

netCommons
Network Infrastructure as Commons

Dissemination Report: Summary of Dissemination Actions and Adoption of netCommons Solutions During the Third Year

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Executive summary

This deliverable summarizes the dissemination activities of the netCommons Consortium and their overall impact during the third and last year of the project, as well as outlining the impact that some actions had and possibly will have in the near and far future.

The structure of the deliverable is based on the type of activity, with an initial overall description and final conclusions. Chapter 1 summarizes the dissemination work documented in this deliverable, giving an overall picture of the strategies adopted and the overall effort both on the inner (communities) and outer (policy makers, society) loop as described in the Description of Action (DoA); Chapter 2 lists and presents one by one the events organized or attended by netCommons researchers; Chapter 3 discusses the activities devoted to improve and support Community Networks (CNs) advocacy initiatives; Chapter 4 is devoted to the meetings and support with local communities in general and CNs in particular; Chapter 5 presents the other dissemination activities that cannot be easily categorized as well as some industrial liaisons that we were able to establish, even if the project in itself did not initially consider this possibility; Chapter 6 discusses the overall positive impact generated for CNs by netCommons, attempting an objective analysis as far as possible; Chapter 7 lists all the scientific publications and interventions of netCommons during the third year of activity classified by publication type; Chapter 8 draws some final considerations on the success of dissemination and impact of netCommons, and provides evidence for its potential impact beyond the end of the project.

netCommons dissemination has been in general very successful, both from a quantitative point of view, with participation in many events, presentations at conferences, scientific papers and so on, and from a qualitative point of view, with publications in top venues and interventions at the EU and UN levels whose final outcome has been the recognition of Community Networks as key elements of a healthy Internet ecosystem, and legal provisions in the European Electronic Communication Code specifically designed for them.

The interaction with Community Networks has also been successful and fruitful, in an exchange process that enabled netCommons to root its research on solid ground, and empowered Communities with a renewed sense of purpose and importance, strengthened by the recognition they got on the legal and socio-economic dimension and by the consciousness of using and building a still evolving, novel, and challenging technological and engineering platform and infrastructure.

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List of Acronyms

APC	Association for Progressive Communications
AWMN	Athens Wireless Metropolitan Network
B4RN	Broadband for the Rural North
BEREC	Body of European Regulators for Electronic Communications
BREKO	German Broadband Association
CITEL	Inter-American Telecommunication Commission
CN	Community Network
CNSIG	Community Networks Special Interest Group
DC3	Dynamic Coalition on Community Connectivity
DoA	Description of Action
EECC	European Electronic Communications Code
EETT	Hellenic National Telecommunications and Posts Commission, National Regulator
ENISA	European Union Agency for Network and Information Security
EP	European Parliament
FOSS	Free Open Source Software
GAIA	Global Access to the Internet for All
GISWATCH	Global Information Society Watch
IAMCR	International Association for Media and Communication Research
IETF	Internet Engineering Task Force
IGF	Internet Governance Forum
IMCO	Internal Market and Consumer Protection
IRTF	Internet Research Task Force
ISOC	Internet Society
ISP	Internet Service Provider
ITRE	Industry, Research and Energy
LACNIC	Latin American and Caribbean Internet Addresses Registry
LIBE	Civil Liberties, Justice and Home Affairs
MEP	Member of the European Parliament
NGO	Non-Governmental Organisation
NGO	non-profit organisation
NPO	Non-Profit Organization
OAS	Organization of American States
SAC	Social impAct Committee
UNESCO	United Nations Educational, Scientific and Cultural Organization
WALC	Workshop for Latin America and the Caribbean

1. Overview of the activities

The third and final year of the netCommons project was marked by several important contributions to the struggle of Community Networks to get legitimized and recognized as a viable means for communities to connect themselves and own their networking infrastructures, to gain access to the Internet or to reduce the digital divide by providing customized services and applications.

- In January 2018 netCommons has initiated an exchange with United Nations Educational, Scientific and Cultural Organization (UNESCO). This positive interaction was followed by a netCommons contribution during the consultation process that finally led to the inclusion of Community Networks in the Internet Universality Indicators document. This is definitely a very important achievement with a major and lasting impact for the future of Community Networks that have been formally included into a UN-supported document.
- Next, netCommons has become an even more active contributor in the CN community, playing a key role in all relevant bodies like Internet Governance Forum (IGF)'s Dynamic Coalition on Community Connectivity (DC3) (netCommons partners contributed five chapters in the latest DC3 book, the “CN Manual”), Internet Society (ISOC)'s Community Networks Special Interest Group (CNSIG) and ISOC-CH¹ (NetHood is leading the social impact working group in both ISOC bodies), Association for Progressive Communications (APC) (UPC and UniTn contributed key chapters in the latest Global Information Society Watch (GISWATCH) book on “Community Networks”), and Battle of the Mesh (UniTn run the core testbed experimentation and NetHood organized a novel encounter –for this community– with local urban activists).
- netCommons has been guiding the advocacy effort by CNs to reach policy makers and politicians, through open letters, the telecommons mailing list and policy briefs, developed by CNRS and UniTn, which maintain a close collaboration with key organizations like the La Quadrature du Net.
- Later, netCommons has been invited to represent the CN case in the EU parliament following its own workshop, a strong evidence of a lasting impact in the EU policy ecosystem, achieved rarely by such short-lived EU projects.
- On the inner loop, two high impact gatherings were organized at the birth places of Sarantaporo.gr and guifi.net where key actors were present and thus had the unique chance to engage in fruitful exchanges with the local community. This gave the opportunity to bring to the table local stakeholders difficult to reach until now, like the Greek regulator and Athens municipality.
- Midway between the inner loop and the outer loop we can place the high popularity of the netCommons twitter channel (~ 10 k impressions monthly), the increasing number of invitations to participate in international high-impact events, and the public praise by bodies like ISOC and the Commons Network are very telling measures of impact.
- netCommons Deliverable 4.5 “Best Practices Guide for Community Networks” will be published, with minor modifications, as a book by APC and supported by ISOC. Several scientific (or technical) results have been re-compiled and published in friendly formats like the policy brief². The participatory design methodology developed in Task 3.1 has been summarized in a booklet³. All this and much more give us confidence that the impact of the netCommons work will continue beyond the duration of the project.

¹The Swiss subsidiary of ISOC <https://www.isoc.ch/committees-bodies/sac>

²See <https://www.netcommons.eu/?q=content/netcommons-guidelines-telecom-policy-makers>

³The current draft is at <https://www.netcommons.eu/sites/default/files/pd-methodology-booklet-v0.6.pdf>; later versions will be available at <http://nethood.org/studio>

- The software and applications developed in WP3, but also the monitoring tools developed in WP2, are receiving attention from the communities that are considering their adoption for different uses, thus also the engineering and computer science research and innovation in netCommons is leaving a significant mark in the world of Community Networks.
- Finally the third year has marked a record of more than 50 scientific publications and contributions. Some of them are being translated in different languages (e.g., Greek, German, Spanish, French, Portuguese) adding to the multi-dimensional impact of netCommons in many relevant fields for the sustainability and development of the CN model.

