry Breton, Commissioner for Internal Markets, European Commission

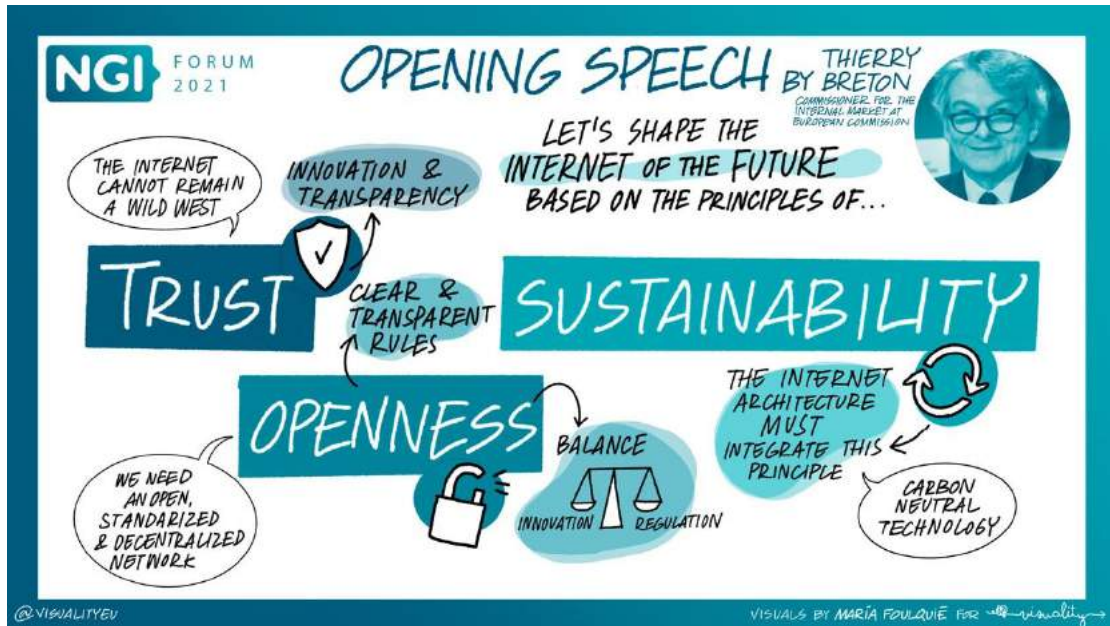
Thierry Breton highlighted the key role of the internet as an essential space, but with many vulnerabilities. He said that trust has become an issue for many users and they want a more predictable and secure system.

Commissioner Breton mentioned some of the EU's legislation in the area, such as the Digital Services Act and the Digital Market Act. He said that innovation goes hand in hand with technology and that innovators are working on new more secure cryptography and passwords to ensure data is shared securely.

Commissioner Breton said that standardised and decentralised networks are needed to create a level playing field and there should be new open standards for interoperational systems.

On the issue of sustainability, Commissioner Breton said that nowadays, sustainability of all digital infrastructures is under high scrutiny. He mentioned the ambitious targets of Europe's Digital Decade and said that Internet architecture must integrate environmental sustainability.

Speaking about the role of NGI, Commissioner Breton said that it has mobilised SMEs, tech start-ups, academics, and innovators into a community. NGI will continue under Horizon Europe, as a seven-year investment.



Keynote: “Vision of the future internet”

Andrew S. Tanenbaum, Professor at Vrije Universiteit, Amsterdam

Andrew Tanenbaum focused his address on the disruptive nature of the Internet, both in terms of its impacts on society to date, and his vision of the future of the Internet. He observed that predictions have always existed but have not always been accurate: heavier than air flying machines were once thought impossible; televisions were predicted to go out of fashion and die after six months; and remote shopping was predicted to be a flop. With this caveat in place, he went on to elaborate on some of the ways the Internet has already changed the world and some areas it may disrupt in the future:

- Telephony - Skype, FaceTime, Zoom are making the entire 120-year-old phone system obsolete.
- Movies - Streaming services like Netflix have made movie theatres obsolete.
- Music - Spotify has dismantled the music industry.
- Shopping - Amazon is challenging the need for physical stores.
- Direct to consumer – It’s now possible to buy direct from the manufacturer, potentially eliminating the need for an intermediary.
- Renting books – the new trend is digital and rental only.
- The office – Zoom and other video conferencing applications are making the office obsolete.
- Crime has been disrupted. Phishing is making robbing the bank obsolete and bitcoin makes kidnapping much easier.
- Mapping - Google Maps eliminates the need for physical maps.

Andrew Tanenbaum said that children have grown up with the Internet and technology and wondered what these 'digital natives' will invent in the future. He said that the Internet will continue to be disrupted and touched on some of the new areas which might be affected:

- Virtual reality – it will expand into education, shopping, and entertainment.
- Smart houses – houses will have a server in the attic controlling heating, air conditioning, security, energy and utility metering, setting lights and music. We will all have smart fridges. He said that security will be a big issue and people will be vulnerable to their entire systems being hacked.
- Transportation - how we buy cars will change. There will be self-driving cars, self-parking, and smart highways. This will mean better traffic flow and fewer accidents. Fewer accidents will mean smaller insurance companies. Street parking spaces will be used for other purposes. No more parking tickets will mean less money for city governments and insurance companies.
- Education – students will watch lectures on their computers and will have access to many instructors. Students will be able to connect from anywhere in the world via video conferencing. Language learning exchanges will happen via video conferencing, as will interactive labs and historic role play with historical figures. Political science, people will run a city with a Sim City-like game. Medical students will be trained with programmes like Sim Doctor. AT predicted that education would be the area with the most change.
- Manufacturing - Internet-enabled 3D printers will make objects and industrial items, e.g., airplane parts.
- Healthcare - telemedicine will make doctors available everywhere. DNA scans will lead to precision medicine. Medical devices like pacemakers and diabetes pumps will have 24/7 real-time connections to hospitals.
- Mobile agents – People will use comparative shopping, where they enlist an agent to do their shopping for them, leading to multiway industrial deals.
- Artificial intelligence – there will be automatic real-time language translation. Machine learning and big data will affect many different fields. There will be simulated experts via interface intelligence applications (e.g., medical and legal).
- Applications – there will be a huge integration of sites (e.g., Google maps and Zillow which shows the housing prices for areas). There will also be a huge segmentation of social networks, in Broadcast TV and radio (narrowcasting).
- Artificial animals – there will be virtual honeybees with a robotic brain. People will be able to download apps for their 3D printed cat's brain.
- The end of recorded history - magnetic deck tape and floppy disks are already obsolete. What happens if all books are electronic books and the company goes under? How will we preserve library archives, literary and historical work?

Andrew Tanenbaum concluded his talk by saying that the Internet has already been disruptive, but it will only get more so. He said that the European Union (EU) should encourage innovation. Since these changes will happen anyway, without EU support, innovations will happen mostly in the United States. The EU should support blue-sky projects, since there are huge payoffs when they succeed. He said that companies are generally very conservative when it comes to risk and they do not like change, so the EU should occupy this gap. He said

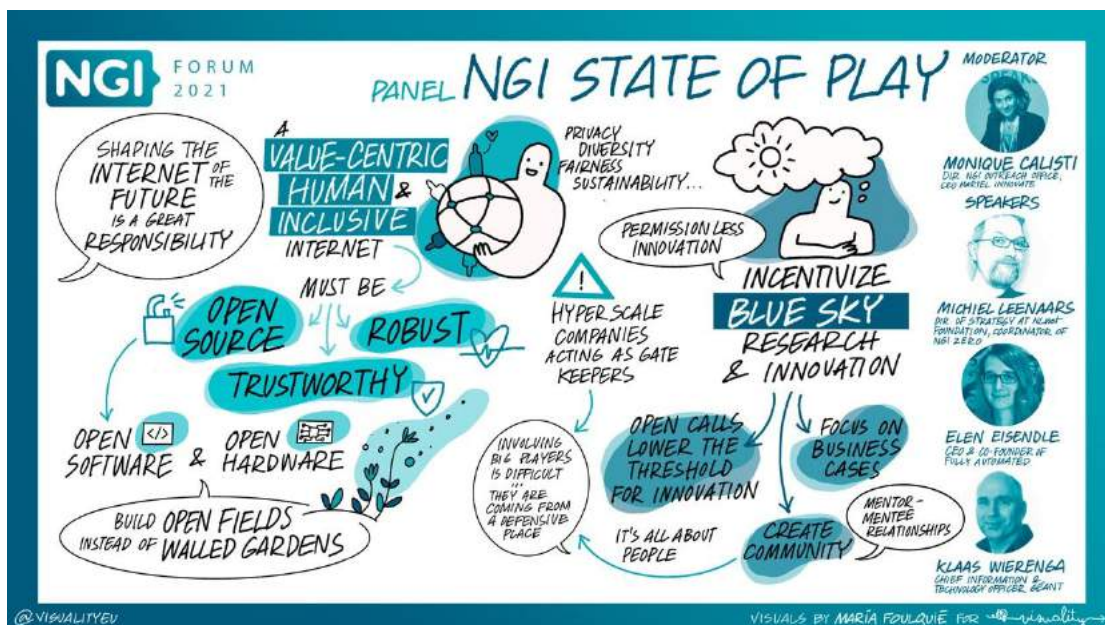
that second generation projects can be successful, so the support is needed from the initial idea stage. The EU should support small start-ups and universities with disruptive ideas.

NGI State of Play

Chaired by Monique Calisti, Director NGI Outreach Office, CEO Martel Innovate

Monique Calisti remarked on the many things that have changed since NGI was set up in 2017. She mentioned the NGI is here to stay and to grow to create an Internet of trust that will be one of the pillars of our digital transformation but also of the recovery and growth of our society.

Monique Calisti said that the session would provide an overview of NGI, which is an integral part of the ambitions of the Digital Decade of the European Commission. She briefly described NGI as having 11 Research and Innovation Actions, with five Coordination and Support Actions. MC asked the participants to talk about where NGI stands on building a human centred Internet, the gaps and how they can be filled.



Michiel Leenaars, Director of Strategy at NLnet Foundation, Coordinator of NGI ZERO

Michiel Leenaars presented NGI Zero and NLnet Foundation, which is a small public benefit, philanthropic organisation in existence for nearly forty years which supports open source initiatives.

Michiel Leenaars said that the overall mission of the NGI initiative is to reimagine and reengineer the Internet for the third millennium and beyond. He pointed at the risk of becoming too dependent on a small number of companies and said that a value-centric Internet was needed to preserve and expand the European way of life. These values include privacy and confidentiality, self-determination and empowerment, inclusiveness, accessibility, diversity, democracy, permissionless innovation, a decentralised and level playing field,

social good, fairness and ethical behaviour, sustainability and ecological responsibility, and a well-balanced economy.

Michiel Leenaars shared his concern that 'hyperscalers' were taking over. He also said that the current Internet is very vulnerable, and a few tweaks could break everything down. ML referenced the Edward Snowden whistle-blowing scandal and said that users should be able to use technology in a transparent and secure way. Technology that is locked into platforms kills creativity and innovation and we must fix the unhealthy Internet economy. Michiel Leenaars conceded that it is a big task, and that the Internet has major issues that are spread across different technologies.

Michiel Leenaars said that NGI mechanisms can have a meaningful contribution. It is necessary to extend horizontal support, as NGI adds value, and to make things operational. With NGI, innovators can collaborate and crowd source their work through the inclusive and open call mechanism.

Elen Eisendle, CEO and Co-Founder of Fully Automated

Elen Eisendle presented Fully Automated, a company dedicated to building open hardware. Fully Automated is a project funded by NGI Zero Discovery, in which open source software and hardware modules are integrated with electronics. Elen Eisendle explained the difficulty associated with the intersectionality of tools when working with open hardware and software and said that the funding from NGI Zero Discovery had enabled Fully Automated to work in this unexplored area.

Elen Eisendle valued the non-profit aspect of collaboration, of working together rather than competing, of building a community. Elen Eisendle said that we should be building open fields instead of walled gardens.

Asked about which areas NGI needs to expand in order to grow, Elen Eisendle said mentorship programmes are essential.

Klaas Wierenga, Chief Information & Technology Officer GÉANT

Klaas Wierenga described himself as a 'big fan' of the NGI initiative, saying that there are many interesting things coming out of the projects and that participants come from different parts of the sector. He said there is involvement from almost all countries in Europe, including students, academics, and industry. Klaas Wierenga supports the open call model, which makes the process of applying for funding less bureaucratic and more operational. It also supports blue-sky thinking and lower technology readiness levels. Klaas Wierenga did make the comment that improvements could be made to improve diversity among projects, to go beyond the typical profile of middle-aged white males.

Klaas Wierenga said that the objective should not be to produce the next hyperscalers in the EU. We should instead focus on making results available in the open domain. There are many interesting and innovative projects but society at large does not necessarily benefit.

In terms of recommendations, Klaas Wierenga said there should be more interaction between NGI projects. There are many interesting results emerging from projects which need to be shared so that other projects can benefit from the learnings of these results. He pointed to the example of Silicon Valley in the

United States where there is a community of people who interact and exchange. He said that physical proximity helps and there is also mobility between companies and commonly built knowledge. NGI should seek to foster this type of exchange.

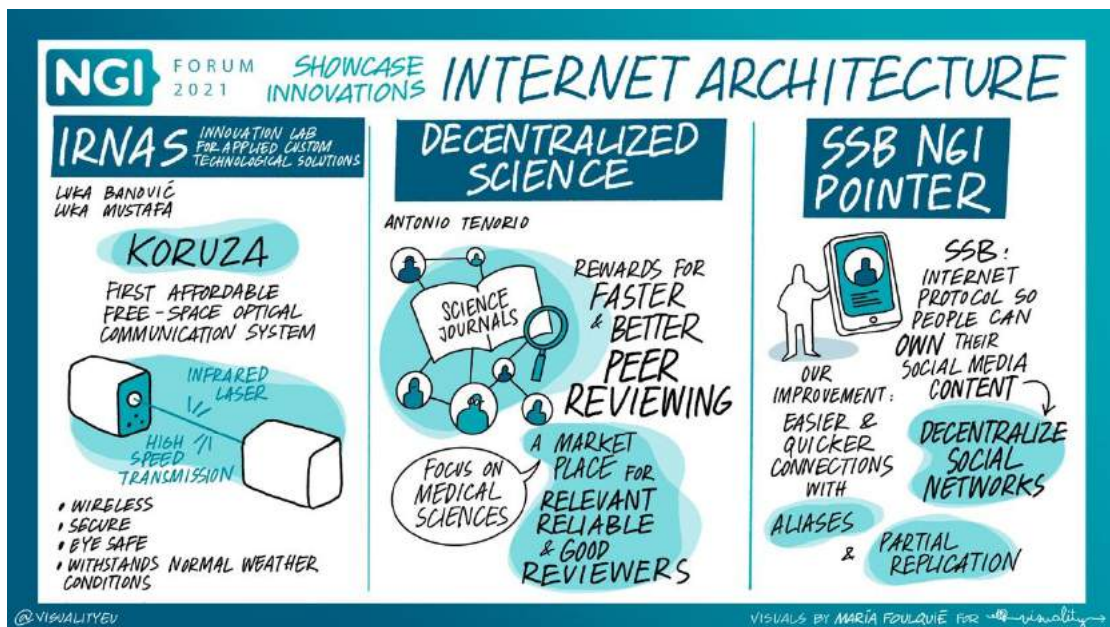
Showcase Innovations – Internet architecture

Innovators’ pitches introducing “Internet architecture”

Koruza - a license-free, wireless optical Internet-access system. It enables instant optical network roll-out in high-density urban networks, with minimal infrastructure investment, and ensures long-term, interference-free operation.

Decentralised Science - provides a public repository of Open Peer Reviews and a reviewers’ reputation network. It focuses mainly on the medical sciences.

Secure Scuttlebutt - a peer-to-peer communication protocol, mesh network, and self-hosted social media ecosystem



Internet architecture

Chaired by Adrian Perrig, SCION, Professor, Network Security Group, ETH Zurich

Adrian Perrig introduced SCION, the first clean-slate Internet architecture designed to provide route control, failure isolation, and explicit trust information for end-to-end communication.

Adrian Perrig talked about the option of optimising the carbon footprint of the Internet. He described the process of looking at latencies of paths to then select paths where more green energy is being used by selected Internet Service Providers (ISPs). The process of ‘sun routing’, routing through paths using more solar energy, so for example sending the data eastwards or westwards depending on the time of day. There are different levels of results. High security

actually uses less energy than today's Internet does, saving 90 percent of the carbon produced by the path, or 0.1 per gigabyte of data transmitted. The main savings from this kind of 'virtuous feedback', is to incentivise other ISPs to start using greener paths. With this model, 20 megatons per year of carbon could be saved.

Adrian Perrig asked how far we can push the boundaries of the Internet and wondered if we will see a disruption of the current Internet or clean-slate approaches. He said that it is possible to deploy a clean-slate approach and mentioned the example of Happy Eyeballs, but that it is possible to innovate at the lower levels. Adrian Perrig said he would like to see more ethical paths being used.