1.1. Internet Presence

netCommons web site in 2018 served 1,988,870 requests for 34,527 visitors (excluding robots) with an average of 94 visitors per day (with a 34% increase with respect to 2017). Fig. 1.1 reports the time graph of number of objects served (blu line, left hand axis) and the unique daily visitors (red line, right hand axis) for the reported period. More details on the website statistics, together with detailed impact of publications and other dissemination indicators are included, at the end of the project, in the dedicated management deliverable D7.5 “Report on the publications and data download, use, and citation”.

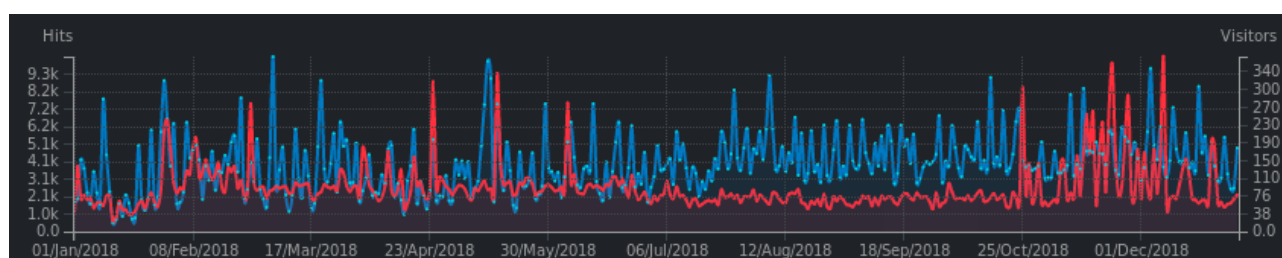


Figure 1.1: The access statistics of www.netcommons.eu for 2018.

2. Events

netCommons has organized numerous events and participated in well established events organized regularly by other stakeholders, being them communities, large scientific societies or other recognized actors. As done in the previous dissemination deliverables we divide events in categories: we first report on the events organized or co-organized by netCommons in Sec. 2.1, then on those where we participated in Sec. 2.2. These two Sections refer to general multi-cultural events. Sec. 2.3 is dedicated to specialist scientific venues where netCommons partners participated. Next, Sec. 2.4, Sec. 2.5 and Sec. 2.6 summarize on general public talks and other community building activities.

2.1. Organized events

2.1.1. What strategy for Alternative Internets?

Type: Workshop

Date: January 29, 2018

Place: Paris, France

URL: <http://www.iscc.cnrs.fr/spip.php?article2420>

Dissemination Level: International

Actors: Academia, civil society, activist, policy makers, CAPS community

Audience: 60

Organizers Melanie Dulong de Rosnay (CNRS) and Francesca Musiani (CNRS)

Description (from the conference material): netCommons in collaboration with NextLeap, another EU-funded research project working on alternative networks and encryption, co-organized a discussion on alternative Internet infrastructures, at the Institut de recherche et d'innovation, Salle Triangle, Beaubourg Center, Paris.

Many groups across the world are trying to build technical infrastructures, be they telecom networks, access provision services or hosting and other online services, that foster decentralization and defend human rights. In that respect, they build “alternative Internets” that embody spaces of autonomy and resistance to hegemonic players in the digital realm. In this workshop, we invited activists and researchers to discuss the state of play, reflect on the success and failures of the “altnet movement” and lay out strategies that can help it grow and flourish in the coming years.

Summary: The main questions raised during this workshop was regarding the decentralization of the Internet and how to develop strategies from several perspectives (technical, economic model, policy).

Input interventions were provided by Ramon Roca (guifi.net), Tristan Nitot (cozy cloud), Félix Tréguer (CNRS), Oriane Piquer-Louis (FFDN), Pierre-Yves Grosset (Framasoft), Alison Powell (LSE).

A animated discussion followed on the main challenges for alternatives to survive and become more mainstream. The overall agreement was that we have to continue trying. Things change in a way you cannot anticipate and thus it is important to propose new possibilities.



Figure 2.1: The venue of netCommons workshop “What strategy for Alternative Internets?” at Center Pompidou, Paris

2.1.2. netCommons at UNESCO

Type: Workshop

Date: January 30, 2018

Place: Paris, France

URL: <https://netcommons.eu/?q=news/netcommons-unesco>

Dissemination Level: International

Actors: Academia, civil society, activist, policy makers

Audience: 25

Organizers Naria Michalis and Melanie Dulong de Rosnay

Description (from the conference material): The netCommons project, together with members of its advisory board visited on January 30, 2018, the offices of UNESCO in Paris for a discussion on the potential impact of Community Networks for several Internet Universality Indicators.

Summary: Leonardo Maccari, Maria Michalis and Melanie Dulong de Rosnay did three presentations to the UNESCO staff with focus on the technical feasibility and social impact of CNs, the perception of CNs from interested people and the impact of the legal system on CN respectively. All three themes produced an informed discussion with the UNESCO working group on the Internet Universality Indicators which was extremely fruitful to enlarge the interest on CNs to a wider community, and to improve the indicators. The netCommons project was asked to participate at the consultation on the indicators, and to produce a formal feedback.

Notes: Eventually, the final version of the [UNESCO’s Internet Universality Indicators](#) contains at p. 39 an indicator explicitly mentioning Community Networks **”C.6 Are communities able to establish their own**



Figure 2.2: The netCommons team at UNESCO headquarters, Paris

networks to provide Internet access?”.

2.1.3. Towards an Alternative Internet in the Age of Cambridge Analytica and Fake News

Type: Workshop

Date: May 15, 2018

Place: London, UK

URL: <https://netcommons.eu/?q=content/towards-alternative-internet-age-cambridge-analytica-and-fake-news%C2%A0>

Dissemination Level: International

Actors: Academia, civil society, activist, policy makers, CNs

Audience: 30

Organizers Dimitris Boucas (UoW) and Maria Michalis (UoW)

Description: As part of the netCommons project, UoW organized a one-day policy workshop in London in May 15, 2018 that brought together a range of stakeholders for discussing what kind of Internet is desirable; whether the digital commons pose viable models for the organisation of the Internet infrastructure, software, platforms and content; and what policies and measures are needed for strengthening the commons as alternatives to Internet monopolies, surveillance, privacy violations, and targeted ads.

The workshop brought together twenty stakeholder representatives from the world of policy making, community networks and civil society. They included participants from community network organisations such as Balancing Act, B4RN, Community Broadband Network, Free2Air, guifi.net, Independent Networks Cooperative Association (INCA), Sarantaporo.gr, Senza Fili Senza Confini, and Wansdyke as well as representatives from organisations such as Association for Progressive Communications, Commons Network, Information So-

ciety S.A., Ofcom, the Dutch Pirate Party, and UNHCR. In addition to the organizers, Virginie Aubrée (UniTN) and Melanie Dulong de Rosnay (CNRS) participated on behalf of netCommons.

Summary: The summary of the event has been published on netCommons web site as [specific event](#), and developed in detail in [Deliverable 4.4](#).

Notes: There was a very positive post by the Network Commons project¹, which gained significant attention on twitter².



Figure 2.3: netCommons Alternative Internet workshop in London

2.1.4. Encounters in the hybrid city

Type: Roundtable

Date: March 31, May 13, May 25, 2018

Places: Heraklion, Greece; Berlin, Germany; Zurich, Switzerland

URL: <https://netcommons.eu/?q=content/encounters-hybrid-city>

Dissemination Level: International

Actors: Academia, civil society, activist

Audience: 10; 40; 20

Organizers Panayotis Antoniadis and Ileana Apostol

Description: The netCommons project collaborates with the MAZI project in organizing a series of gatherings, or encounters, that bring together people from the digital and urban rights movements in an informal and playful way. There is no other agenda but to raise awareness between digital and urban activists on each other's challenges, tactics, and lessons learned. The format varies depending on the context and the available resources and time.