Ruben Verborgh, Professor of Decentralized Web technology at IDLab, Ghent University – imec

Ruben Verborgh said that a broader discussion was needed on the topic of Internet architecture. He said that technology is being built by a narrow segment of society. A lot of power is being concentrated into a small number of companies and a huge amount of innovation and creativity is being lost. Ruben Verborgh said that the original architecture of the Internet was designed to be open. In theory this is still possible but because of non-technology drivers, such as business interests, it is often difficult to penetrate. Ruben Verborgh highlighted the need to solve the business model, and to balance the needs of companies with the needs of people.

Ruben Verborgh said that much can be done with the current architecture and does not think a new stack is needed. There are improvements which could be made to the higher layers, in the area of data interoperability. He said that one option could be to add an extra data layer on top of the other layers of the architecture. RV thinks that the technical issues are easier to solve than the business aspect. He said that he has faith in the existing stack and that rather than starting a radical new stack, we should make incremental adjustments instead.

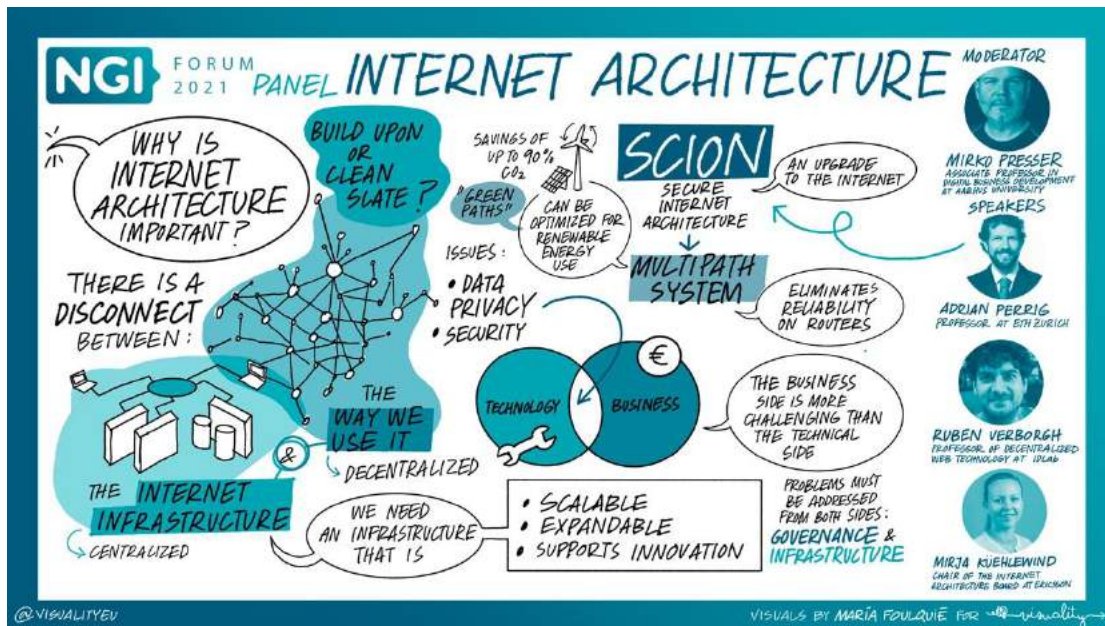
Mirja Kühlewind, Master Researcher at Ericsson Research, Herzogenrath, Germany; Chair of the Internet Architecture Board (IAB) in the IETF

Mirja Kühlewind described the Internet Engineering Task Force (IETF) as an open standards organisation, which develops and promotes voluntary Internet standards, in particular the standards that comprise the Internet protocol suite. IETF focuses on technological issues rather than the societal perspective. She said that innovators were trying to make sure the Internet is scalable, extendable and can innovate more.

Mirja Kühlewind posited that the Internet is a critical infrastructure and observed that there is a need for improvement. She said the Internet is the first thing humans have built that they no longer understand. There are new traffic patterns, huge evolutions, and now even heavier loads from the COVID-19 pandemic, such as securing communications technology. Mirja Kühlewind said it is possible to design protocols to expose as little data as possible.

Mirja Kühlewind said that clean-slate projects have a positive impact as they generate new ideas, but the current architecture is still working, and we should

focus on improving the current system. In terms of Internet governance, she advocated for a bottom-up approach.



The Open Source Model

Chaired by Gijs Hillenius, European Commission OSPO (Open Source Programme Office)

Gijs Hillenius introduced the topic of open source, asking the participants what they thought should be the main reason for European public services to increase their use of open source software and hardware.

Sachiko Muto, Chief Executive Officer of OpenForum Europe

Sachiko Muto presented the OpenForum Europe, which is a Brussels based think tank focused on researching open source and how it contributes to a European market. The organisation works across academia, industry, and policy makers.

OpenForum Europe is working on a major publication for the European Commission's DG Connect on open source hardware and software, which should be published at the end of the summer. The research will measure the impact of open source software and hardware on the European economy. Currently, open source contributes €63 billion annually to the European economy. The study shows there is even greater potential and that we can grow the economy by increasing the amount of open source hardware and software. It also shows that there are key differences between open source in Europe and in the United States (US). In Europe there are more SMEs involved, both contributing and benefiting from an open source code base. This is an important point for policy makers to take note of, and the recommendation of the study is that the European Commission should earmark funding for open source which would contribute to developing SMEs.

Sachiko Muto touched on the need for protection at the individual level, so that people can benefit from the innovation of open source. She also talked about

the issue of procurement, saying that we must move with the changes while also ensuring that public resources are used to get the best value, not just in terms of cost saving but focusing limited resources on the biggest impact.

Roberto Di Cosmo, Founder and CEO of Software Heritage

Roberto Di Cosmo talked about drawing on different experiences of open collaboration and free software. He mentioned that there are big differences between the US and the EU, pinpointing France as a leading country for open source.

Roberto Di Cosmo went into some of the challenges of getting open source past the development stage. There is a dilemma for developers who must decide whether to sell their software or share it. Connecting with people who share your vision, and creating a community of developers, can help to grow the idea and means you are happy to cover costs, or go the extra mile and create a larger organisation that caters in a more sustainable and scaled way. Roberto Di Cosmo said that Europe is strong in building SMEs and there are many great ideas and innovations. But going from the initial spark to the extra step of scaling-up and going beyond the initial developers/technologists is a challenge. There is more to scaling an idea than just technology and developers need support with the business side of things. He said that a network of knowledge is needed.

Roberto Di Cosmo welcomed the idea of having a specific instrument for open source, however he said that funding would never match the levels in the US. What is needed is a sustainable ecosystem with sustainable business models. One area to improve is to reform the procurement system so that it is more responsible, which would have a greater impact than creating a new instrument.

Piotr Król, CEO at 3mdeb Embedded Systems Consulting and LPN Plant

Piotr Król talked about his organisation, 3mdeb Embedded Systems Consulting, which is an open source firmware company working for smaller hardware vendors rather than hyperscalers. He echoed comments from others about the difference in mindsets in the US and the EU, saying that the EU was losing a lot of talent to the US and inadvertently building the value for hyperscalers which are outside Europe.

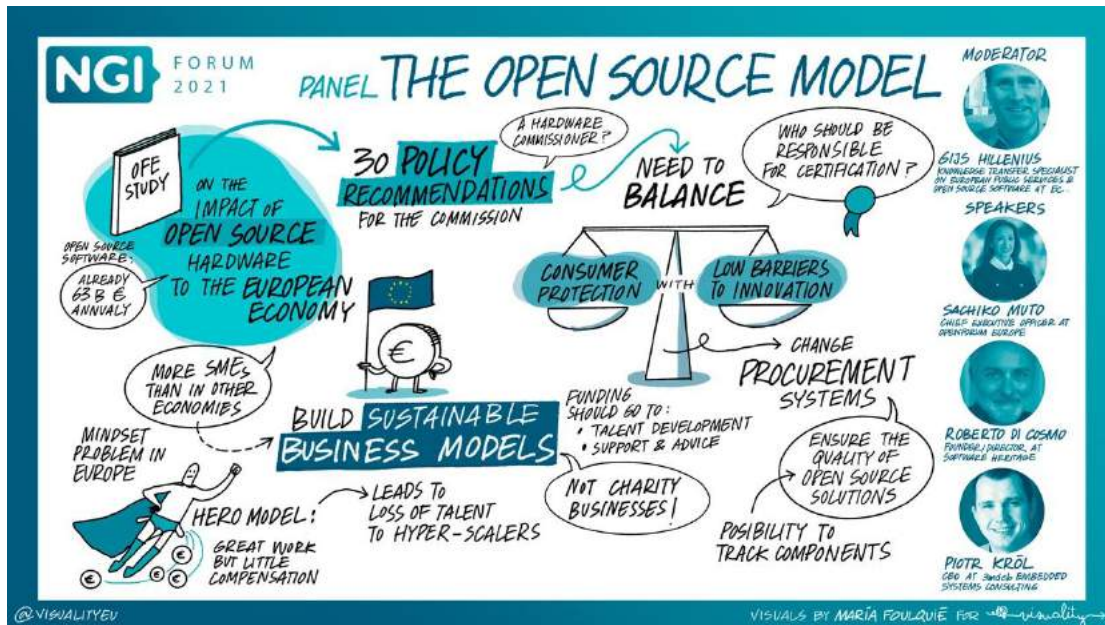
Piotr Król also discussed the issue of helping developers build their businesses to have greater impact. Many developers do not have business and managerial experience, so it can be difficult for them to move forward. He said that we need to move beyond the 'hero model' where great work is done for little compensation. Although it plays a role inspiring young people, we must move towards a more sustainable growth environment.

Piotr Król said the big difference between open source hardware and software models is that hardware relies on logistics and supply chains, which can cause issues. He suggested that supply chains could be in Europe, as they are in the United States.

He also mentioned innovation versus certification. Companies which have performed certification understand the process better than smaller companies.

Piotr Król agreed on the issue of procurement saying that rules can be too stringent and only a small pool can meet the requirements. He also said that we should seek to remove proprietary components of firmware.

On the question of a hypothetical European Strategic Fund for Open Source, he said that he would promote open source hardware and software (Linux), adding sponsorship to build a better skills base. He would also focus on supporting companies working on Internet architecture.



Plenary day 2 -19 May 2021

Keynote: “European policy for a future Internet of Trust”

Eva Kaili, Member of the European Parliament and Chair of the STOA

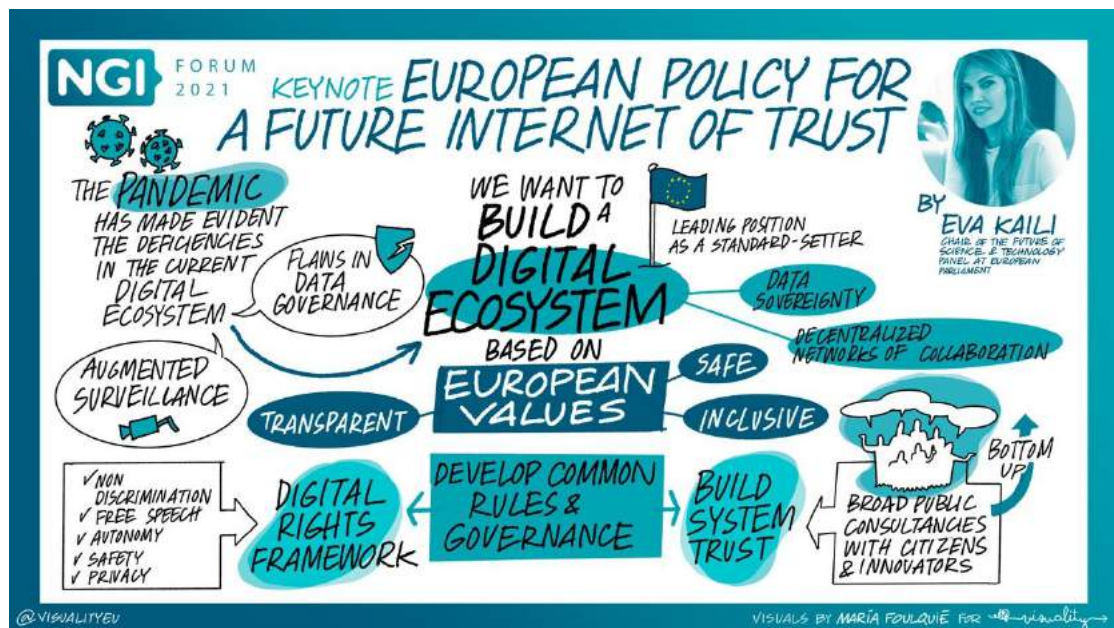
Eva Kaili welcomed the organisation of the NGI Forum as a space to bring together Internet innovators who are building bridges, working on complex Internet architecture, and open systems. She talked about some of the impacts of the COVID-19 pandemic, such as a 20 percent increase in Internet usage. The current digital ecosystem and applications which control data flows tend to be based on a default architecture rather than actual choice. The Internet should grow to support resilience, more choices and better user control. The pandemic has also shown how important digital technology is in crisis response, both in terms of treatment response and protection.

Eva Kaili stated that trustworthiness is a key foundation of the digital economy, and inter-institutional cooperation, digital rules and regulations are vital to ensure this trustworthiness is upheld. She touched on the Digital Services Act and Digital Market Act as being an important part of a European legal framework whose aim is safeguarding privacy and accountability in the digital sphere. She also mentioned the need to open closed getaways and to support SMEs, and help new start-ups to flourish.

Eva Kaili talked about the broader framework of Internet architecture as being an important tool to support European values and indeed it is an important item on the agenda of EU institutions and agencies. She called for a need to balance sovereignty with protections and that Internet usage must be inclusive and safe. We must translate what is legal offline into the online sphere. Algorithmic transparency and ethical governance are vital to uphold political and Human Rights and the principles of liberal democracy.

Eva Kaili touched on the development of a new digital rights framework, amongst other things to ensure that people's perceptions are not being manipulated, such as with the Cambridge Analytica scandal. Tailor-made content is one thing, but people should be aware of options they have.

Eva Kaili touched on the issue of investment in ethical Artificial Intelligence (AI), which is already part of a series of European Parliament resolutions and reports. AI will be a key area in the future which touches on many sectors and it is vital to reach common definitions going forward. She made a comparison between the EU and countries like the United States (US) and China, stating that in the EU there is a strong role for policy makers whose obligation it is to provide security and trust for citizens. Finally, she stated that Europe is a global standard setter, with smart regulation not over regulation.

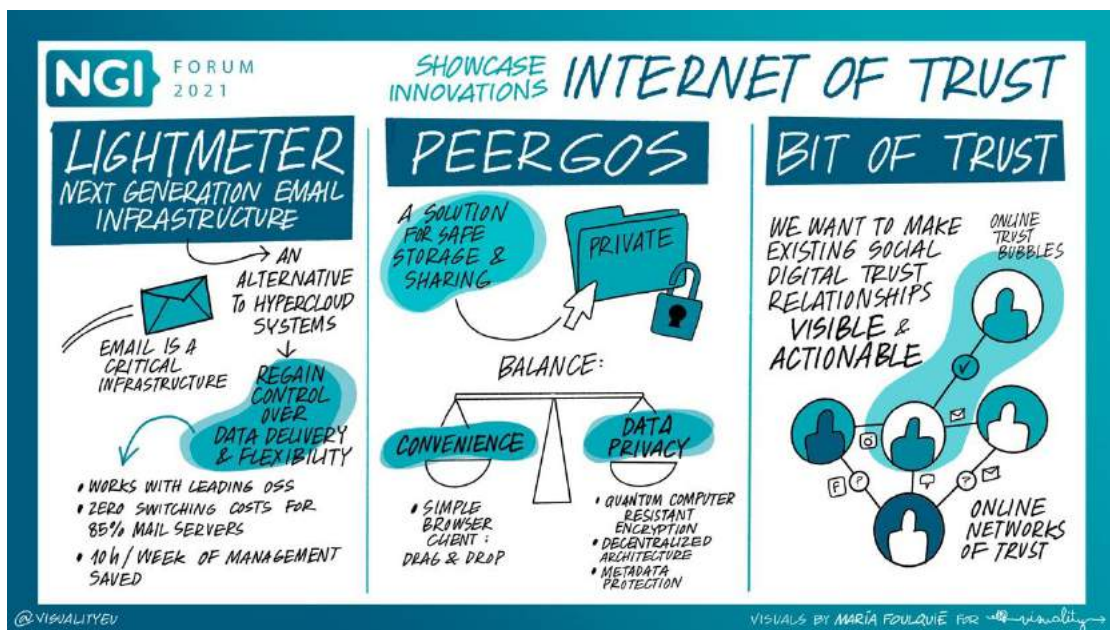


Showcase innovations – Internet of Trust (Innovator pitches)

Lightmeter – An email application providing an alternative to hyperclouds (e.g. Gmail). Lightmeter runs with existing open source so one can easily switch to the product without switching costs. A single glossy overview, bringing peace and transparency to email, as opposed to 'blackbox' systems like Gmail.

Peergos - Storing and sharing digital content securely through the use of a private web. Consumers are faced with a false trade off that security entails. The solution is quantum computer end-to-end encryption. The decentralised architecture means credentials are not centralised and meta data not collected. More than storage, Peergos is a platform for the next web, the private web.