¹<http://www.commonsnetwork.org/news/commonsnetworkinlondon/>

² <https://twitter.com/commonsnetwork/status/1026456858607996928>

Summary: The summary of the three encounters is included in detail in Deliverable D5.5, and especially for the one in Berlin, held in the framework of the Battle of the Mesh, there is a dedicated [blog entry](#) in netCommons web site.



Figure 2.4: Encounter in the hybrid space in Berlin

2.1.5. Sarantaporo Conference

Type: Conference

Date: July 7-8, 2018

Place: Sarantaporo area, Greece

URL: <https://netcommons.eu/?q=content/sarantaporo-conference-building-community-community-networks>

Dissemination Level: International

Actors: Academia, civil society

Audience: 20

Organizers Panayotis Antoniadis

Description: On July 7-9th researchers, practitioners, and key actors in the development of Community Networks around the world will visit one of the success stories of this movement in Greece, the Sarantaporo.gr Community Network. The event includes a 2-day guided visit in the Sarantaporo area and a public event in Athens, with local stakeholders, organized by the netCommons project and the Sarantaporo.gr Non-Profit Organization.

Organizing gatherings and workshops where the real action takes place is important for both parties involved.

The local community feels recognition and empowerment, and realizes the importance of their endeavor at a global scale.

The people working on the global technical, social, economic, and political challenges that these networks face get the opportunity to progress their agenda in an environment that is full of information on how things work on the ground, but also full of inspiration and motivation being in contact with the people's particular stories related to their CN.

The Sarantaporo.gr CN being located close to the highest and most popular Greek mountain, the mount Olympus, offers also a great opportunity for informal discussions and socialization in nature, a collaboration experience that can prove much more productive than 'air conditioned rooms and power point presentations,' both in the short and in the long term.



Figure 2.5: Workshop at the Sarantaporo village with local residents and netCommons guests, including a live streaming session with NYC Mesh

Summary: This conference managed to bring to the remote Sarantaporo.gr area key actors in the CN world community like Jane Coffin (ISOC) and Steve Song (VillageTelco), but also the netCommons advisors like Ramon Roca (founder Guifi.net) and Adam Burns (founder Free2Air).

The netCommons consortium and their distinguished guests were hosted by the members of the Sarantaporo.gr network and engaged in numerous formal and informal interactions, with highlight the public live stream, the "CN encounter #1" with the NYC Mesh Community Network, more specifically with its core members Brian Hall and Joly MacFie, in New York City.³

³A tweet by Jane Coffin, ISOC, documenting the encounter: https://twitter.com/jane_coffin/status/1015639201453207552 and more photos are available at <https://netcommons.eu/?q=content/sarantaporo-conference-building-community-community-networks>

Notes: This event was very well received by all parties involved and generated significant praise online⁴. It served both giving the local community a strong sense of global participation, extremely important for isolated communities, and raised additional attention by global bodies like ISOC on the work of netCommons.

2.1.6. ImpactHub symposium



Figure 2.6: ImpactHub workshop in Athens with special guests the Greek Regulator and the Chief Digital Officer of the City of Athens

Type: Symposium

Date: July 9, 2018

Place: ImpactHub, Athens

URL: <https://netcommons.eu/?q=content/new-eu-telecommunications-code-greece-and-its-effect-community-networks>

Dissemination Level: International

Actors: Academia, civil society, policy makers, local authorities, regulators, general public

Audience: 50

Organizers: Panayotis Antoniadis

Description: After the 2-day visit and conference of the Sarantaporo.gr CN, this public panel in Athens, organized by netCommons, brought together international experts and local stakeholders to build a better understanding of the key role of small providers and community networks, and their needs, how the new EU telecommunications code might affect them, and which precautionary actions can be taken today.

We will present to the Greek public the Community Network model and the worldwide movement aiming to support it, and the current legal and regulatory situation in Greece as an EU member state, through a series of 5 min statements of special guests from abroad and local stakeholders.

We will then open the discussion to explore how community networks like Sarantaporo.gr can be supported and replicated.

Summary: The presence of netCommons guests in Greece, made it possible to have in this event in Athens key stakeholders difficult to reach until then: Vassiliki Gogou, President's Office, Hellenic National Telecommu-

⁴E.g., https://twitter.com/jane_coffin/status/1017016892668743680

nications and Posts Commission, National Regulator (EETT). Konstantinos Champidis, Chief Digital Officer, City of Athens, and Prodromos Tsiavos, Member of the board of the Greek Free Open Source Software (FOSS), responsible for Policy Recommendations, Open Content and Intellectual Property

After a roundtable of introductory presentations, a very interesting discussion developed which highlight the expression of interest for a pilot project in the city of Athens, the development of first ideas on how the regulator can help CNs catch up with the upcoming regulations through dedicated seminars, and the creation of dedicated educational processes on community networking through the Greek FOSS.

2.1.7. Global Access for All (GAIA) WG

Type: Workshop

Date: November 6; Jul 17; March 22, 2018

Places: Bangkok, Thailand (IETF 103); Montréal (IETF 102), Canada; London, UK (IETF 101).

URL: <https://irtf.org/gaia>

Dissemination Level: International

Actors: All actors, mainly the technical community, standards and research.

Audience: 40 (IETF 103), 60 (IETF 102), 60 (IETF 101)

Organizers: Leandro Navarro (UPC) and Jane Coffin (ISOC)

Description (from the conference material): The Global Access to the Internet for All (GAIA) Research Group is an Internet Research Task Force (IRTF) initiative that aims to create increased visibility and interest among the wider community on the challenges and opportunities in enabling global Internet access, in terms of technology as well as the social and economic drivers for its adoption; to create a shared vision among practitioners, researchers, corporations, non governmental and governmental organisations on the challenges and opportunities; to articulate and foster collaboration among them to address the diverse Internet access and architectural challenges (including security, privacy, censorship and energy efficiency); to document and share deployment experiences and research results to the wider community through scholarly publications, white papers, presentations, workshops, Informational and Experimental RFCs; to document the costs of existing Internet Access, the breakdown of those costs (energy, manpower, licenses, bandwidth, infrastructure, transit, peering), and outline a path to achieve a 10x reduction in Internet Access costs especially in geographies and populations with low penetration. to develop a longer term perspective on the impact of GAIA research group findings on the standardisation efforts at the Internet Engineering Task Force (IETF). This could include recommendations to protocol designers and architects.

Summary: The summary of the activities are reported in the IETF repository for all editions⁵.

2.1.8. Community Networks course in Latin America and the Caribbean

Type: An intensive, one week course, on community networks in Spanish, as part of the Workshop for Latin America and the Caribbean (WALC) 2018 (Track 7) of training activities coordinated by [Fundación EsLaRed](#).

Dates: 26-30 November 2018

Place: Santo Domingo, Dominican Republic

URL: http://eslared.net/walc2018/?page_id=1172&lang=en_US

Actors: General Public and Students

Audience: 15

Organizers: Leandro Navarro from UPC, Erick Huerta from RedesAC/Rhizomatica (Mexico), Roger Baig from the guifi.net Foundation, Roger Pueyo and Emmanouil Dimogerontakis from UPC and netCommons.

⁵<https://datatracker.ietf.org/group/gaia/meetings/>



Figure 2.7: An image of the participants in the course in Latin America and the Caribbean

Sponsors: EsLaRed foundation, Internet Society, Inter-American Telecommunications Commission (CITEL), American States Organization (OEA), netCommons.

Description: This workshop trains participants, through a combination of theoretical and practical elements, in the tools and techniques for planning, designing, deploying, operating and maintaining community networks, with an emphasis on the use of low-cost solutions suitable for rural and urban areas.

The course targets people interested in making a first immersion in community networks and citizen-based telecommunications networks, they can have diverse profiles with previous training or experience (organizational, social, networking, economic) that can provide and enrich the exchange of views and activities in the course group.

Summary: The course was organized over 5 days with the following content:

Day 1: Concepts, models and cases of community networks and operators.

Day 2: Activity models, experiments to familiarize yourself with various access and transport technologies.

Day 3: Network planning, design, deployment and operation, development of individual cases I.

Day 4: Regulation, feasibility and impact, development of individual cases II.

Day 5: General summary, development of individual cases III, presentation of results (cases and implementation plans).

The slides, activities and diverse materials are available from Leandro Navarro web site.

2.1.9. netCommons Booksprint

Type: A full immersion week to prepare the material for a book

Date: October 21-25, 2018

Places: Seminari de Vic, Catalonia

URL: N/A

Dissemination Level: Internal (the Booksprint); Global the resulting book

Actors: netCommons partners, Advisory Board members, and

Audience: 12 booksprint participants and around 10 guifi.net community members



Figure 2.8: Writing intensely during the netCommons booksprint

Organizers Local organization: Ramon Roca, Meritxell Vilaró, Clara Cusó (guifi.net); Scientific organization: Melanie Dulong de Rosnay (CNRS) and Félix Tréguer (CNRS)

Description: Creating the basic content of a book in 5 days with approx. 12 experts:

- A book with social and technical guidelines to structure the practice of the CNs;
- In a nice-to-read, useful style for enthusiasts with basic knowledge which want to know how to create, develop and maintain free networks;



Figure 2.9: Group photo after the visit of guifi.net at EU's Ombudsman

- Comprehensively covering recommendations in legal, policy, governance and economic models, with hints for the technical start-up.

Summary: The netCommons booksprint was organized as a small event taking place in guifi.net’s birthplace the Seminari de Vic, in Catalonia.

In addition to the collective writing process we had the opportunity to visit important locations in the history of guifi.net and talk with key actors. netCommons also participated in the submission of a complaint to EU’s Ombudsman one day after the end of the booksprint. The presence of netCommons partners and advisory board was used as evidence for the wider potential impact of addressing the complaint for all CNs in Europe.

Notes: The outcome of the booksprint is the netCommons deliverable 4.5 “Best Practices Guide for CNs.” However, there has been an agreement to proceed to a proper book publication by APC supported by ISOC in 2019.

netCommons produced a [video report](#) documenting the guifi.net’s visit to EC Ombudsman in Barcelona.

2.2. Participation in high-impact international events

2.2.1. Battle of the mesh, Berlin

Type: International Conference

Date: May 7-13, 2018

Place: Berlin, Germany

URL: <https://wireless-meshup.org/doku.php>

Dissemination Level: International

Actors: Activists, Academia

Audience: 100

Participants Leonardo Maccari, Luca Baldesi, Virginie Aubrée, Panayotis Antoniadis

Description (from the conference material): The Wireless Battle Mesh v11 (#WBMv11) and the Wireless Community Weekend 2018 (#FFWCW18) will be meshed up and co-located in Berlin from May 07 to May 13, 2018. Since it is the 15th anniversary of the WCW, friends and fellows from across the globe celebrate together wireless mesh network technologies and ideas of community networking.

You can expect to meet with tech experts in mesh technologies, policy discussions, talks, hands on workshops, late night hacking sessions, measurement campaigns and an ongoing barbeque at the riverside. If you are a mesh networking enthusiast, community activist, or simply have an interest in WiFi or dynamic routing protocols, you can’t miss this event!

Summary: This core event for the CN Community included many netCommons contributions, including the implementation of the main activity (the set-up of the testbed and comparisons by Leonardo Maccari and Luca Baldesi, which was a key step for the development of PeerStreamer-ng, and it is better detailed in D3.5 [2]), the coordination of a panel on the CNSIG by Panayotis Antoniadis, the invitation to a call for action by Virginie Aubrée, and the organization of a “hybrid encounter” between the battle of the mesh participants and urban activists from Berlin, by Panayotis Antoniadis and Ileana Apostol.

2.2.2. Internet Engineering Task Force (IETF) 101

Type: International Forum

Date: March 17-23, 2018

Place: London, UK

URLs:

- Plenary talk: <https://www.internetsociety.org/blog/2018/03/connect-everyone-internet-ietf-101-technical-plenary/>
- General details of the event: <https://www.ietf.org/how/meetings/101/>
- Blog article about the talk: <https://netcommons.eu/?q=content/internet-everyone-everyone>
- Slides: <https://datatracker.ietf.org/meeting/101/materials/slides-101-ietf-sessb-go-local-community-networks-leandro-navarro-00>
- Video Recording: <https://www.youtube.com/watch?v=zRF6Trtk290&feature=youtu.be>

Dissemination Level: International

Actors: Industry, Developers, Civil society, technical community, standardization groups

Audience: 2026

Participants: Leandro Navarro



Figure 2.10: Leandro Navarro keynote at the IETF 101 Plenary

Description: IETF Meetings are very large conventions where the future standards of the Internet are discussed. This year, thanks also to netCommons activities, one of the Technical Plenary Sessions of the IETF was organized by GAIA IRTF WG and dedicated to “The Future of Internet Access”, or how community networks, spectrum regulation and satellite links can enable the remaining 50% of the global population in developing their own network infrastructures.

Before the keynote we had a private lunch meeting with the Internet Architecture Board (IAB) where we discussed about the obstacles for an open and public Internet.

Summary: How do we connect everyone, everywhere, to the Internet? What role do “community networks” play in helping connect more people? How can we best use wireless spectrum and what are the issues with that? How can satellites fit into the picture? And what is the state of satellite technology? And what about the role of “space lasers”?

These were the questions that the panel at the Technical Plenary at IETF 101 in London tried to answer. The panel was moderated by Jane Coffin and included these speakers: Leandro Navarro Moldes, Steve Song, and Jonathan Brewer.

The session began with Leandro Navarro outlining how half the world is still not connected to the Internet and is not able to benefit from all the opportunities. He explored the reasons why, the challenges with business models, and the opportunities to improve the situation. He spoke about the different types of community networks and the need for small providers to cooperate and collaborate to be most effective.

Next Steve Song opened with the provocative question –do we care more about connecting refrigerators than poor people? He went on to talk about the impact of fiber optic connections in Africa– and then explained both the opportunities and challenges of using radio spectrum for communication. Steve discussed the economics and politics of spectrum allocation and finished looking at some of the upcoming next generation technologies. A key message: access diversity is critical!