Bitoftrust - Networks rely on trust to function, but in an online environment, this trust is hidden. Bitoftrust is a new way of making connections online in a trustworthy manner.



Internet of Trust

Chaired by Nicole Harris, Head of Trust and Identity Operations Geant, NGI Trust

Nicole Harris introduced the topic by stating that trust is more of an emotion and a feeling that cannot be expressed in binary terms. There are multiple ways to establish trust as a human and it is the same online. How can we translate this concept online, what does that mean to people, in an online environment? Is it potentially better to work with a trusted third party? Should we be asking developers to sign up to a Code of Conduct, having completed a privacy risk assessment? How do we ensure that software being developed can meet trust standards? Finally, she asked whether users

ultimately care about trust or do they feel that regulation is getting in the way of usability? For example, the Cookie laws which have caused issues with usability.

Colin Wallis, Executive Director at Kantara Initiative Inc, NGI TRUST

Colin Wallis echoed Nicole Harris by saying that human trust is a belief. Technology is still a fairly crude tool to reflect human trust in a digital version. A trustworthy and secure Internet is more accessible to technologists and 'geeks' but far harder for a broader populace. Technology is still a significant challenge but there are some interesting projects and technology like Pie (a parental control-style filter), Bit of Trust, cookie catchers, and others. There is a continuum of solutions while others are being produced along the way.

Colin Wallis said that everything online is mediated by at least one third party, and third party actors have the means and access to work against our interest.

In terms of building a secure and trustworthy framework, Colin Wallis spoke about the push against the big players, with new players coming to the ecosystem with supposedly more private and secure systems. But how do we ensure they genuinely provide that? Crowd source reputation, and other novel processes, are one way of building trust. However, these must be brought forward beyond the 'test bench' and lab to be actually viable. There is a need for a market of potential buyers to take these products on and try them 'in the wild'.

Colin Wallis spoke about being stuck in a particular architecture and mentality, and applauded efforts to push beyond the current architecture and challenge assumptions. He mentioned private webs as being a step in that direction to push boundaries, however whether it becomes mainstream is another question.

Colin Wallis touched on the privacy versus security issue, saying that we should limit backend intervention and privacy should not be compromised by security (government intervention).

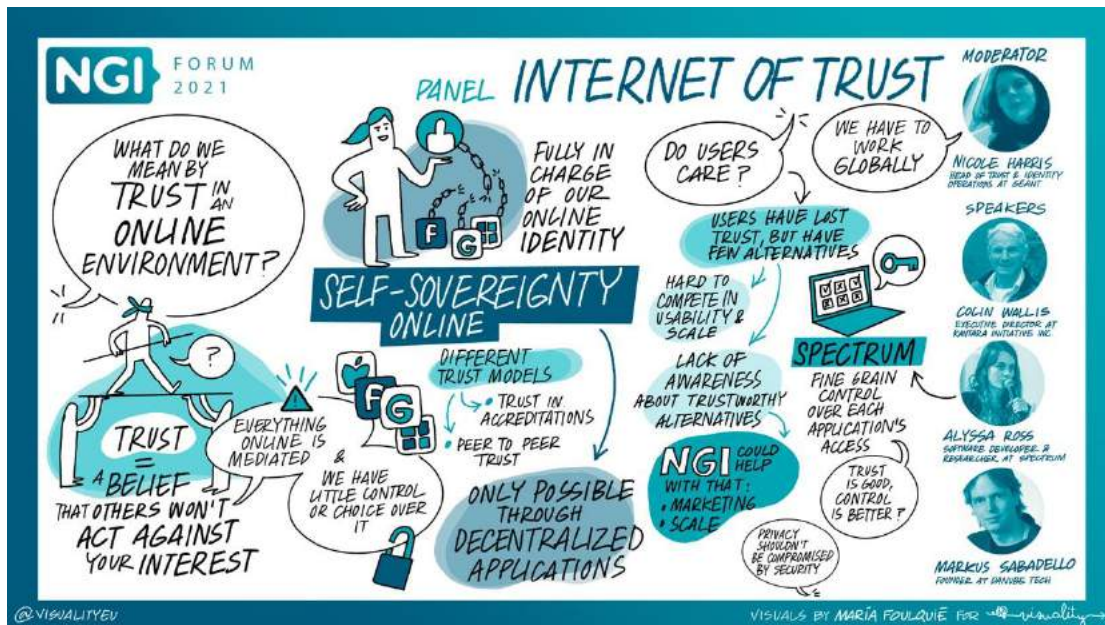
Markus Sabadello, Editor at W3C DID WG

Markus Sabadello said we must distinguish between human trust and technical trust. With technical trust, we are dependent on technology. While there are some technological ways of addressing trust, such as compartmentalisation and building blocks, there will always be a need for human trust, a means of assessment, and an aspect of voluntary sign-up by users and companies.

Markus Sabadello touched on the issue of decentralisation and sovereignty, saying that our digital identity (who we are and how we present ourselves) should be controlled by ourselves and not by third parties. He said that big players such as Google and Facebook had become a form of 'digital feudalism'. Markus Sabadello spoke about the growing awareness of privacy issues and that companies like Google and Facebook may not be as

trustworthy as once thought. He said that in the EU we are overly identified and that third parties have a lot of information to gain.

A key aspect to ensure trust is the use of Open standards and Open Source software, to enable interoperability and to move from one technology to another. Markus Sabadello also spoke about decentralisation, which allows for greater diversity of users.



Alyssa Ross, Software developer and Researcher at Spectrum

Alyssa Ross spoke about the quandary faced by ‘mainstream’ users, who may not trust systems like Google but do not have the means to *not* use it, nor have the ability to understand what they are trusting Google with. When it comes to online trust, there are no real boundaries and online services are constantly finding new ways to betray that trust.

Alyssa Ross said that on desktop computers, under current operating systems, all software runs from the same compartment so every piece of software can interact. Alyssa Ross’ Spectrum creates a software environment where software is compartmentalised, where users can have fine-grained control over each application they use. AR said that users should be in control of what they trust developers with, rather than having to trust that all software developers do what they say they are doing. If the user is in control, then they do not have to trust someone else to limit themselves if they are not given that power. Alyssa Ross said that we should be putting people in control where possible.

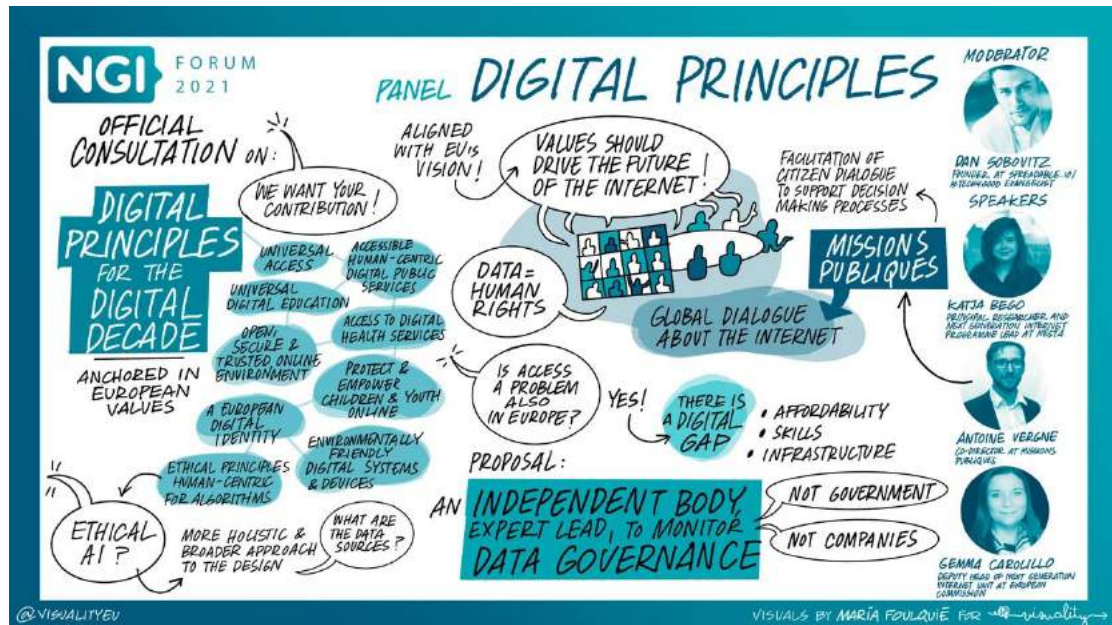
Alyssa Ross talked about the challenges of stopping using an application like Zoom, which would only work if everyone did so at once. Remote working has created a dependence on these sorts of systems, despite concerns about their privacy. Although there are alternatives, it can be hard for them to compete on usability. Alyssa Ross said that NGI can help by putting resources towards these alternatives. Marketing is also an important factor, as people are not aware of alternatives that might have better motivations.

Alyssa Ross said that working on usability is important, because 'ordinary' users either feel powerless about the trust issue or do not really take it into consideration over usability. She said that we need to reframe and ensure trust becomes part of the conversation, while getting usability to match that of hyperscalers.

Digital Principles

Chaired by Dan Sobovitz, Founder of spreadable.io, #Tech4Good Evangelist

Dan Sobovitz touched on some of the issues and values which will be discussed in the Consultation on the future EU Digital Principles. He asked the panellists about the issue of internet accessibility. He posed the question of how we can make sure our data is safe and how to protect data bases. He touched on the future of AI and algorithmic solutions, which have interesting potential but come with many risks as well. DS asked how we can ensure that AI is used ethically.



Gemma Carolillo, Deputy Head of Next Generation Internet Unit at European Commission

Gemma Carolillo presented the European Commission public consultation on the formulation of a set of EU Digital Principles. She spoke of the growing need for and reliance on highly skilled and digital professionals, and how our businesses and public services should embrace the digital transformation. A governance structure is indeed key: a framework to be built around Digital Principles, which will inform citizens and guide service providers. Gemma Carolillo spoke about the launch of a consultation process to examine key topics on digital transformation, looking for gaps and opportunities to inform the policy framework.

The Digital Principles will be shaped around different areas, such as access to Internet services, to a secure and trusted online environment, to digital health services and to human-centric digital public services and administration. They are currently not binding, but once translated into regulation and policy, they will have an important impact on citizens.

Gemma Carolillo spoke of a convergence between what citizens want in terms of solutions which are secure, preventing identity manipulation, and data privacy. The EU's data protection and GDPR standards have effectively been expanded across the world. This is perhaps more of an unintended consequence but because of the interlinkages with the rest of the world and the fact that Internet services do not have borders. Therefore while standard-setting is primarily to meet European expectations, it does have broader consequences outside Europe's borders.

Antoine Vergne, Co-director at Missions Publiques

Antoine Vergne introduced the "We, the internet" project. Its mission is to test, improve and institutionalise deliberative governance. The project invites ordinary citizens (non-engaged and non-active) to debate on different topics. Participants are gathered by random selection, given key information on topics, time to form their opinions, and then they make recommendations on the topics. The project covered more than 70 countries, including 22 EU Member States. The consultants were hybrid (half online and half face to face). Some of the topics covered were disinformation, data privacy and AI.

Antoine Vergne talked through some of the results of the project. Consultations showed that citizens all over the world support a value driven Internet, showing a strong alignment with the values of NGI. In terms of the tools to fight disinformation, education was considered the most urgent and important, while technical tools rated low in the polls. People all over the world want freedom and access, regardless of where they are based. Accessibility became more of an issue during the COVID-19 pandemic.

In terms of trust, there is a lower trust level towards governments and private countries and respondents felt that data should be handled at the supranational level. Overall, Asian countries put more trust in governments, even more so than in Europe. South America was lowest in terms of trust in governments. There is a strong feeling that private companies should be part of the solution. Data-driven societies bring more advantages than disadvantages, but only if they are underpinned by trust. A human rights-centred approach is vital. On the African continent, respondents viewed data more positively, in particular the positive role it can play in economic growth and jobs creation.

Antoine Vergne said that having performed consultations in 70 countries, there is a general convergence of what citizens want when it comes to digital citizenship. He concluded by saying that it is difficult for humans to trust something that they do not understand. He said we need to work on how we feed the algorithms and what the data sources are. When it comes to AI regulation, we must tailor the measures according to risks. And we have seen that some risks are unacceptable, like social scoring.

Katja Bego, Principal Researcher at Nesta, Coordinator of NGI FORWARD

Katja Bego introduced Nesta, which is a think tank and civil society organisation, with partners from all over Europe, from academia and industry. She said that there are many interesting initiatives and developments happening all over the world and that diversity of expertise is important. Katja Bego said that since there are challenges and problems across the 'stack', it is important to have that diversity. There are many different perspectives, and no one-size-fits-all solution, of either new technology nor new regulation, but a mix of solutions.

Katja Bego touched on the issue of accessibility, saying that it is still an issue in the EU. There are areas where high speed broadband needs to be rolled out, and there is also the nexus of affordability, so it is not just about technological capacity. Some potential users might have an Internet connection but many lack digital skills.

Katja Bego talked about the initiative to build a more inclusive and sustainable Internet, giving every European a sovereign identity. Identity is still a big issue, and we must move towards a model where citizens can share data around identity but also be able to retract this permission. In the current system, there is a reliance on intermediaries, and we must bring the power back to the individual. Katja Bego spoke about alternative models, in which individuals accumulate their data and then decide how and when they distribute or retract it, rather than giving permission once and effectively signing away one's rights. Katja Bego said that we need to find the right balance between centralisation and decentralisation but advocated for a decentralised approach to data collection. She said that it is less interesting to hack individuals, rather than big data lakes.

Katja Bego said that there is a role for governments to play, but spoke of a model which advocates for an independent body to constantly monitor and come up with its own governance model, rather than a central government actor with ownership.

On the point about AI, Katja Bego said that there is a tendency to focus too narrowly on this issue. She said that we should be focusing on where data for AI comes from and on the quality of this data. We need to take a much broader approach to the design of AI.

NGI in Horizon Europe – Work Programme 2021-2022

Jorge Gasós, Next Generation Internet, DG CONNECT, European Commission

Jorge Gasós gave an overview of the new funding framework, Horizon Europe, which will provide support for the next seven years. HE is organised around three pillars:

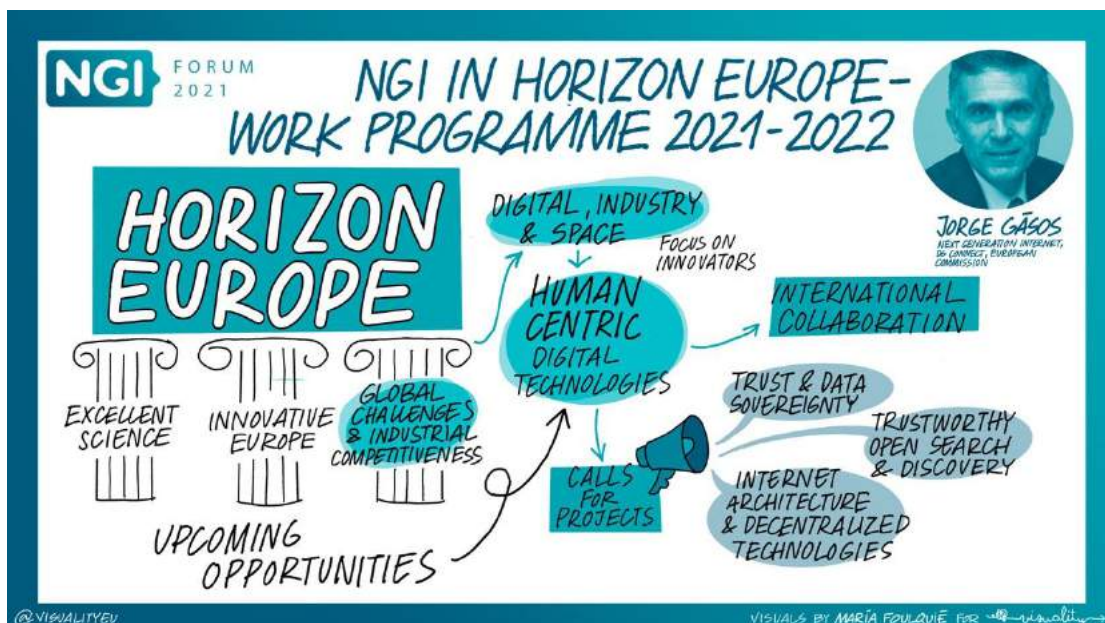
1. Excellence in science (ERC, mobility programmes like Marie Curie, research infrastructures)

2. Global Challenges and industrial competitiveness
3. Innovative EU (start-ups, SMEs, developers, helping to bring to the market), a new pillar.

Jorge Gasós presented the NGI, which is under the 2nd pillar and 4th cluster: Digital, Industry and Space, with the digital part falling under DG Connect and DG Grow. This chapter looks at world-leading data and computing technologies, emerging technologies, and human centred and ethical development of digital and industrial technologies.

The European Commission (EC) is pushing a human-centred approach, through projects it supports (privacy and trust, decentralisation, environmental sustainability). It also supports technological research exploring some of the challenges that have been mentioned, to implement activities focusing on innovators, high tech start-ups, developers, which is a different approach than other DG Connect projects.

Using the cascading grant funding model reduces the administrative burden, making application procedures simpler. Projects follow a short research and innovation cycle. Under the cascading or 'sub-granting' process, projects are submitted to an EC call, which is then run by Research and Innovation Actions (RIA), organisations in the ecosystem who provide the leadership in the research area. These organisations are then responsible for defining calls for projects, attracting and selecting top talent, and ensuring project management and monitoring. The sub-grantee (one legal entity or individual, such as an Internet innovator, outstanding academic, high tech start-up, open source developer) implements the project. In addition, funding is allocated to Coordination and Support Actions (CSAs).



Jorge Gasós elaborated on some of the specific funding actions:

- RIA 2021: €12 million for Trust and Data Sovereignty on the Internet. Its objective: to deliver architecture, protocols and services to ensure that end-users can exert their rights and benefit from decentralised

technological solutions that ensure that they are fully in control of their personal data on the Internet.

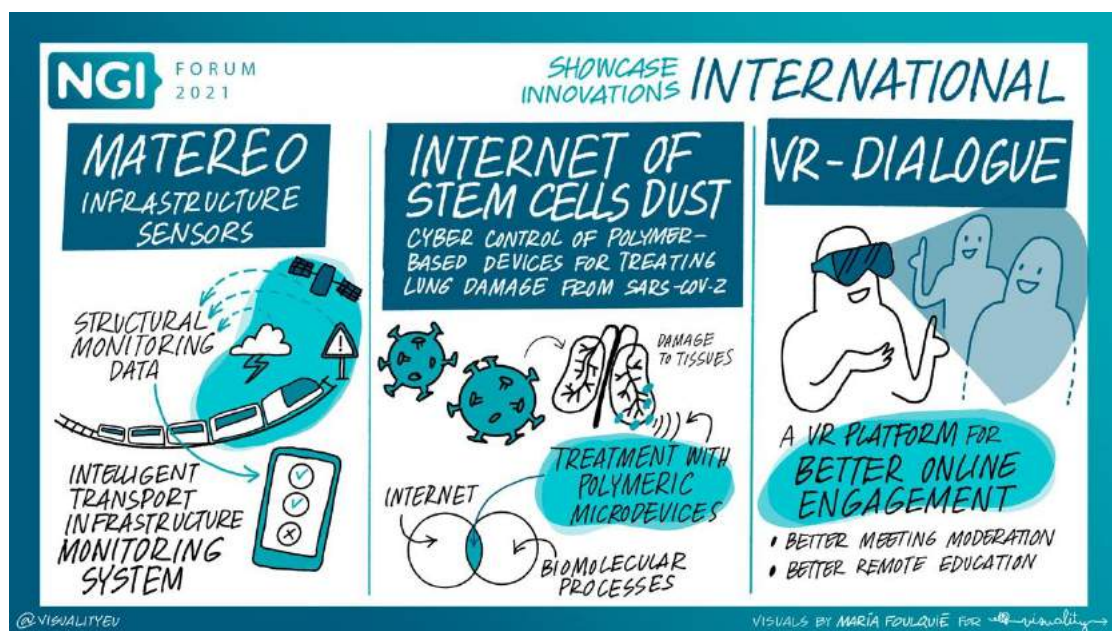
- RIA 2021: €17 million for trustworthy open search and discovery. Its objective: to develop technology and solutions enabling new and trustworthy ways of searching and discovering information across a variety of resources such as connected devices/smart objects, services, multimedia content etc.
- RIA 2022: €22 million for Internet architecture and decentralised technologies. Its objective: to review and upgrade the open Internet architecture to increase performance of the network, adapt it to new app requirements. Improve quality of service, make it more resistant to threats, and more energy efficient. It will also address current limitations to decentralised technology, such as blockchain and distributed ledger technology.
- CSA 2021: €2 million for a transatlantic fellowship programme to reinforce EU-US and EU-Canada cooperation in the areas of NGI.
- RIA 2022 €6 million for NGI International collaboration – USA & Canada

NGI calls in 2021 - Tentative proposal submission deadline 08 Sept 2021, with projects starting in Q1 of 2022.

Jorge Gasós reminded participants that there are still NGI open calls as part of Horizon 2020.

Showcase Innovations - International

Innovators' pitches introducing NGI "international" explorers



Matero – a digital solution using predictive intelligence to optimise maintenance systems of transport infrastructure.

Bruna Fonseca, Walton Institute – using a micro device to allow more efficient treatment of respiratory conditions (Internet of stem cells dust)

VR-Dialogue – a next generation online communication platform, using state of the art AI technology to improve the user's experience.

NGI International

Chaired by Iwa Stefanik, Project manager F6S, Coordinator of NGI Explorers

Iwa Stefanik explored the topic of international collaboration. She asked the panellists to present their projects and the aspects of international collaboration in their work.

Peter Van Daele, Professor at Ghent University - IMEC, coordinator of Fed4FIRE+

Peter Van Daele highlighted the importance of NGI as a space for experimentation. He then presented the Fed4Fire+ project which has been running for 10 years, supporting the digital community to run experiments.

Peter Van Daele said that new research, ideas, concepts, products, and tools need to be implemented in a highly competitive environment, with rapidly changing requirements, in multiple technology areas. He explained that new technology cannot be introduced in the 'live environment', so up-to-date testing environments and skilled support are needed. Unfortunately, this is far too expensive for many developers. This is where testbeds come in. Fed4Fire+ enables access to a 'federation' of testbeds, making it easy to experiment and use multiple testbeds, with a single account, and a choice of tools. It provides access to about 65 experimental facilities across the world (mainly within the EU and the United States).

Peter Van Daele underscored the importance of international collaboration, since it is impossible for a single university, country, or even region to create the appropriate environment for experimentation. Experimentation cannot be done with real life testing (the disruptions could be disastrous) and it cannot be done with computer simulation. He spoke about the added value of linking testbeds, which allows for the diversity of technologies and topics, and also includes scalability.

Peter Van Daele said that support to innovators is crucial. NGI supports new players with bright ideas who want to introduce a usable and scalable product ready for market. Knowledge from research can also support them. He stressed the importance of this supporting/mentoring service, not just investing in the technology.

Peter Van Daele said that the project in its current iteration is coming to an end, and the next step will be to establish a research infrastructure within Europe to solidify the initiative. Fed4Fire+ is working with other European partners on this initiative.

Dan Kilper, Professor at Trinity College Dublin and University of Arizona

Dan Kilper introduced his project explaining that he was initially working in the US on a testbed project, before moving to the OpenIreland testbed. The project focused on federating with other testbeds around the world, through the COSMOS interconnecting continents, COSM-IC. NGI Atlantic was essential on the Irish side to secure funding to build up interfaces and capabilities.

Dan Kilper elaborated on some of the features of COSMOS and Open Ireland, which are designed as open platforms for researchers to use. Open hardware was put into the testbeds with researchers in mind. The project is working on adding capabilities over time which will allow people to do more. They are also looking at how to make the testbeds work well together, by using common practices, so that technology can be used in one testbed and then transferred to another seamlessly. This means using translation services which would allow them to look at their software in one environment and then another.

On the point of capacity, Dan Kilper said that funding agencies should keep in mind that equipment and technology are not the only priority, but a wide organisation and staff skills is needed to bring value to the various applications.

Dan Kilper raised the issue of engaging collaborators on the US side to avail of National Science Foundation (NSF) International Team funding. He called on those in Europe who are working with US partners to look into the range of programmes under the NSF. There are opportunities for programme managers interested in setting up other types of collaborations, and getting funding going between different funding agencies.

Ana Bevc, Trace Labs - Food Data Marketplace - Privacy and Trust Enabling Data Marketplace for Sustainable Supply Chains, NGI Atlantic.eu

Ana Bevc is an awardee of the grant from NGI Atlantic and she talked about her experience of international collaboration on her project, Food Data Marketplace.

Food Data Marketplace (based in the EU) is based on the belief that sustainable supply chains are only possible by allowing all organisations, big or small, to benefit from trusted data exchanges. She stressed the challenges of ensuring data-exchange in this sector. Food Data Marketplace is a marketplace fostering new economic models for sustainable food supply chains. It is based on the core principles of data privacy, data integrity, data interoperability, and origin train.

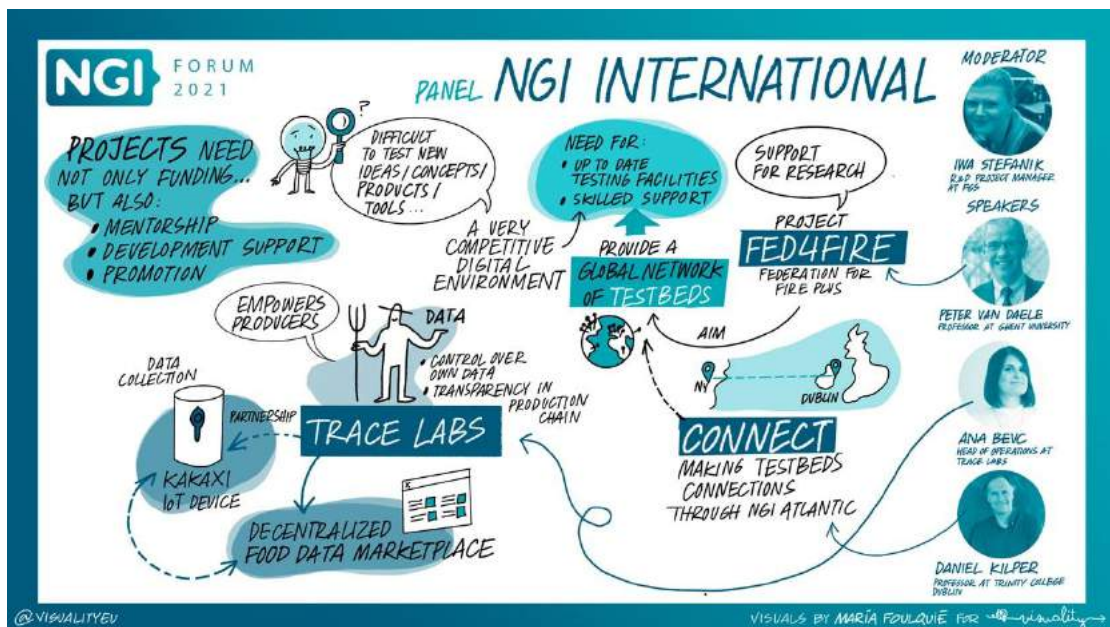
Kakaxi IoT device (based in the US) is a self-sustained IoT device with multiple sensors to measure temperature, humidity, rainfall and luminosity. It is a tool for food producers to collect food data which they can monetise through the Food Data Marketplace.

With funding from NGI Atlantic, the project deployed the Kakaxi device internationally, in a cacao supply chain in Columbia, a whiskey distillery in Ireland, and a solar farm in Nepal. Through the Food Data Marketplace, farmers can gain an additional revenue stream by monetising data captured by Kakaxi devices.

Ana Bevc said that the project had experienced some challenges in their international collaboration, but these were mainly due to logistical issues with customs and factors linked to the COVID-19 pandemic.

In terms of next steps and sustainability, collaboration with Kakaxi will continue. New collaborations have opened up, validating the use of the product and furthering its aim of global deployment.

Ana Bevc said that her project had been funded by multiple NGI initiatives. She spoke highly of the multitude of opportunities for support, which go beyond just funding, such as mentorship, marketing and connection with other players. She highlighted how important these areas are to innovators.



Awards for NGI innovator pitches and community future

Pearse O'Donohue, Director for the Future Networks Directorate of DG CONNECT, European Commission

Pearse O'Donohue announced the winners of the innovator pitch award:

- **Best story:** Matereo infrastructure sensors
- **Most engaging production:** IRNAS Luka Banovic
- **Personal performance:** IRNAS Luka Banovic

Link to the elevator pitches:

https://www.youtube.com/playlist?list=PLMry6uwmHiLaaMojD93G-zczbliOG_nGD

Pearse O'Donohue gave some concluding remarks, saying that he had been inspired by the speakers he had heard in the plenary over the two days. He spoke of the big investment of getting the initial push to get the NGI working. He said he was happy to see the commitment of those involved and that the EC is not running NGI, but *facilitating* it.

Pearse O'Donohue said that one of the high points of the NGI Forum for him was Professor Tanenbaum's keynote address in which he showed the disruptive effects of the Internet on society and traditional sectors. He took note of Professor Tanenbaum's point about whether disruption is more likely to happen with or without governance, through regulation and investment. Pearse O'Donohue said that it is important that the Internet be governed properly, but that regulation should not be as involved in the delivery.

Pearse O'Donohue welcomed the discussions about Internet architecture, saying that environmental sustainability is a key issue. Consumers want a safe and fast Internet, but it must also meet Green Deal objectives. This is indeed one of the Digital Principles.

Pearse O'Donohue took note of the many comments about open source, saying that the message was clear, and that the EC needs to support the model. The key to maintaining the building blocks of the Internet is through open source. As part of ongoing efforts, the EC has commissioned a study on open source hardware and software.

Pearse O'Donohue said that the Digital Decade is not just for European policy makers but that there is an essential role for NGI and the wider digital community to play. Non-corporate stakeholders are also important and there is a need to involve citizens and ensure their needs are being served. Digital services must be human-centric and put the user in control. The ideas and inputs of citizens are needed to arrive at concrete solutions to build an Internet of trust, an Internet *of* and *for* humans.



Workshop day 1 -17 May 2021

Self Sovereign Identity. Trust in NGI

Date & time: **May 17 | 11:00-15:00**

Organizer: **NGI FORWARD**

Moderators: **Gaëlle Le Gars and Rob van Kranenburg**, *NGI Forward*

Participants: 65 (am) 31 (pm) plus 101 views on YT

The topic of this workshop was online trust, based on Self Sovereign Identity frameworks funded in NGI projects. International interest in digital identity management and SSI is growing globally.

The workshop had two parts. A webinar with short presentations (60 min) and a general discussion on Big Blue Button for participants' contributions (60 min).

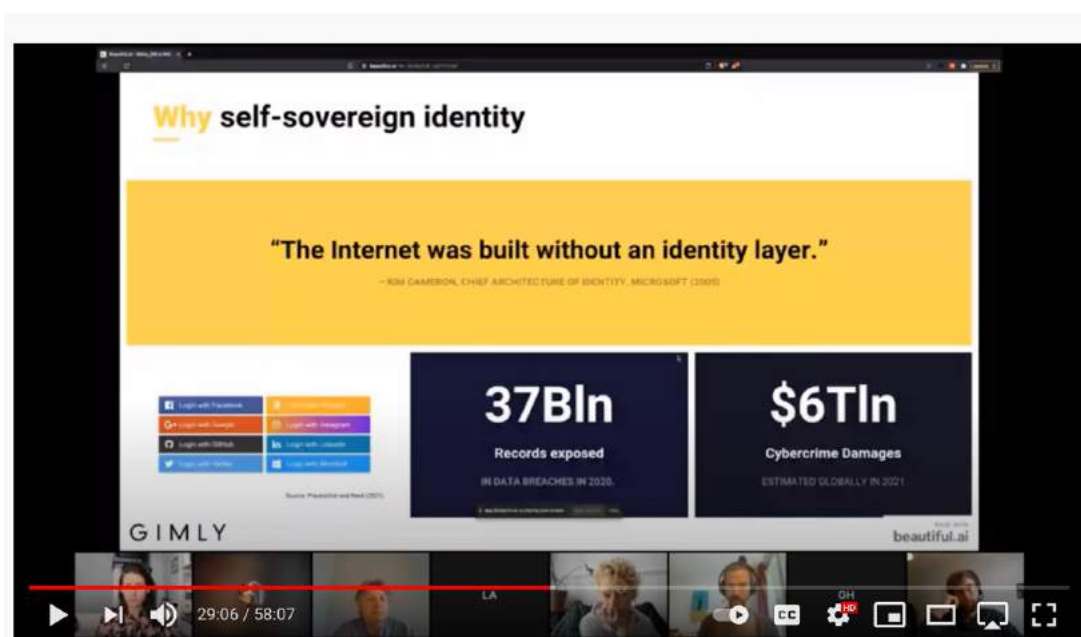
The main presentation in the afternoon session was from **Oskar van Deventer** from *TNO* who explained the upcoming ESSIF Labs Open calls. Other main topics included a presentation by **Gordana Halavanja**, *Co-founder of Co-operating.systems (NGI Trust subproject)*: The world faces complex and interrelated issues that can only be addressed by real-time secure digital co-operation between diverse organisations. How can we enable effective co-operation between autonomous actors and institutions without sacrificing digital sovereignty? The answer, concluded in the workshop, is a new kind of open source/open standards platform, with a unique social enterprise driving its development.