Finally, Jonathan Brewer provided a view on satellite options for Internet access. He outlined typical orbits and latencies; spoke about different architectures and common deployment scenarios; and explained different satellite spectrum bands and then pros and cons. We learned about “rain fade” and other terms. He also offered three newer commercial ventures as examples of the exciting activities in the space sector.

After the panelists spoke, Jane opened the floor to questions. Attendees asked about the diversity of options, the need to include more people and regions, and more. It was an educational session that offered many ideas for how to connect the rest of the world, and self-provision is an opportunity for citizens and small providers to cooperate to be effective in developing local networking infrastructures that provide regional coverage and services. As netCommons has shown, community networks have demonstrated to be effective for helping in local socio-economic development, developing local connectivity, enabling the growth of local business, and supporting local resilience. Community networks need diversity, standards, interoperability, commodity components, ways for incremental upgrading of the networks, and decentralised management, investment and governance. The IETF community can contribute to create this environment.

We firmly believe that connectivity for the next 50% of the global population will develop bottom-up. The research in netCommons and the discussions and work of the IRTF GAIA WG contribute to understand and achieve this.

2.2.3. “Community Networks: How the Unconnected Connect Themselves” at WSIS 2018

Type: Thematic Workshop in International Forum

Date: March 19, 2018

Place: Geneva, Switzerland

URL: <https://www.itu.int/net4/wsis/forum/2018/Pages/Agenda/Session/143>

Dissemination Level: International

Actors: Academia, Policy Makers, Activists

Audience: 50

Participants Panayotis Antoniadis

Description (from the conference material): Half of the world’s population does not have access to the internet. Limitations on existing business models to provide affordable services in low-income areas, combined with innovations in low-cost communication technology, have resulted in new possibilities for the development of affordable, locally owned and managed networks, commonly known as Community Networks.

Community Networks don’t just provide affordable access; they have broader development implications. In the first part of this workshop, representatives from 5 different Community Networks worldwide will present their infrastructure and approaches to show the links between their work and the Sustainable Development Goals. Presentations will focus on the progress made by each of the initiatives during the last year, as progress is taking place in the field constantly.

In the second part of the workshop a panel discussion will take place among the presenters to discuss what lies ahead, including opportunities and challenges they face to expand their infrastructure.

Summary: The description of several Community Networks, including guifi.net and sarantaporp.gr were given highlighting their of Community Networks in connectivity spread

The full report is available at <https://dig.watch/sessions/community-networks-how-unconnected-connect-themselves>

2.2.4. Session on Sustainability and Governance Training for Community network operators, in the Third Summit on Community Networks in Africa

Type: International Forum

Date: September 2-7, 2018

Place: Wild Lubanzi Trail Lodge, Eastern Cape, South Africa

Organizers: ISOC, APC, Zenzeleni.

URL: <https://www.internetsociety.org/events/summit-community-networks-africa/2018/agenda/>

Dissemination Level: International (mainly in Africa)

Actors: Community networks, civil society, technical community, international organizations.

Audience: 90

Participants: Carlos Rey Moreno and Sol Luca de Tena from Zenzeleni, Leandro Navarro (remotely) prepared and run the session.



Figure 2.11: The CN summit was attended by many community networks projects, realities, and interested parties.

Description (from the conference material): On day 2 of the event, netCommons contributed to prepare a session on “Sustainability and Governance Training for Community network operators.” This session aimed to give a clear idea of the various elements that play into the sustainability of CNs; business (governance, finance), legal, social. Understanding planning aspects, opportunities, start up and business operation and business purpose, documentation (lessons learned and evidence building), reporting, unique value proposition and constraints.

Summary: The session offered practical tools and examples towards understanding the phases of planning, start up, operation and growth, building a business canvas/plan in groups. The session is based on the WP1 results on organizational models using the business model canvas as a template for the description of how communities relate and provide value to its local environment.

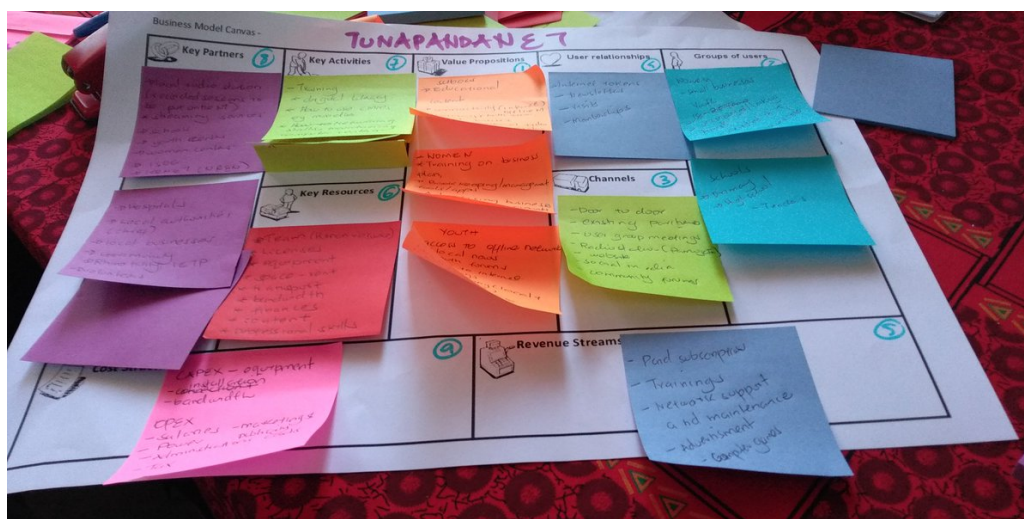


Figure 2.12: One of the canvas model developed during the CN summit.

It was very helpful as a way to structure and highlight critical aspects to consider in the different initiatives, and be able to compare and complete each high level section of the canvas.

2.2.5. Internet Governance Forum (IGF) 2018

Type: International Forum

Date: November 12-14, 2018

Place: Paris, France

URL: <https://www.intgovforum.org/multilingual/content/igf-2018-0>

Dissemination Level: International

Actors: Academia, Policy Makers, Activists, Regulators

Audience: 3000 at the forum, 30-100 in the netCommons sessions

Participants Leandro Navarro (UPC), Virginie Aubrée (UniTN), Melanie Dulong de Rosnay (CNRS), Félix Tréguer (CNRS), Panayotis Antoniadis (NetHood)

Description: netCommons contributed to two main sessions during the IGF2018:

- **IGF 2018 DC Community Connectivity: When The Unconnected Build Connectivity (DC3)**⁶ The Dynamic Coalition on Community Connectivity (DC3) provides a common platform involving all interested stakeholders in a cooperative analysis of the community network model, exploring how such networks may be used to sustainably expand Internet connectivity while empowering Internet users. The DC3 session 2018 has been organised through email interactions on the [DC3 mailing-list](#) as well as through a face-to-face meeting, held at [RightsCon 2018](#). Session panelists presented their contributions to “The Community Network Manual: How to Build the Internet Yourself,” which is the official 2018 outcome of DC3 and is a joint publication of the ITU, FGV and ISOC. Furthermore, the session will stimulate discussion with stakeholders that are developing community network-related initiatives and that could become DC3 partners.
- **IGF 2018 WS #279 Scaling community networks: exploring blockchain and efficient investment**

⁶<https://www.intgovforum.org/multilingual/content/igf-2018-dc-community-connectivity-when-the-unconnected-build-connectivity-dc3>

strategies⁷

The goal of the session is to bring together multiple stakeholders from the Community Networks movement, including collaborators from academia and funding agencies, to discuss the future of community networks through the integration of new technologies –particularly Blockchain– and the development of effective investment strategies for scaling-up.

The establishment of Community Networks has emerged as a concrete alternative to address the challenge of connecting the unconnected. In recent years, a range of CNs worldwide have consolidated and demonstrated not only the viability of CNs from a infrastructure standpoint, but also from community management perspective through the establishment of sustainable business models.

netCommons also had significant contribution to the GISWatch 2018 book on Community Networks and the DC3 “The Community Network Manual: How to Build the Internet Yourself,” which were launched during IGF 2018⁸.

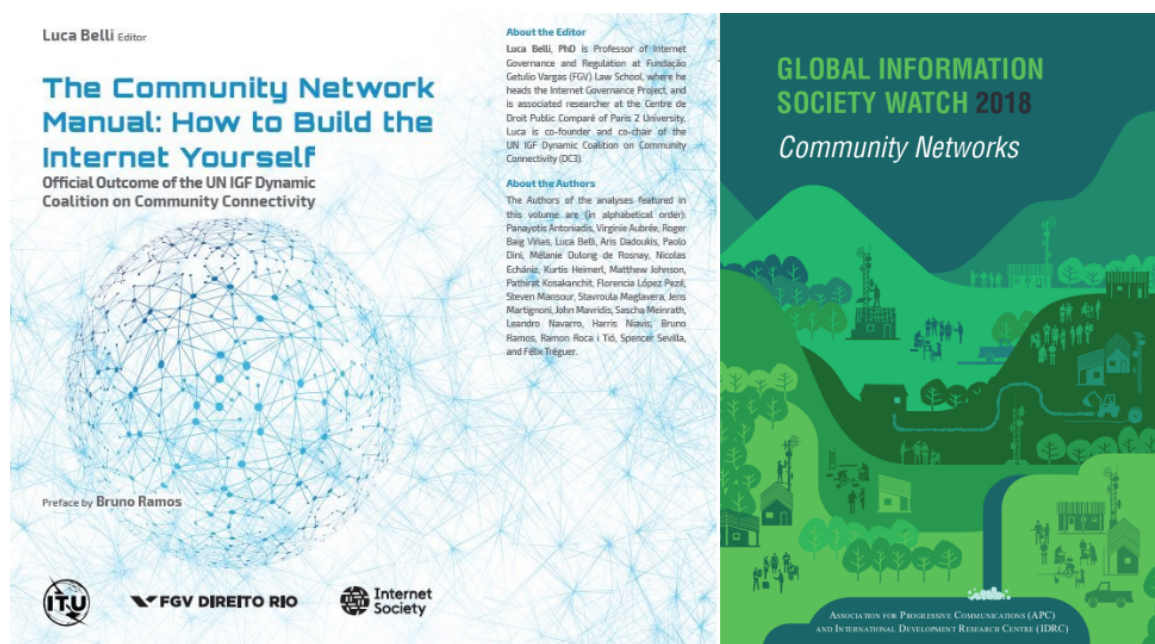


Figure 2.13: Two books on CNs with significant netCommons contributions launched at IGF2018

Summary: Community Networks had a significant presence in IGF 2018, one of the most important global events on Internet Governance and beyond. And netCommons contributed significantly in three of the most important sessions around this topic. In addition, among many private meetings with key actors present in the conference, Félix Tréguer and Mélanie Dulong de Rosnay had a meeting with Jane Coffin (ISOC) and Carlos Rey-Moreno (APC) to organize the publication in 2019 of the netCommons book deriving from Deliverable 4.5 (see Sec. 2.1.9).

Notes: A blog post including the draft talk by Panayotis Antoniadis at WS #279 is available at <https://netcommons.eu/?q=content/blockchain-and-community-networks-friends-or-foes>

⁷<https://www.intgovforum.org/multilingual/content/igf-2018-ws-279-scaling-community-networks-exploring-blockchain-and-efficient-investment>

⁸<https://www.intgovforum.org/multilingual/content/igf-2018-apc-giswatch-launch>



Figure 2.14: Full house at the IGF 2018 DC Community Connectivity Session

2.3. Scientific conferences and workshops

2.3.1. 14th IFIP/IEEE Conference on Wireless On-demand Network Systems and Services (WONS)

Type: Conference

Date: 6-8 February 2018

Place: Isola 2000, France

URL: <http://2018.wons-conference.org/>

Presented paper: Lorenzo Ghiro, Leonardo Maccari, and Renato Lo Cigno “*Proof of networking: Can BlockChains Boost the Next Generation of Distributed Networks?*”

Dissemination Level: International

Actors: Academia and industry

Audience: Around 50 people

Participants Renato Lo Cigno

Description (from the conference web site): Wireless on-demand network systems and services have become pivotal in shaping our future networked world. Starting as a niche application over Wi-Fi, they can now be found in mainstream technologies like Bluetooth LE, LTE Direct and Wireless LANs, and have become the cornerstone of upcoming networking paradigms including mesh and sensor networks, the Internet of Things, cloud networks, vehicular networks, disruption tolerant and opportunistic networks, underwater and intra-body networks.

The challenges of this exciting research field are numerous. Examples include how to make smart use of these novel technologies when multiple technologies or a mix of permanent services and on-demand networking opportunities are available to a network node, how to provide robust services in highly dynamic environments, how to efficiently employ and operate heavily resource-constrained devices, and how to develop robust and lightweight algorithms for self-organization and adaptation. Finally, there are many application-specific challenges.

WONS, now in its fourteenth edition, is a high quality forum to address these challenges. WONS aims to pro-

vide a global platform for rich interactions between experts in their fields, discussing innovative contributions in a stimulating environment.

Summary: Renato Lo Cigno presented the mentioned paper, a short, vision paper where the role of blockchains in distributed networking is seen from a very different perspective: instead of using an external blockchain to achieve consensus for networking, the implicit consensus required to run the network is used to build a management system exploiting blockchains. The idea raised attention, and the following discussions, both in-session and informal gave ideas for further research work and possible practical impacts.

2.3.2. IEEE International Conference on Computer Communications (Infocom)

Type: Conference

Date: April 15-19, 2018

Place: Honolulu, HI, USA

URL: <http://infocom2018.ieee-infocom.org/>

Presented paper: Leonardo Maccari, Lorenzo Ghiro, Alessio Guerrieri, Alberto Montresor, and Renato Lo Cigno, “*On the Distributed Computation of Load Centrality and its Application to DV Routing*”

Dissemination Level: International

Actors: Academia and industry

Audience: Around 800 people

Participants Leonardo Maccari

Description: IEEE Infocom is one of the top conferences on Computer Communications, by far the one with the largest audience. The acceptance rate is below 20%. It covers all fields in networking, thus papers presented get a very wide audience.

Summary: The presentation got several questions from the audience, showing interest. Centrality-based routing, a research mainly supported by netCommons, is getting attention to improve resilience and failure recovery in Wireless Mesh Networks, hence in Community Networks too, and may find its way into IETF standards in the future.