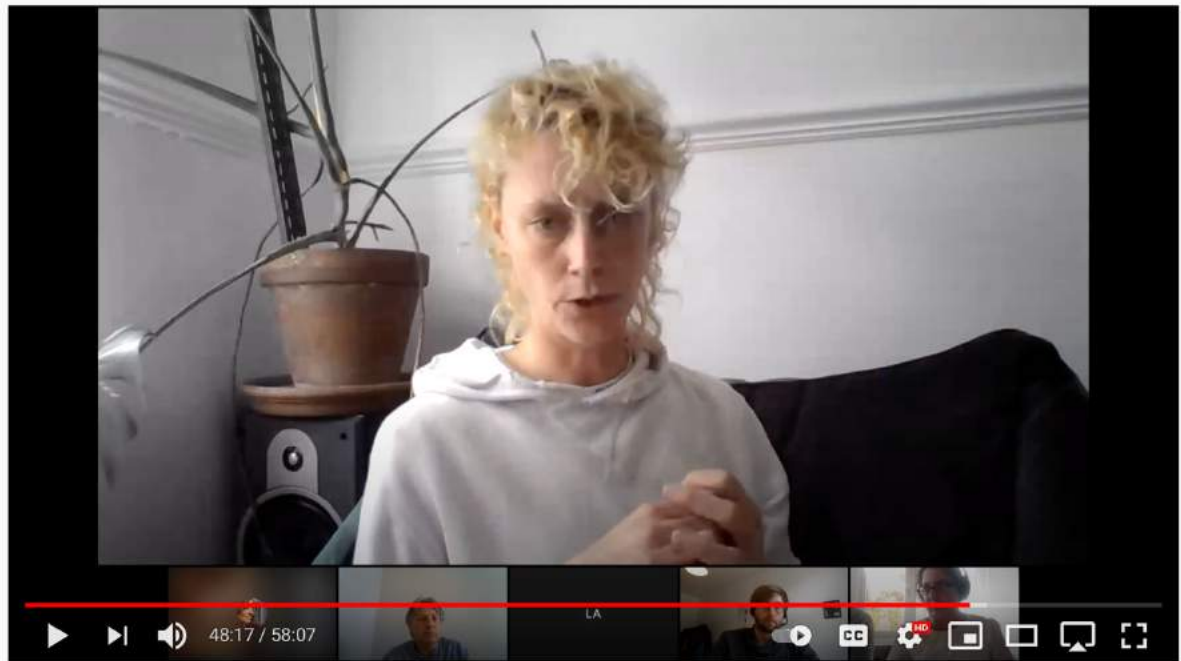
PRE-NGI Forum event: Self-sovereign identity trust

Primavera de Filippi, CNRS, 'Self-Sovereign Identity in a Globalized World: Credentials-Based Identity Systems as a Driver for Economic Inclusion'. See further reading: How combining blockchain-based cryptocurrencies and SSI contributes to promoting privacy as well as greater economic inclusion. <https://doi.org/10.3389/fbloc.2019.00028>



Caspar Roelofs, *Founder of Gimly Blockchain Project (ESSIF Lab subproject)*

Gimly's focus is on self-sovereign identity and secure data exchange as pivotal building blocks for the future of internet, supply chain, finance, and health care. See: <https://www.gimly.io/>



PRE-NGI Forum event: Self-sovereign identity trust

Jaya Klara Brekke, *Founding member of Magma Collective (NGI LEDGER project)*

Dr Jaya Klara Brekke speaks on SSI in relation to two EC projects: CoBox cobox.cloud and Nym nymtech.net (which also has EC roots through the Panoramix and DECODE projects). See: <https://cobox.cloud/>

Speakers also included:

Daniel Du Seuil, *Convenor of the European Self Sovereign Identity Framework within the European Blockchain Partnership*

This partnership of 30 EU member states and related countries cooperate in the establishment of an interoperable infrastructure (EBSI) that supports the delivery of cross-border digital public services, with highest standards of security and privacy.

<https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/EBSI>

Irene Hernandez, *Founder and CEO of Gataca (ESSIF Lab subproject)*

Gataca has built three components to connect a more secure digital ID ecosystem. Aims to help issuers transform their CREDENTIALS into IDENTITY wallets in the customers' mobile phones. This will connect and access a range of digital services, from e-government to car sharing.

<https://gataca.io/>

Michael Kubach, *Team Identity Management at Fraunhofer IAO, TRAIN (ESSIF Lab subproject)*

The trust management architecture that TRAIN enables more secure, trustable digital interactions. At the same time a classical hierarchical CA-type structure is avoided – limiting fraud, chaos and the pure dominance of the economically strongest actors in the system.

<https://essif-lab.eu/essif-train-by-fraunhofer-gesellschaft/>

Self-Sovereign Identity is an emerging concept associated with the way identity is managed in the digital world. According to the Self-Sovereign Identity approach, users should be able to create and control their own identity, without relying on any centralised authority. The participants brought a variety of tools, practical building blocks like wallets (one of the main components of the recent EU eID regulation), secure architectures, questions such as what the relationship is between blockchain and SSI, why novel concepts of unlinkability are necessary and policy perspectives such as the relationship between the updated eIDAS regulation and the EBSI framework and the notion of safeguarded identity.

The session is part of an ongoing series of NGI Forward Salons on Identity that started with a presentation at STOA in June 2020 and will end with recommendations at the end of 2021.

The session was opened and closed by EC Officer Loretta Anania who pointed to the upcoming ESSIF Labs calls and stressed the importance of the notion of Safeguarded Identity.

Why safeguards are needed

- **IN EUROPE PRIVACY DIGNITY & SECURITY AS FUNDAMENTAL RIGHTS ASSIGNED TO EACH INDIVIDUAL CITIZEN**
- **EC REGULATORY SUCCESS STORIES: MAKE CHOICE OF BROWSERS TRANSPARENT, GDPR, eIDAS, POLICIES THAT 'ENTITLE' CITIZENS**
- **POLICY INITIATIVE: MAKE EUROPE A CENTER FOR SAFEGUARDED DIGITAL IDENTITY! AN NGI (E2E) TRUST PREROGATIVE**
- **FROM FEDERATED IDENTITIES TO SELF SOVEREIGN IDENTITY, AND WHAT NEXT, DISPOSABLE IDENTITIES ?**

Why policy action is timely

- **EU MEMBER STATES MUST GO DIGITAL MUST DELIVER ON DIGITAL WELFARE NEEDS (esp. in time of big crisis cost-efficiency)**
- **INTERNET ACCESS THAT IS NON-DISCRIMINATORY NEEDS A PUSH: DATA POLICY, RIGHT TO MEANINGFUL CONSENT, TO OPT-OUT, SPY-ME-NOT, PERSONAL DATA MINIMISATION, NO ILLEGAL REPURPOSING, MY RIGHT TO REDRESS.**
- **DID & ISA2 FROM SSI INFRASTRUCTURES TO SELF-GOVERNED IDENTITIES UNDER PUBLIC SCRUTINY AND CONTROL**
- **UNITY IN DIVERSITY NEEDS COMMON INTEROPERABILITY & OPEN STANDARDS, INCLUSION IS A POLITICAL CHOICE quid pro quo. Regulatory framework to rebalance public/private sphere, FAIRNESS**

Key takeaway from the series is that on the basis of EU legislation it is urgent to address the identity technology sphere in terms of the translation into the digital realm of fundamental rights and values. These include especially

trust, accountability and autonomy. Original contributions from the NGI Forward Identity ecosystem are safeguarded identity and disposable identities. Both concepts encapsulate important findings and promising avenues for policy as well as technology developments. The first one “safeguarded identity” reflects the purpose of EU policy as it emanated from our exchanges throughout the period. The second “disposable identities” reflects a possible alternative, a better technology alternative to the options currently promoted by the dominant players of the sector.

Recording available here:

<https://www.youtube.com/watch?v=NzY9spKyKvM>

The banner features the NGI Forum 2021 logo on the left and the NGI Forward logo on the right. The main text reads "SELF SOVEREIGN IDENTITY. TRUST IN NGI." followed by "organised by NGI FORWARD". At the bottom left, it says "ONLINE EVENT" and "2021.NGIFORUM.EU". At the bottom right, it shows a clock icon, "11:00 | 15:00", and "17 MAY 2021". The background is white with blue abstract shapes on the right side.

Workshop day 2 -18 May 2021

How to make data portability go mainstream?

Date & time: **May 18 | 14:00-15:00**

Organizer: **NGI FORWARD**

Moderator: **Michiel de Jong**, *Ponder Source, DAPSI's Advisory Board Member*

Speakers: **Alejandro Russo**, *Dpella project*; **Hans-Joerg**, *OpenXPort project*; **Tom Haegemans**, *UI-Transfer project*; **Mehdi Medjaoui**, *ALIAS project*

Participants: 61

The right to data portability was considered one of the most important novelties within the EU General Data Protection Regulation. An opportunity to give the power of personal data back to the people and fuel competition. Users, however, still demand more practicality associated with the rules. Five experts and innovators in the field discussed how data portability can go mainstream sharing very different experiences, points of view and innovative solutions.

Key quotes

Michiel de Jong, Ponder Source: *"We need to do something better than just waiting for the big services to fix it [data portability] themselves."*

Tom Haegemans, UI-Transfer project: *"We should enable people to easily reuse their data from one place to another place."*

Mehdi Medjaoui, ALIAS project: *"Data portability works but human-centric data portability is still an issue."*

Cause for optimism to build an Internet of Trust

The Data Portability term within the GDPR is quite young in terms of internet ages and in terms of legislation. There won't be only one perfect and agnostic solution available tomorrow, but what we can see with this EU regulation is the setting up of a cornerstone on the topic, and there are domains, like banking, real estate or healthcare, with specific data portability regulation, that are advancing faster. The development of sectorial oriented regulation and new technological solutions can be extended to other domains to accelerate adoption.

Main challenges to build an Internet of Trust

The main Data Portability Challenges identified in the workshop are in the interoperability, standards, user experience and regulation domains.

Next steps

Some of the aspects needed to make Data Portability go mainstream are:

- More education and public awareness on data portability and human centricity benefits.
- More regulation, and sectoral regulation, so data portability can not be avoidable by organisations.
- Interoperable technologies and standardised APIs

NGI funded projects showcased in the workshop:

- <https://dapsi.ngi.eu/hall-of-fame/alias/>
- <https://dapsi.ngi.eu/hall-of-fame/dpella/>
- <https://dapsi.ngi.eu/hall-of-fame/ui-transfer/>
- <https://dapsi.ngi.eu/hall-of-fame/openxport/>

DAPSI website: <http://dapsi.ngi.eu/>

Recording available here:

<https://www.youtube.com/watch?v=eqK2ueGytTo>



Next Generation Internet Technologies for Green Digital Transformation

Date & time: **May 18 | 14:00-15:00**

Organizer: **NGI4ALL**

Moderator: **Dr Monique Calisti**, CEO at Martel Innovate, NGI Outreach Office, NGI4ALL

Speakers: **Dr. Loretta Anania**, European Commission, Directorate-General for Communication Networks, Content and Technology Next Generation Internet; **Prof Adrian Perrig**, ETH Zurich, NGI Innovator; **Dr Giovanni Rimassa**, Digital for Planet, NGI Ambassador; **Chris Adams**, The Open Green Web

Participants: 70

The main objective of this workshop was to voice some of the most significant efforts within the NGI Community that through their work are paving the way to a greener Internet, while advocating for an increased focus on understanding and studying the environmental footprint of Internet technologies.

The environmental cost of the Internet has been dramatically growing in recent years. The Internet consumes electricity on end users' devices, in data centres and in communication networks that transfer data. According to recent studies, the total electricity consumption of its infrastructure alone

(networks and data centres, without consumer devices) is around 500 TWh per year that is 2.5% of worldwide electricity. Besides the negative impact due to the huge energy consumption, the environmental footprint of the Internet also accounts for the production, use and disposal of its infrastructure and the massive proliferation of connected things (25-50 billions by end of 2021!).

Recommendations

1. Stricter rules on **conflict minerals**
2. Supply of rare-earth metals: plan for long term independence
3. **R&I** to reduce reliance on desctructive mining operations
4. **Supply Chain**: set rules to ensure transparency

Integrate sustainability into all digital policy

1. **Green procurement** for digital products and services
2. **Data centres** to be powered entirely by renewable energy by 2030
3. R&I funding to support low-energy services by design
4. Rules to ensure continuity of **software updates** to discourage unnecessary replacement of devices.

1. Explore a coherent **environmental impact labelling scheme**
2. Increase **transparency** of the **environmental impact of web services**.
3. Introduce **reparability scores** for products

Inform and empower consumers

1. Rules for companies to practice **data minimization**
2. Assess possible extensive **use of low-tech/low consumption solutions**
3. Supply chain: countries to pay the **full price of the carbon emissions** of their **purchases**

Panelists shared their perspectives on the topic, with a very clear alignment among them. The key points mentioned by the speakers were: all individuals are responsible for the choices they make, at several levels; growing awareness is one of the major steps towards a conscious data consumption and data behavior; engagement and commitment will not suffice – we must act with a complex mindset and above all – execute what we preach.

Key quotes

Loretta Anania, EC *"Practice what you preach. It's easy to say and hard to do but I see the next generation being more vegan, doing data minimization; I think their behavior is a lot better than what we have seen in the previous generations."*

Adrian Perrig, ETZ: *"It would be good to have carbon transparency for whatever we do on the internet."*

Chris Adams, The Open Green Web: *"Green your stack and make sure green power is fossil-free power 24/7."*

Giovanni Rimassa, D4P: *"Think systemically and have a complexity mindset. We have to act on many different levels; no single category can solve or even address this problem. We need a multi-actor approach and we must act together; together but in diversity."*

Firefox Developer Edition File Edit View History Bookmarks Tools Window Help

D4P: The Green Web Foundati... X

https://docs.google.com/presentation/d/1_DiOOV583nJwGTJz78Ym#27F1epi: 00%

Chris Adams

Fossil energy versus green, non-fossil energy

Gas

Coal

Wind

Solar

You don't have control over what others feed into the grid.

If you know the mix going into the grid, you can at least account for it.

> TOWARDS A SUSTAINABLE INTERNET

Silviano Rinasca (D)

PILLARS AND LAYERS

The NGI Forward 2030 vision for a future Internet includes *five pillars*, of which two are of significance for D4P core interests: **resilience** and **sustainability**. The traditional layered network model was extended to cover information and societal aspects.

Resilient and sustainable Internet impacts many layers

- > L01: escaping unsustainable consumerism
- > L03: data minimization and processing power
- > L06: little sustainability focus in Internet standards
- > L07: network resilience vs. environment footprint

- 01 > Societal impact
- 02 > Applications
- 03 > Data and transport
- 04 > Information
- 05 > Technology and software development
- 06 > Protocols, standards and governance
- 07 > Physical infrastructures and hardware

The layers of the power-stack model for the internet

© Digital For Planet - D4P

digital4planet.org

Next steps

Small and medium organizations should not wait for the big players; they should act now.

Links

- <https://www.thegreenwebfoundation.org/news/a-way-to-think-about-the-environmental-impact-of-streaming-services-like-netflix/>
- <https://digital4planet.org/resources/>
- <https://eosc-portal.eu>
- <https://www.weh.ox.ac.uk/research/digital-environmental-sustainability-ethics>

- <https://www.electricitymap.org/map>
- <https://www.weforum.org/agenda/2021/03/internet-carbon-emissions-data-path-scion>

Recording available here:

<https://www.youtube.com/watch?v=6plovyeZJA8>

NGI FORUM 2021 **NGI 4ALL**

NEXT GENERATION INTERNET TECHNOLOGIES FOR GREEN DIGITAL TRANSFORMATION
organised by **NGI4ALL (NGI Outreach Office)**

ONLINE EVENT
2021.NGIFORUM.EU

14:00
18 MAY 2021

How are NGI Research and Innovation Actions working towards creating a more human centred internet?

Date & time: **May 18 | 14:00-15:00**

Organizers: **POINTER, LEDGER, eSSIF-LAB, ASSURE**

Speakers: **Mirko Presser**, *NGI POINTER*; **Dr. M. Oskar van Deventer**, *eSSIF-LAB*; **Michiel Leenaars**, *NGI Zero*; **Andrés Sánchez**, *LEDGER*; **Jaya Klara Brekke**, *Magma Collective, Cobox*

Participants: 33

Like the pieces of a puzzle, each of the Innovation Actions participating in NGI are working towards the same common objective: foster developments that contribute to a more Human Centric Internet. But, what do we understand by Human Centric and how is each project approaching it in practice? How can we inspire the audience to adopt this approach?

Each of the participants provided their perspective on how their field of work contributes to this objective including trust (eSSIF-LAB), decentralised technologies and blockchain (LEDGER & ASSURE), or the development of

the Internet's architecture itself via new tools and protocols (POINTER), whilst keeping European values at the core.

The session highlighted common understanding about the RIAs that any product needs to be designed and built thinking in the benefits they bring to people and citizens.



Key quotes

Jaya Klara Brekke, NGI Innovator – LEDGER: *“What I like the most about the concept human-centric is that it is not individual-centric, nor user-centric. When we use human-centric we widen the scope to a more society-related concept.”*

Michiel Leenaars, NGI Assure: *“NGI as a mechanism focusing on open source, focusing on decentralisation makes a lot of sense. It is a very powerful generic principle to avoid any type of dominance and it puts innovation in the hands of everybody”.*



Oskar van Deventer, eSSIF-lab: *“The whole goal of what we are doing in NGI is ecosystem building, that will eventually create new types of jobs that we don't even know yet.”*

Mirko Presser, NGI Pointer: *“The Next Generation Internet is building some of the foundational protocols or architectural components for people to create a more secure and trusted environment.”*

Andrés Sánchez, LEDGER: *“We are looking to apply a European approach to the Internet, versus the market-oriented or the surveillance-based models of the USA and China.”*

Cause for optimism to build an Internet of Trust

The increasing awareness of citizens regarding the power of a few players who control the data of the majority.

The screenshot shows a presentation slide for NGI (Next Generation Internet) with a list of projects and a video call overlay on the right. The slide content is as follows:

- Core Internet Application:**
 - **Ltt.rs** - Open source email client (JMAP);
 - **Next** - Fully extensible power-browser.
 - **Lightmeter** - Email Infrastructure reinvented
- Identity:**
 - **Id-xover** - Internet-wide identity through realm crossover.
- Virtualisation:**
 - **MirageOS** - Deploying MirageOS unikernels.
- Transport/Network:**
 - **MPTCP5G** - Multipath TCP for 5G networks;
 - **MPTCP** - Multipath TCP;
 - **SCE** - Some Congestion Experienced.
 - **IGNNITION** - Fast prototyping of complex Graph Neural Networks for network optimisation.
 - **RIM** - Receiver-driven Incoming-traffic Management.
 - **TA4NGI** - Trust and Authentication for Next Generation Internet.
- Security:**
 - **Firmware-lib** - European Firmware and app library.
 - **EDGEsec** - New architecture for local (edge based) routers.
- Tools:**
 - **Linux-Regression** - Linux kernel regression tracking.
- Privacy-by-Design Communication Protocols: 4:**
 - **KORUZA** - Wireless optical communication system for urban environments.
 - **DATAHOP** - Incentivised content dissemination at the network edge.
 - **Scuttlebutt** - The Gossip protocol.
 - **Peergos** - Decentralised, end-to-end encrypted, and trustless protocol.
- New ideas and paradigms:**
 - **DREAM** - Distributed Replicable Extensible Agency Machine.
 - **Reewolf** - From low-level Internet sockets to high-level programmable connectors.
 - **Solid-Shape** - Reshaping linked data on the fly. *
 - **VerifiedSCION** - Verified secure routing with SCION. *

The video call overlay on the right shows four participants: Andrés Sánchez, Mirko Presser, michiel, and Jaya Klara Brekke. The slide footer includes the NGI logo, the number 9, and the URL <https://pointer.ngi.eu/ngi-architects/>, along with a link to a podcast episode: <https://shows.acast.com/spotlight-on-ngi-architects/episodes>.

Main challenge to build an Internet of Trust

To fight the predominant visions and paradigms of USA (market capitalism) and China (surveillance capitalism).

Next steps

To keep betting for open source and decentralised solutions.

Links

- **NGI Assure**
<https://spaces.fundingbox.com/spaces/ngi-community-ngi-assure-1>
- **NGI Pointer**
<https://spaces.fundingbox.com/spaces/ngi-community-ngi-pointer>
- **LEDGER**
<https://spaces.fundingbox.com/c/ledger>
- **eSSIF-lab**
<https://spaces.fundingbox.com/spaces/ngi-community-ngi-essif-lab>
- **NGI Community**
<https://spaces.fundingbox.com/c/ngi-next-generation-internet>

Recording available here:

<https://www.youtube.com/watch?v=B10Og1DeJQg>

Article available here:

<https://spaces.fundingbox.com/spaces/ngi-next-generation-internet-the-next-generation-internet-news/60ae680b30af7c57fa708f98>

HOW ARE NGI RESEARCH AND INNOVATION ACTIONS WORKING TOWARDS CREATING A MORE HUMAN CENTRED INTERNET?

organised by **POINTER**, **LEDGER**, **ESSIF-LAB** and **ASSURE**



Dr. Mirko Presser



Dr. M. Oskar van Deventer



Michiel Leenaars



Dr. Jaya Klara Brekke



MODERATOR
Andrés Sánchez



8 sentences to stimulate the appetite of your audience

Date & time: **May 18 | 15:00-16:30**

Organizers: **TETRA**, **NGI OUTREACH OFFICE**

Speakers: **Susanna Albertini** and **Louis Ferrini**, *FVA new media research (NGI TETRA)*; **Philippe Felix**, *Tipik (NGI4ALL)*

Participants: 17

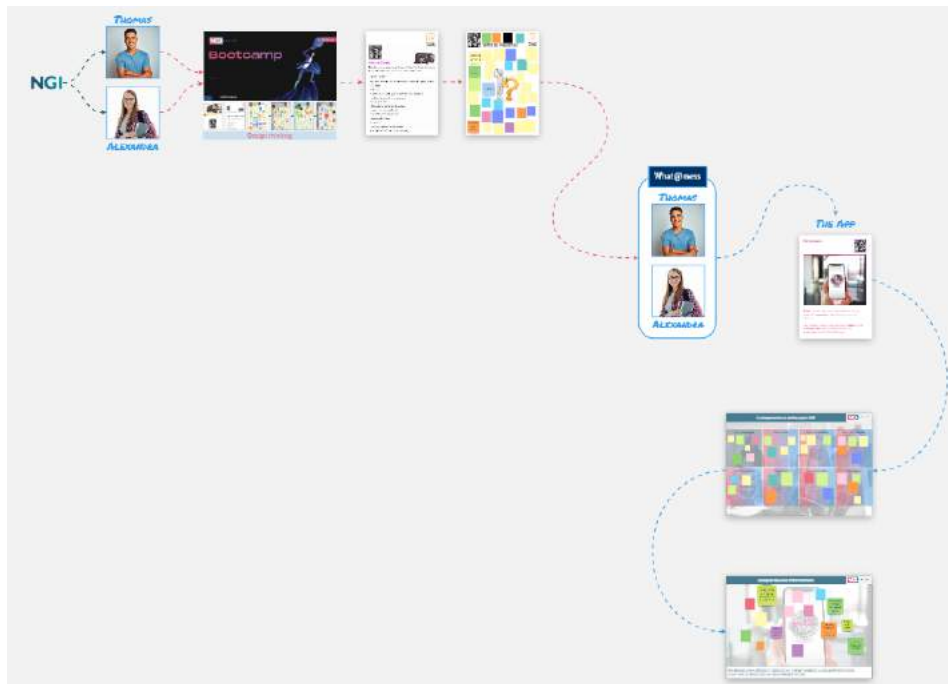
This learning experience was composed of three modules:

- Presentation on the Art of Pitching.
- Presentation of the unique selling points.
- Interactive session for specifying one's unique selling point and tweaking their skill of presenting their project/product in the process of raising funds.

This learning experience was designed to prepare for a pitch. The game was presented with a video scenario that shows a situation where the innovator is in line for lunch and has the opportunity to be close to an investor.

He/she had one minute to convince others why his/her idea, service or product is so good. After the scenario the participants were invited to structure a one minute pitch using only eight very focused key sentences. The participants had an online canvas (using the MIRO tool) to structure their eight sentences:

Who is our target? What is the problem? How is it magical? What do we offer? What we do. What is our solution? Who we are. Call to action.



The last part of the learning experience bridged the pitch with the definition of the USP: the participants were invited to think 'out of the box' to find something really unique about their product / service, compared to the competitors.

Recording available here:

<https://www.youtube.com/watch?v=TwFDYkSnCQU>



8 SENTENCES TO STIMULATE THE APPETITE OF YOUR AUDIENCE

organised by TETRA and NGI4ALL (NGI OUTREACH OFFICE)

ONLINE EVENT

2021.NGIFORUM.EU

🕒 15:00

18 MAY 2021

Regaining control over our devices: Building open hardware chips in Europe

Date & time: **May 18 | 15:00-17:00**

Organizer: **NGI ZERO**

Moderator: **Rob Taylor**, *Librecores/Chipflow*

Participants: 37 participants in session, unspecified number of participants on stream

The NGI Zero projects presenting their progress demonstrated a diverse range of chip developing tools and components that addressed virtually all dimensions of hardware design and manufacturing, providing open alternatives for permissionless innovation.

The industry panel discussing the future of European chip development with open hardware tools was impressed by this variety of mature and developing projects, comparing it to the open source software boom in the late 90's after which software development has become unimaginable without using open source.

Europe has been losing market share in the semiconductor industry with chip production down to 10% of world production. And at the same time, semiconductor chips are at the heart of the majority of modern technology and form a core part of today's society. This forms a vulnerability for European industry, security and sovereignty and affects European society at many fundamental levels. One potential path forward to address these issues is to apply the economics of Open Source to the domain of semiconductor design and manufacture.

Key quotes

Mohamed Kassem, cofounder and CTO of open hardware platform eFabless: *"It is actually very exciting and I am very happy, being in the semiconductor world for all my career, this is the most exciting period in that industry right now for me."*

Rob Taylor, LibreCores, Chipflow, moderator of industry and policy panel: *"I am very enthused about what we can do by increasing that rate of innovation by enabling these open technologies."*

Jana Nieder, research group leader and coordinator of the advanced materials and computation cluster at research organization INL: *"If there was more of these projects available in open hardware, suddenly I think it may have an impact later on to be actually picked up, simply because the younger generation would be trained in these tools".*

Andrew "bunnie" Huang, developer, activist and writer on open hardware and reverse engineering *"It's been cathartic almost to see real communities come together creating things that are not just usable, but capable of displacing incumbencies. There is a real meat, a real substance to the movement at this point in time."*

Rob Taylor, LibreCores, Chipflow, moderator of industry and policy panel *"It feels very much like there is an uptick, the knee of an exponential curve"*

happening. It reminds me a lot of the late 90's, early 2000's, in open source software. Now no one can even consider making a new software product without using open source."

Thomas Kramer of LibrEDA: "Our society relies highly on silicon, but silicon chips are black boxes and this comes with a lot of security implications."

Staf Verhaegen of Chips4Makers ASICs: "*Having low-cost options will not only make it possible for academia or professional design houses, but also for makers to make their own chip. And when you have a lot of people doing things, you will also drive innovation of the tool chain the open source way, with people scratching their own itch.*"

Sally Ward-Foxton, European correspondent electronics industry magazine EE Times: "*We are at a point now where we are seeing such a lot of renewed interest and investment into the world of hardware and chip design, driven by these new applications, AI, 5G, the rise of domain-specific architectures, coming together to make hardware cool again. Open source hardware can be a big part of it, removing or reducing the barriers to entry for the smaller companies, startups, SMEs and even for makers.*"

Cause for optimism to build an Internet of Trust

Open hardware can contribute to addressing the issue of black-boxed technology and help solve security and privacy issues, while creating a level playing field for academics, (small) businesses and makers that allows for permissionless innovation. The diversity of issues addressed by open hardware projects presented and discussed during the workshop contribute to maturing the process of manufacturing open hardware for trustworthy computing. And as these publicly available components, chips and tools grow and are picked up by new generations of hardware designers to learn and create, this will enable the use of these same tools for larger projects. Furthermore, currently the shackles or limitations to open hardware currently can be viewed as no longer technical, but commercial, and to a large degree artificial: the industry simply was not used to it yet. Because of advancements in open process technology, open hardware will make it.

Main challenge to build an Internet of Trust

Open hardware contributing to an internet of trust would currently require further sustained support, funding and resources for projects developing open hardware chips, components and tools. In the case of resources, entry to open hardware manufacturing possibilities are needed in Europe, as currently this is mostly available in the US (think the [Google-sponsored open source shuttles run at SkyWater](#)).

Next steps

Regarding which concrete components are still missing in the open hardware world, panelists of the session mentioned that amongst other things we would need more open interfaces for communications, sensors, etcetera that are relevant to real-world applications. And while a lot of development has been happening for digital components and tools, analog

elements that are needed to bring system-on-chips together deserve more attention.

Regarding European open hardware manufacturing possibilities, the current ecosystem consists of only a few players making very high volume chips with small process nodes (specific process technologies). But most people do not need such high volumes, they would be perfectly fine with lower volumes of chips with a higher node or diversity of manufacturing processes. Adding to this, we need more foundries, not just top of the line ones but more diverse, spread out and available, following standards that allow you to take your designs and move between foundries.

Finally, commercialisation of efforts into usable hardware solutions does not only require money, but foremost usefulness for people.

Links:

- LibrEDA: <https://nlnet.nl/project/ChipDesignFramework>
- Chips4Makers ASICS: <https://nlnet.nl/project/Chips4Makers>
- Libre-SoC: <https://libre-soc.org/> (and prerecorded presentation: <https://ftp.libre-soc.org/ngiforum2021.mp4>)
- LibreSilicon: <https://nlnet.nl/project/LibreSilicon>
- Openwifi: <https://nlnet.nl/project/OpenWifi-80211n>
- SpinalHDL, Vexriscv, SaxonSoc: <https://nlnet.nl/project/SaxonSoc>

Presentation slides and session recording and download links: <https://nlnet.nl/news/2021/20210507-NGI-Zero-workshop-open-hardware.html>

The image is a promotional banner for an online event. At the top left, it features the 'NGI FORUM 2021' logo in blue and white. To its right is the 'NGI ZERO' logo in green and white. The main title, 'REGAINING CONTROL OVER OUR DEVICES: BUILDING OPEN HARDWARE CHIPS IN EUROPE', is written in large, bold, dark blue capital letters. Below the title, it says 'organised by NGI ZERO'. In the bottom left corner, there is a blue rounded rectangle containing the text 'ONLINE EVENT' and '2021.NGIFORUM.EU'. In the bottom right corner, there is a blue rounded rectangle containing a clock icon, the time '15:00', and the date '18 MAY 2021'. The background of the banner is white with abstract blue and green shapes on the right side.

Software ecosystem(s) for trust management

Date & time: **May 18 | 15:00-17:00**

Organizer: **NGI TRUBLO, ONTOCHAIN**

Moderators: **Vlado Stankovski**, *ONTOCHAIN* and **Mirko Lorenz**, *TruBlo*

Participants: 64

Trust is a key property specific to human-to-human interactions. As software becomes ubiquitous and pervasive it provides an interface between the inherently untrusted physical and virtual world (e.g. sensors, data, algorithms), on one side, and the trusted world of blockchains, where everything happens based on a wide consensus.

ONTOCHAIN and TruBlo are two NGI projects where the focus is to advance the State-of-the-Art. Both projects have funds to support ideas from European researchers, developers and teams from startups and SMEs and build software ecosystems for trust management in different business scenarios.

The most impressive conclusion of the workshop is that several ONTOCHAIN and TruBlo technologies can be brought together to form a unified vision of Blockchain for the Next Generation Internet. This includes interesting use cases, such as the semantic aspects of the Blockchain marketplace, part tracing and copyright related use cases and similar, identity management mechanisms that include the self-sovereign identity, Decentralised Identities (DIDs) and Verifiable Credentials (VCs) of the Semantic Web, on-chain and off-chain knowledge management principles and mechanisms, integration with databases, Level 2 sidechains, and many other aspects.

Functional components

- Story 1: **Trusted knowledge management**
- Story 2: **Decentralised Oracles**, Anthony Simonet, *Research Scientist - iExec / Blockchain Tech*
- Story 3: **Tokenomics**, Hadrien Zerah, *Adoption Manager / Nomadic Labs*

EU Blockchain infrastructure

- Story 4: **Quality of Service and sustainability**, Tadej Slapnik, *Director - Tolar HashNET / State Secretary in the office of Prime Minister of Slovenia*
- Story 5: **Decentralised Identities**, Jack Tanner, *GIMLY*
- Story 6: **Scalability: Blockchain, graphs**, Artem Barger, *Manager, Blockchain Technology Platforms IBM Research*

Key quotes

Mirko Lorenz, TruBlo: “We must enable to some extent that, if I read something, I can check whether this is trustworthy and reliable. ”

Mirek Sopek, MakoLab: *“It is a dream of people who create intellectual work, not to worry about being copied without permissions.”*

Anthony Simonet, iExec: *“Once data is in the blockchain, what the blockchain provides is the proof that that’s the truth.”*

Caspar Roelofs, Mimly: *“We are being confronted with the fact that a secure identity layer has been missing since the invention of the Internet.”*

Thanasis Papaioannou: *“We identified several problems in the current internet and several security threats in the everyday lives of people on the Internet that would benefit from a trust assessment.”*

Cause for optimism to build an Internet of Trust

In many ways, technologies and approaches are ready for integration. In some areas, the solutions are more mature (e.g. Blockchains) and some other areas less mature (e.g. Decentralised Oracles, Smart Contract development platforms). What we now need is more intelligence from the communities, from the non-IT savvy professionals that should help us exactly define the humanity needs for trust, dependability, quality, sustainability, human-rights, social acceptance and so on. We need to extend further towards non-technological professionals in order to be able to appropriately tune the Next Generation Internet to what humanity needs.

Challenges to build an Internet of Trust

The main challenges are non-technological in nature. These relate to the core essence of our vision of the future of humanity and the world we live in. Do we want to make it sustainable and how? Do we want to respect human rights and how? Once humanity converges on these requirements, technologies are getting ready to follow. We need to address the Collingridge dilemma, in a way that technology follows humanity and not vice versa.

Next steps

These two NGI projects are: supporting the development of software, platforms or tools enabling distributed trust (TruBlo); and building a software ecosystem that should present in a form of an architecture of essential components for trusted knowledge management (ONTOCHAIN). This is both a very challenging as well as exciting work to do.