2.3.3. 15th Italian Networking Workshop (INW)

Type: Workshop

Date: 15-17 January 2018

Place: Courmayeur, Italy

URL: <https://inw2018.polito.it/>

Presented papers: Lorenzo Ghiro, Leonardo Maccari, and Renato Lo Cigno “*Proof of networking: Can BlockChains Boost the Next Generation of Distributed Networks?*”; Leonardo Maccari, Lorenzo Ghiro, Alessio Guerrieri, Alberto Montresor, and Renato Lo Cigno, “*On the Distributed Computation of Load Centrality and its Application to DV Routing*”

Dissemination Level: National

Actors: Academia and industry

Audience: Around 50 people

Participants Leonardo Maccari, Renato Lo Cigno, Luca Baldesi, Lorenzo Ghiro

Description (summarised from the conference web site): This annual workshop provides a forum to present recent and original work in various areas of telecommunication networks. It is mainly intended for researchers working in Italian Universities. International speakers and attendees are most welcome and in fact growing in

number in the last few years. The main purposes of the Italian Networking Workshop are to present the latest research results, obtaining immediate feedback from the research community in a rather informal but thorough way, fostering discussions about scientific topics, as well as interaction with Professors and researchers from other universities. The workshop is quite informal. Contributions are not published nor copyrighted, and participants are encouraged to submit the work presented here to the most appropriate international venues.

Summary: Leonardo Maccari presented the paper published at WONS, while Lorenzo Ghio presented the work published at Infocom. In both cases the paper sparked discussion and further feedback were collected by the researchers present to the conference.

2.3.4. Conference on Digital reality legal issues, The Law Institute, University of Iceland, Reykjavik

Type: Conference

Date: June 13, 2018

Place: Reykjavik, Iceland

URL: https://www.hi.is/vidburdir/stafraenn_veruleiki_lagaleg_alitaefni

Dissemination Level: National

Actors: Academia

Audience: 50

Participants Melanie Dulong de Rosnay

Description (from the conference material): Conference on Digital reality legal issues, The Law Institute, University of Iceland, Reykjavik

Summary: Melanie Dulong gave a talk on Community Networking as Commons, raising awareness on CNs in a country without CNs and on commons in an assembly of lawyers not familiar with the concept.

2.3.5. European Conference on Networks and Communications (EuCNC)

Type: Conference

Date: June 18-21, 2018

Place: Ljubljana, Slovenia

URL: <https://www.eucnc.eu/2018/www.eucnc.eu/>

Presented papers and contribution:

1. Leonardo Maccari, Merkouris Karaliopoulos, Iordanis Koutsopoulos, Leandro Navarro, Félix Freitag, Renato Lo Cigno, “5G and the Internet of Everyone: Motivation, Enablers, and Research Agenda”
2. Aris Pilichos, Merkouris Karaliopoulos, Iordanis Koutsopoulos “From Community Networks to Community Data: The AppLea Farming Mobile App,” Poster presentation
3. Leandro Navarro, Leonardo Maccari, Renato Lo Cigno, Merkouris Karaliopoulos, Iordanis Koutsopoulos, “Wireless Community networks and 5G: the 7 Billion challenge,” half-day tutorial
4. Renato Lo Cigno, “Wireless 2035: New Technologies or New Architectures?,” Invited speech at the “thinking outside the box session”

Dissemination Level: International

Actors: Academia and industry, EU officers

Audience: About 300 people

Participants Renato Lo Cigno, Merkouris Karaliopoulos, Aris Pilichos, Iordanis Koutsopoulos

Description (from the conference web site): EuCNC 2018 is the 27th edition of a successful series of a conference in the field of telecommunications, sponsored by the European Commission. The conference focuses

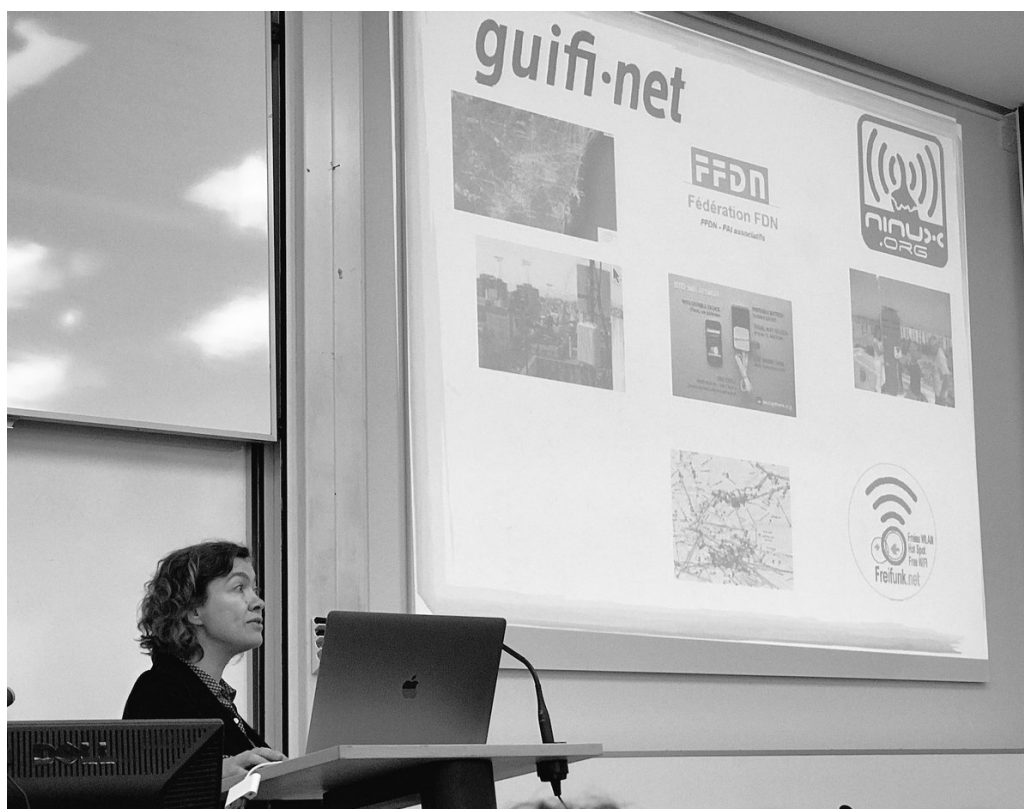


Figure 2.15: Melanie Dulong de Rosnay presenting results of netCommons at the University of Reykjavik in June 2018

on various aspects of 5G communications systems and networks, including cloud and virtualisation solutions, management technologies, and vertical application areas. It targets to bring together researchers from all over the world to present the latest research results, and it is one of the main venues for demonstrating the results of research projects, especially from successive European R&D programmes co-financed by the European Commission.

Summary: EuCNC 2018 key focus was on 5G technology, where most of the project present in the demo parts were showcasing their results. netCommons presence, with its focus on organization rather than technology, alternative views on future communications and wireless usage has been an interesting seed for discussion.

On the first day Renato Lo Cigno and Merkouris Karaliopoulos gave the tutorial “*Wireless Community networks and 5G: the 7 Billion challenge.*” Unfortunately being the first day of the conference, and probably also due to the non-mainstream topic related to EuCNC 2018, the attendance was low; however the few attendants were interested and participated in the presentation and discussion.