Links

NGI projects presented:

- ONTOCHAIN: <https://ontochain.ngi.eu/>
- TruBlo: <https://www.trublo.eu/>

Speakers from teams funded by our NGI projects:

- Mirek Sopek (MakoLab): <https://ontochain.ngi.eu/content/graphchain>
- Caspar Roelofs (GIMLY): <https://ontochain.ngi.eu/content/gimly-id>

Recording available here:

<https://www.youtube.com/watch?v=KAt2jAr3j6A>



Showcasing results of the NGI EU-US enhanced ecosystem of top researchers, innovators, and policy stakeholders

Date & time: **May 18 | 17:00-19:00**

Organizer: **NGI ATLANTIC, NGI EXPLORERS, THINK-NEXUS**

Moderator: **Iwa Stefanik**, *NGI Explorers Project Coordinator*

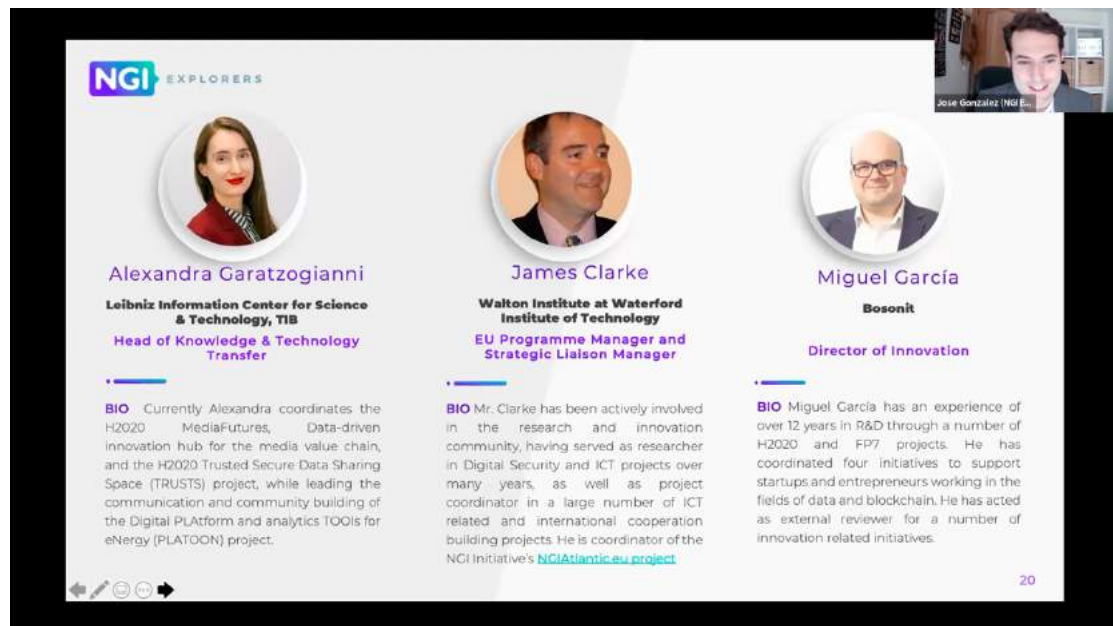
Participants: 88

The workshop was organized by three EU-funded projects with the main objectives to bridge, expand and sustain a cross continents Research & Innovation collaboration on NGI, involving relevant stakeholders. The event included pitching & awards ceremony for the NGI Explorers, followed by showcasing NGI Atlantic research collaborations, and closing by discussions with NGI EU and US stakeholders on R&I collaboration perspectives for NGI delivered by Think-NEXUS.

During this workshop, the NGI Explorers community was treated by a unique event, meant to celebrate the amazing results achieved by our outstanding Explorers, the NGI Explorers Oscars.

Each of the 12 nominees was asked to pitch their project, briefly showcasing their results and project highlights. These projects have been carried out by European researchers and innovators directly working with US interdisciplinary, tech- driven collaborative groups in the following domains: AI, Cybersecurity, Cloud/Edge Computing, IoT, 5G; and verticals: health,

smart cities and buildings, network security and connectivity, smart transport, and tourism.



The contestants were then evaluated by a top-notch and well-rounded jury panel with solid knowledge and skill in technology and business:

- **Jose Gonzalez** - NGI Explorers
<https://www.linkedin.com/in/joseglezes/>
- **Miguel Garcia** - Innovation Director at Bosonit
<https://www.linkedin.com/in/miggarcia Gonzalez/>
- **Alexandra Garatzogianni** - Head of Knowledge & Technology Transfer at Leibniz Information Center for Science & Technology
<https://www.linkedin.com/in/alexandragaratzogianni/>
- **Jim Clarke** - Project Coordinator at NGIAtlantic
<https://www.linkedin.com/in/jimclarke/>

Despite the high-quality of the results of all our NGI Explorers, in the end only five were awarded prizes for their outstanding performances.

- BEST PROJECT EXCELLENCE – **Erma Perenda**
<https://www.linkedin.com/in/erma-perenda-19328460/>
- BEST NGI EXPLORERS IMPACT – **Martin Serrano**
<https://www.linkedin.com/in/martin-serrano-dr-www-insight-centre-org-90008814/>
- BRIGHTEST EU EXPLORER – **Iñaki Eguia**
<https://www.linkedin.com/in/inakieguia/>
- BEST SOCIAL INNOVATION IMPACT- **Selvakumar Ramachandran**
<https://www.linkedin.com/in/rrselvakumar/>
- THE BEST EU-US COLLABORATION TEAM - **Michal Kedziora**
<https://www.linkedin.com/in/michalkedziora/>

It was a proud moment for everyone in the NGI Explorers Community, to celebrate The European spirit of progress and collaboration.

Key quotes Experimental Platform Interconnection

CacheCash Experiment. EU Team: Sorbonne Université, France; US Team: New York University Tandon School of Engineering and US Ignite. Berat Can Şenel, Sorbonne Université: *“ We aim to reach out to the broad user community both with CacheCash and EdgeNet. At CacheCash, it is crucial to attract entrepreneurs who are interested in Blockchain-Based Content Delivery Network. Meanwhile, EdgeNet welcomes Inter-Atlantic experimenters to use the platform and wishes them to contribute to its cluster or its codebase.”*

CloudBank EU Experiment. EU Team: CERN, Switzerland; US Team - University of California San Diego (UCSD), California. Bob Jones, CERN: *“Science has no borders - the ability to share cloud services and data across continents is crucial as demonstrated with the global scientific collaboration to address COVID-19. The NGI experimental platform connection allowed UCSD in the US and CERN in Europe to collaborate to deploy scientific applications on commercial cloud services using trans-Atlantic networks and federated identity management systems.”*

Integrating OpenIreland and COSMOS testbeds for delivering a cross-Atlantic Open Networking Solution. EU Team: Trinity College Dublin (TCD), Ireland, Polytechnic University of Milan, Italy; US Team: University of Arizona, Arizona, Rutgers University, New Jersey. Marco Ruffini, Trinity College Dublin, *“The project connects two open testbeds both from a data plane and control plane perspective, so it would naturally attract researchers from both sides of the Atlantic. The similarity in control mechanism will encourage researchers from either side to make use of the partner testbed and to attempt joint experiments across the two. In addition, as both testbeds are currently expanding their reach across the globe, this will only increase the possibility of cooperation. One important feature is the ability to collect real data, which has become a key feature for researcher interested in exploring intelligent control planes, machine learning and AI”*

Key quotes on Privacy and Trust Enhancing Mechanisms

Food Data Marketplace. Privacy and Trust Enabling Data Marketplace for Sustainable Supply Chains. EU Team: Prospeh d.o.o. (brand name: Trace Labs) - tracelabs.io, Slovenia; US Team – Kakaxi Inc., California. Jurij Skornik, Tracelabs and Adam Smith, Kakaxi Inc.: *“Our Food Data Marketplace tackles the issue of transparency in global food supply chains and enables a more equitable distribution of gains through trusted data exchange. Global issues such as these, require international cooperation to be addressed effectively and by combining the most innovative platforms spanning the Atlantic we are able to deliver impactful results. NGI Atlantic allows us to expand our existing cooperation with our US partner Kakaxi to address these complex issues, ultimately empowering farmers and facilitating sustainable supply chains.”*

P2PR2P experiment. EU Team: Danaides.org, France, Sciences Po Toulouse, France; US Team: Clemson University, South Carolina. Stephanie Lamy, Sciences Po Toulouse: *“Both US and EU foreign policy rely on bolstering the role of civil society actors in conflict/complex environments, where erosion of trust is one of the main drivers of crisis and where the informality of local civil society is a hurdle for these actors to integrate more formal processes, such as institution building. Therefore, during this NGIatlantic.eu project, we are looking at how our platform, P2PR2P can: generate trust at a community level for local civil society actors, which includes safeguarding the privacy and security of the users, and allow civil society actors to formalise their informal collective action by capturing their transactions of “asking” and “offering” aid to their final beneficiaries through a “commons governance” type institutional framework building.”*

NextDE – Enabling the Next Generation P2P/Data Economy experiment. EU Team: ILVO, Belgium, ChangeTheBlock, Spain; US Team: IdPlizz Inc., Florida, University of Central Florida, Florida. Alan Draguilow, Changetheblock: *“Due to the privacy and trusting technologies such as Blockchain and Id verification being experimented on because of this project, we could ensure a better interaction between parties worldwide. All this without the need of having to be in the same location but with the same level of confidence. On top of that, for business transactions and contract signings, these technologies improve the communication and execution of those contracts. Thanks to the awarding of the NGIatlantic.eu project, we were able to implement Blockchain and Id Verification in a new third party Marketplace in a completely different country, namely USA. This opportunity gave us a lot of knowledge on how to work in an international domain where there are very different requirements and compliance models.”*

Topic 1. Experimental Platform Interconnection

CacheCash Experiment
 Sorbonne Université, NYU, usignite

Integrating OpenIreland and COSMOS testbeds for delivering a cross-Atlantic Open Networking Solution
 Trinity College Dublin, The University of Arizona, Politecnico Milano, Rutgers

CloudBank EU NGI
 CERN, Rutgers

Experimental Study of Context Based Routing Using Deep Reinforcement Learning
 (Note: has not started yet so will be showcased in next Fc)

Panellists
 Berat Can Şenel, Marco Ruffini, Dan Kilper, Ivan Seskar, Bob Jones, James Mitchell, and Apostolos Theodoridis

4 18/05/2021 NGI International Workshop

NGI ATLANTIC.EU

Key quotes on Decentralised Data Governance

Self-Certifying Names for Named Data Networking. EU Team: Athens University of Economics and Business - Research Centre (AUEB), Greece; US

Team: The University of Memphis (UofM), Tennessee. Nikos Fotiou, AUEB, *“With this project we connected to and became part of the NDN testbed. These two additional testbed nodes will be maintained beyond the end of the project, will be available to other EU-based institutions to experiment with this Internet-wide facility. Moreover, DIDs and VCs, which are a related technology, are exploited for solving various cross-borders issues, e.g., consider the recent efforts for creating vaccination certificates (credentials).”*

fairteam EU experiment. EU Team: fairkom, Austria; US Team: Rocket.Chat, Delaware. Roland Alton, fairkom, *“The fairteam project has given us the opportunity to collaborate with the US team of Rocket.Chat, which is an amazing company with engineers working all over the Americas, including Silicon Valley and Delaware, Canada and Brazil. Furthermore, they are very business-oriented and fueled with venture capital and seem to perform very well. As testament to this, during our experiment phase, they raised \$ 19 million in a round A funding. In a first round of experiments, we checked how we could implement the team's functionality with identity management systems, which have been made available on premise. In doing so, we have identified a lack of visualization of how teams can join channels. The specifications work has been done and then implementation of the team feature has been included in RocketChat 3.13. The second round of experiments looks promising - the new team channel type is well accepted. We plan to be contributing an add-on to manage additional links for each team.”*

Decentralized data ecosystem for the Open Blockchain for Asset Disposition Alliance. EU Team: Technical University of Catalonia, Spain; US Team: Open Blockchain for Asset Disposition Alliance (OBADA) LLC, Wyoming, University of Reno, Nevada. *The collaboration combines together the industrial experience of OBADA, the knowledge about the reverse supply chain of electronics at the University of Nevada-Reno in USA with the NGI eReuse-Ledger testbed in Europe. The NGI Atlantic collaboration enables global standardisation of APIs to create effective, global scale, interoperable circular market ecosystems capable of reusing ICT devices, extending their lifespan for new uses, instead of always manufacturing new ones, through reuse, repair, and ensuring final recycling in a sustainable way. Together, the result has the potential to become the global de-facto standard (data model and API) for the circular economy of digital devices (e.g. as part of ISO TC307 or ITU-T process) and relate to other standards (e.g. the W3C DID recommendations).*

Key quotes on Search and Discovery

Measuring Multi-Carrier Cellular Access International Roaming Performance. EU Team: University Carlos III of Madrid (UC3M), Spain, Telefonica Research (TID), Spain; US Team: Northwestern University, Illinois. Marcelo Bagnulo Braun, UC3M: *“The objective of the project is to characterise the performance of MCCA services while roaming. We collect quantitative information to help us understand the benefits and downsides of MCCA service when used abroad. We focus our analysis on clients from MCCA operators in the US that are roaming in the EU and investigate how*

their performance compares to both traditional US carriers while roaming and local EU carriers while providing local services in the visited network.”

The banner features the NGI Forum 2021 logo on the left. To its right are three smaller logos: NGI ATLANTIC.EU, NGI THINK NEXUS, and NGI EXPLORERS. The main text in the center reads: "SHOWCASING RESULTS OF THE NGI EU-US ENHANCED ECOSYSTEM OF TOP RESEARCHERS, INNOVATORS, AND POLICY STAKEHOLDERS." Below this, it says "organised by NGI ATLANTIC, NGI EXPLORERS and THINK-NEXUS". At the bottom left, a blue pill-shaped button contains the text "ONLINE EVENT" and "2021.NGIFORUM.EU". At the bottom right, a blue pill-shaped button contains a clock icon, "17:00", and "18 MAY 2021". The background is white with blue abstract shapes.

Workshop day 3 -19 May 2021

FED4FIRE+ Free testbeds for the NGI Innovators

Date & time: **May 19 | 14:00-15:00**

Organizer: **Fed4FIRE+**

Speakers: **Prof dr. Ir. Peter Van Daele**, *Fed4FIRE+ Project Coordinator, imec - Ghent University, IDLa*; **Daniele Miorandi**, *CEO of U-Hopper, Fed4FIRE+ innovator*; **Paulo Marques**, *AllBeSmart, Fed4FIRE+ innovator*; **Dr Brecht Vermeulen**, *Fed4FIRE+ Technical Coordinator, imec - Ghent University, IDLab*

Participants: 22

Fed4FIRE+, a federation of testbeds for hands-on experimentation, allows innovators to access to its wide federated facilities to execute tests on a variety of technologies with a single access all around the world. Moreover, experimenters can apply for funding to support their experiments by submitting a proposal to Fed4FIRE+'s Open Calls. This webinar:

- presented an overview of the project Fed4FIRE+
- described the main features of the Fed4FIRE+ Testbed's portal

- present success stories from Open Call participants
- presented the 9th Open Call and Continuous Call for SME & NGI Experiments

Speakers

Prof dr. Ir. Peter Van Daele, Fed4FIRE+ Project Coordinator, imec - Ghent University, IDLab

Daniele Miorandi, CEO of U-Hopper, FED4FIRE+ innovator

Paulo Marques, AIIBeSmart, FED4FIRE+ innovator

Dr Brecht Vermeulen, Fed4FIRE+ Technical Coordinator, imec - Ghent University, IDLab

Highlights

In the context of the NGI Forum 2021, Fed4FIRE+ organized “*FED4FIRE+ Free testbeds for the NGI Innovators*” workshop, which brought together participants from academia, SMEs and startups across multiple technology areas. The workshop aimed to showcase the benefits of an open, accessible and reliable testing facilities for NGI research domains.

Objectives Fed4FIRE+ (2017 – 2021)

Fed4FIRE+

has the objective to

- serve the **community** and to
- support **digital transformation**

by

- offering **low threshold** access to
- a **top-quality** Research Infrastructure
- for a **broad spectrum** of activities in the IT domain
- covering a **wide range of technologies**
- and supporting **cross-technology** applications

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Peter Van Daele, Fed4FIRE+ Project Coordinator (imec – Ghent University, IDLab), opened the workshop with a brief introduction to Fed4FIRE+ project: the free gateway to top-quality testbeds in the area of NGI experimentation. Peter highlighted the importance of experimentally driven research in a highly competitive environment with rapidly evolving requirements and in multi and cross-technology areas of our digital society. Up-to-date facilities that mimic the real world, technologies and know-how are extremely

expensive; Fed4FIRE+ offers simple, efficient and cost-effective experimental processes to SMEs, industry and academia in the NGI domain. The floor then was given to **Brecht Vermeulen**, Fed4FIRE+ Technical Coordinator (imec – Ghent University, IDLab).

Design principles

Multiple identity providers

Standardized APIs

Multiple tools

Multiple testbeds

Testbeds trust IdPs in federation

WWW.FED4FIRE.EU All of them can appear and disappear !

Brecht provided an overview of the testbeds currently available, including but not limited to cloud computing, wireless and wired networking, sensor networks, and software defined networking. Thanks to the federation Fed4FIRE+ testbeds can be fully operated remotely. The use of multiple testbeds, he emphasized, enables innovators to combine different resources and scale up with a single free account. This approach will be maintained also after Fed4FIRE+'s end, as a set of principles have been designed to ensure the project's sustainability in the future. Brecht concluded his presentation with a demonstration of the Fed4FIRE+ Testbed's portal use and insights about the next steps.

"Fed4FIRE+ supports many different technologies as well as all the experiments as you need." said Brecht Vermeulen.

The presentation continued with the success stories of two NGI innovators, **Daniele Miorandi** (U-Hopper) and **Paulo Marques** (AllBeSmart), who

responded to the Fed4FIRE+ Open Calls and tested their products and tools with Fed4FIRE+ facilities.

The prototype of Golden Owl, the latest U-Hopper product that leverages distributed ledger technologies (DLTs) to store a digital and verifiable version of an education certificate, needed to be tested at scale. Thanks to Fed4FIRE+, Daniele told, U-Hopper could firstly access a cloud in vitro testing facility – Grid’5000 – to identify the bottlenecks, adjust them and in the second stage of the Open Call enhance the product.

Paulo presented Fed4AI trial with the w-iLab.t, a testbed intended for Wi-Fi and sensor networking experimentation. The Fed4FIRE+ testing facility, he pointed out, was very valuable for the AllBeSmart’s project, which aims to enhance virtual communication for Intelligent Transport Systems.

Despite the different nature of their projects, Daniel and Paulo agreed on the Fed4FIRE+ features that paved the way to the market, namely:

- large-scale and state-of-art experimental facility
- free and remote access
- top-notch expertise
- cost effective experimental process
- financial support
- low administrative burden

“This experiment allowed us to identify four scalability bottlenecks. We adjusted one by one, and we came up with a new product development roadmap.” Daniele Miorandi

“This Fed4FIRE+ experiment has enabled us to speed up our prototype demonstration in operational environment, complete it and qualify it for commercial adoption.” Paulo Marques

Peter concluded the workshop introducing the newly launched Fed4FIRE+ Open Calls:

- The Continuous Call “SME & NGI Cascaded Experiments” is marked by cut-off submission dates targeting only experiments originating from SME’s or from other parties (also not restricted to SMEs) who have successfully completed an experiment or project in the framework of one of the Open calls of any of the other NGI-projects. With a maximum experimenter funding of €10.000 per experiment, next deadlines are 1 June and 15 June 2021.

- The 9th Open Call for “Medium Experiments”, with a maximum experimenter funding of €55.000 per experiment. The deadline for the proposals ‘submission is 7 September 2021.

Main takeaways

- Effective positive feedback from NGI innovators.
- Test facilities in multiple NGI technology areas.
- Highly skilled support from the Testbeds patrons.
- Identification of bottlenecks and subsequent development of the product at scale.
- Experimentally driven products gained credibility on the market.
- Remote access decreased Covid-19 impact.
- Easy access to funding through Fed4FIRE+ Open Calls.
- Free open access to the testbeds.

More information

If you are interested to learn more about Fed4FIRE+ and innovators’ projects:

- **The presentation of Fed4FIRE+:** <https://www.fed4fire.eu/download/fed4fire-presentation-for-ngiforum21-workshop/?wpdmdl=5564&masterkey=60ae131589ea9>
- **Our Open Calls:** <https://www.fed4fire.eu/opencalls/>
- **Golden Owl:** <https://www.fed4fire.eu/demo-stories/cc/golden-owl/>
Fed4AI: <https://www.fed4fire.eu/demo-stories/cc/fed4ai/>
- **Demo Stories:** the success stories presented by Fed4FIRE+ experimenters - <https://www.fed4fire.eu/demo-stories/>
- YouTube channels:
Fed4FIRE+: <https://www.youtube.com/channel/UCw-qixoqWLJ8qzEEGrRNQUA>
U-Hooper: <https://www.youtube.com/watch?v=Ed2AhR6A2X0>
AllBeSmart: <https://www.youtube.com/watch?v=9pvpzOyxZgc>

Recording available here:

<https://www.youtube.com/watch?v=7bMOMmSZw9E>



FED4FIRE+: FREE TESTBEDS FOR THE NGI INNOVATORS

organised by FED4FIRE+

ONLINE EVENT

2021.NGIFORUM.EU

🕒 14:00

19 MAY 2021

Conscious connectivity: imagining a more sustainable future internet

Date & time: **May 19 | 14:00-15:00**

Organizer: **NGI FORWARD**

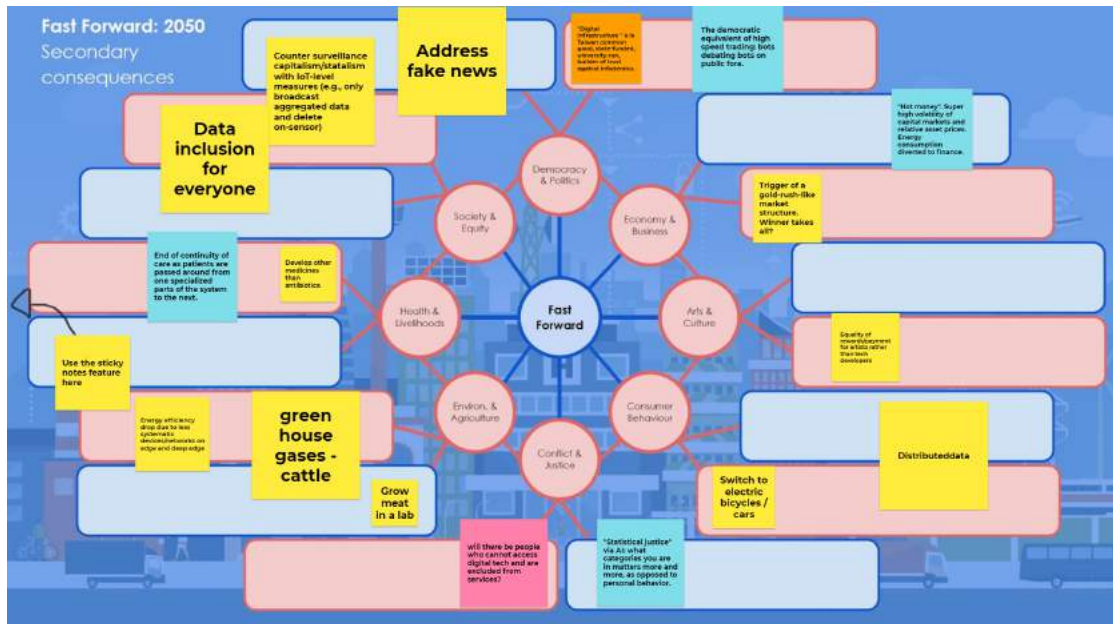
Speakers: **Katja Bego & Markus Droemann**, *Nesta*; **Kristóf Gyódi & Michał Paliński**, *DELab, University of Warsaw*; **Alberto Cottica**, *Edgeryders*; **Ida Anthonj Nissen**, *Aarhus University*; **Dr Giovanni Rimassa**, *Digital for Planet, NGI Ambassador*

Participants: 59 (based on registration vs average attendance)

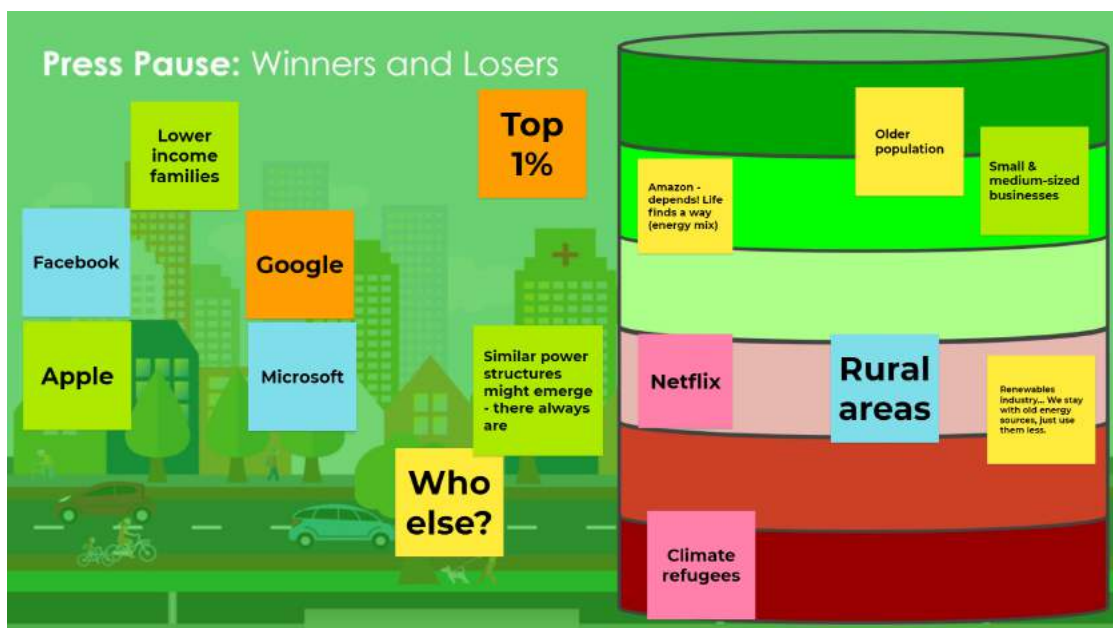
A brief introduction to the topic of conscious connectivity was given, where project partners presented interesting findings, trends and questions on the relationship between the internet and sustainability, participants engaged in a series of interactive group exercises. Discussions focused on what the world might look like if politicians, businesses and citizens had to make more conscious decisions about connectivity, our data and the devices we use. Participants were asked to consider difficult trade-offs, predict winners and losers, and think through a series of unexpected consequences that could range from the emergence of a new class system on the Internet to urban mining booms and net-zero stock bubbles.

We're experiencing an unprecedented – and likely unsustainable – proliferation of connected devices, services and data. Although technology grows smaller, we may soon see its impact exceed our planetary and cognitive boundaries. Do we risk sleepwalking into a future where the escalating socio-environmental costs of technology force us into data rationing, internet curfews and bandwidth-shaming? Or can frugal

innovation, conscious connectivity and smart policy save the day? Join us for an interactive workshop in which we explore new data, identify emerging trends and contemplate strange futures.



The session generated lots of interaction with participants, who engaged in speculative thinking about the future of the internet and the impact its growth and development may have on our green and built environments.



Key quotes

Katja Bego, Nesta: "The twin digital and green transition highlights the importance of Internet technologies for preventing the looming environmental crisis. We need the Internet's help more than ever, but at the same time we must also reduce its own impact."

Alberto Cottica, Edgeryders: *“Sustainable tech – generally considered in relation to carbon emissions and the climate – links to broader discussions of community and responsibility.”*

Cause for optimism to build an Internet of Trust

- Europe’s innovation ecosystem is taking the environmental of digitalization more and more seriously
- European and national policy initiatives towards a more circular digital economy are gaining significant support – from the Right to Repair to the greening of our data infrastructure

Challenges to build an Internet of Trust

- We must let go of the notion that our digital lives are separate from the material world
- We must accept the twin challenge of digitalising and greening the economy, not adopt blind tech solutionism
- Interdisciplinarity is more important than ever but must be matched by community diversity
- Social and economic sustainability are important - but they should complement our efforts towards environmental sustainability, rather than distract from them.

Next steps

- Don’t preach, practice – a call on NGI projects as well as attendees to adopt ‘conscious connectivity’ in their work and seek out green alternatives where available
- The workshop feeds into NGI Forward’s research and efforts to shape the future internet policy agenda, towards a more sustainable internet by 2030
- Digital4Planet works to help innovators assess their environmental footprint, foster synergies between a human-centric and sustainable Internet, and include the ELSE layer in the future Internet stack

Links

- www.digital4planet.org
- <https://fwd.delabapps.eu/>
- <https://research.ngi.eu>
- <https://exchange.ngi.eu/>



CONSCIOUS CONNECTIVITY: IMAGINING A MORE SUSTAINABLE FUTURE INTERNET

organised by **NGI FORWARD**

ONLINE EVENT

2021.NGIFORUM.EU

🕒 14:00

19 MAY 2021

How to be memorable in an online pitch?

Date & time: **May 19 | 14:00-14:30**

Organizer: **TETRA**

Speakers: **Susanna Albertini** and **Louis Ferrini**, *FVA new media research (NGI TETRA)*

Participants: 9

What is the difference between live and online pitching? Make your online presentation memorable.

- Videos of good/bad examples
- Tips about communication attitudes, setting and body language
- Checklist for an online pitch



HOW TO BE MEMORABLE IN AN ONLINE PITCH?

organised by **TETRA**

ONLINE EVENT

2021.NGIFORUM.EU

🕒 14:00

19 MAY 2021

NGI Trust 6th Results Webinar - Showcasing privacy and trust

Date & time: **May 19 | 15:00-17:00**

Organizer: **NGI TRUST**

Speakers: **Alasdair Reid**, *Principal Researcher - Policy Director European Future Innovation System Centre (EFIS)*; **Jean-Luc Dorel**, *Programme Officer, European Commission*

Participants: 85 (based on registration vs average attendance)

The NGI Trust Webinar series is an opportunity for a series of the NGI Trust innovators to present their results and talk about the future plans for the projects. This event showcased five funded projects and gave an opportunity for comments and reflections from coaches and mentors and the wider NGI community.

The Project Managers of five third party projects funded:

- **CryptPad SMC**, Xwiki SAS - Aaron MacSween
- **CUBBIT**, Cubbit - Gianluca Granero
- **MQ2M**, TU Delft - Joshua Slater
- **SID:SO&C**, 7Signals OÜ - Elena Tairova
- **COP-MODE**, Joao P. Vilela

The webinar was structured in three parts: initially, Alasdair Reid and Jean Luc Dorel introduced key facts and figures about the NGI Trust project and described the importance of funding projects in the field of Trust, which is key in the Human-Centered Internet agenda.

NGI TETRA was invited to present and promote the bootcamps which will happen at the end of June.

PRESENTATION OF THE SUMMER BOOTCAMP

- **TETRA presented the bootcamp**
 - in the two activities of TETRA
 - in a dedicated session for NGI projects on the 19th (20 attendees)

Day	Activity	Topics
Day 1	SHAPE	Transversal competences and skills Design thinking to shape your idea Understand your market Define your value proposition Community engagement for open source projects
Day 2	FRAME	Proposition validation, first customers Introduction to business modelling Team competencies and skills Intellectual Property basics Communicating your idea (customers, partners, investors)
Day 3	BOOST	Funding opportunities NGI Open calls, investors, grants, alternative funding Investors' insights Pitching competition

Managers of the third party funded projects presented their projects, highlighting objectives, results and challenges. The topics of this webinar was mainly Stronger Tools and one project about the thematic field of “Beyond Passwords”. Finally, there was a discussion focused on diverse questions, including two issues regularly discussed during the Results Webinars series: open source aspects of solutions and sustainability of the business model.

Projects Objectives

- **CryptPad** is a web-based suite of end-to-end-encrypted collaborative tools released under the AGPL. CryptPad delivers on the cloud 's promises of availability without violating user privacy. It does so by applying strong encryption and managing keys on users' devices before anything is shared over the network.
- **Cubbit** on-premises distributed cloud is able to provide organizations with a data storage technology offering the highest performance, the lowest costs and privacy-by-design. It relies on direct end-to-end encryption and embeds privacy keeping at the core of the whole software architecture.
- **MQ2M** project aims to explore and assess the commercial potential of a breakthrough innovation in the field of Quantum-resistant cryptography: Measurement Device Independent Quantum Key Distribution (MDI-QKD).
- **SID:SO&C** project aims to develop a solution that puts the user (not a platform) in charge and to ensure the privacy and security of the content shared, with an ultimate goal of establishing a fair and transparent market for visual digital content.
- **COP-MODE** project plans to gather the necessary data for developing privacy profiles that map privacy preferences with context. These datasets and privacy profiles for mobile devices shall form the basis for future development of automated mechanisms for setting privacy preferences on behalf of users according to current context.

Discussion:

Jean Luc Dorel launched the webinar stating that *“Trust is pretty much high in the agenda; it is a permanent discussion, we need to map human trust and technical trust. There is improvement to be made.”* The discussions proved to be rich in terms of solutions provided in different fields (and this webinar about stronger tools) and it is expected future projects could apply a similar thematic portfolio approach NGI Trust is using, which may allow further collaboration between projects. Furthermore, there is a gap between the variety of solutions developed by the funded projects and their utilisation and uptake. These should be addressed in future calls.

Links:

- Full List of NGI Funded Projects:
<https://wiki.geant.org/display/NGITrust/Funded+Projects>
- Webinar Slides:
<https://wiki.geant.org/display/NGITrust/6th+Results+Webinar+-+19+May+2021>



NGI FORUM 2021 **NGI** TRUST

**NGI TRUST - 6TH RESULTS WEBINAR:
SHOWCASING PRIVACY AND TRUST
ENHANCING TECHNOLOGIES**

organised by **NGI TRUST**

ONLINE EVENT
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🕒 15:00
19 MAY 2021