In the following days Renato Lo Cigno presented the paper “*5G and the Internet of Everyone: Motivation, Enablers, and Research Agenda.*” which outlines the open questions that relate to the global implementation 5G vision and presents possible answers to them, as anticipated and pursued within the netCommons project. Aris Pilichos presented the poster “*From Community Networks to Community Data: The AppLea Farming Mobile App.*” summarizing the work on the AppLea mobile app, which is carried out by AUEB in the context of netCommons WP3, and that raised keen attention for its diverse approach to sharing data and economy, while still spinning around smartphones, which are obviously mainstream in 5G vision.

Finally, at the ‘out of the box thinking’ session the speech “*Wireless 2035: New Technologies or New Architectures?*” given by Renato Lo Cigno raised high attention and received very good appraisal, being the only one in the session to present an architectural view of possible wireless communications in the future and to challenge

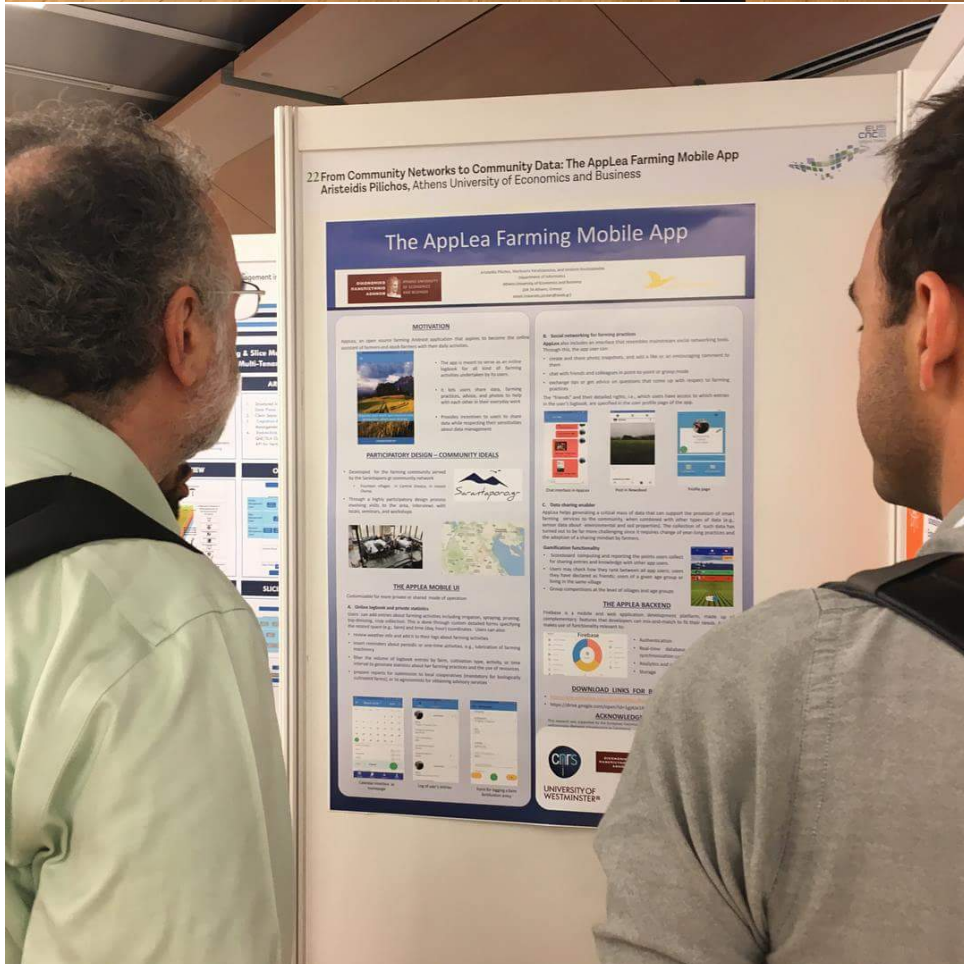


Figure 2.16: View of the poster session and the AppLea poster presented in the poster session at EuCNC '18 conference.

the “technology first” (so no really new, ground-breaking ideas, but just traced furrow innovation) perspective dominating at the conference.

2.4. Local events

2.4.1. MERGE-it

Type: Community Meeting

Date: March 24, 2018

Place: Torino, Italy

URL: <https://merge-it.net/>

Dissemination Level: National

Actors: Community Networks and more Open-* Italian groups (Open source/data/knowledge...)

Audience: About 30 stability present in the CN track, with hundreds in the whole event roaming from a track to another.

Participants Leonardo Maccari

Description: The goal of the event was to gather together all the entities/realities that operate in Italy in the context of open culture and digital rights. It was the first one of its kind and it put together similar projects that never “merged” before, like community networks, Wikimedia Foundation, open data associations and many more.

There was a dedicated track on community networks organized by ninux, and also other communities around Italy, in which several themes were discussed.

Summary: Leonardo Maccari made a presentation on the state of progress and on the results achieved so far by the netCommons project. It was also an occasion to physically meet with people from remote ninux islands (like the island in Cosenza, South Italy, approx 900km from Trento) and involve them in the experimentation with the PeerStreamer-ng platform which we describe in D3.5. This meeting replaced the ninuxday (the a-periodic meeting of the ninux community) for 2018.

2.4.2. General Assembly of the FDN Federation

Type: Assembly

Date: May 5, 2018 to May 8, 2018

Place: Saverdun, France

URL: <https://www.ffdn.org/fr/article/tag/ag>

Dissemination Level: National

Actors: Existing Community Networks

Audience: 70

Participants Félix Tréguer, Virginie Aubrée

Description (from the conference material): Yearly Meeting of the French Federation of Community Networks

Summary: The “law and policy” team of the netCommons research team is just back from a three-day field trip in Southern France with French Community Networks.

Regarding governance, one key focus this year was on inclusion, with the goal of making FFDN’s member organizations more welcoming for women, non-whites and disabled persons. As underlined in another report we released last year on governance, this has been long-running concern at FFDN and this year, participants



Figure 2.17: The audience in the ninux track of MERGE-it.

decided to launch a new working group to tackle these structural challenges. Another focus of the discussions on governance was how to fund the growing joint actions taking place within the federation, and how to build financial solidarity between member organizations. One challenge in this regard is to account for the diversity of financial situations among them while preserving local autonomy and equal representation at the federal level. Finally, we have seen a growing willingness on the part of many participants to start focusing again on growing existing organizations and seeding new ones across France. Founded in 2011, FFDN indeed underwent a fast-paced growth at the beginning and then capped at about 30 member organizations. But time now seems ripe to expand the initiative. A working group has been set up to start developing a new strategy to that effect.

On the technical front, the three-day event was extremely fruitful as well. On the first day, a small team worked on sharing the castle's WiFi network with a circus troop established down the hill and deprived of any Internet access. To that end, the castle's own WiFi network –connected to an ADSL access in a nearby village through a radio link– was expanded thanks to a new antenna installed on the castle's roof. Other workshops focused on starting new development efforts of the “Internet Cube,” a device allowing for self-hosting functionalities (thanks to the Yunohost operating system) and channeling Internet traffic to a CN's VPN services. We also took part in a demonstration on fiber optic soldering.

Finally (and most importantly for us), we had many fruitful interactions on the legal front. We gave an update of our work on legal guidelines on data retention obligations and data protection. Several participants gave us very positive feedbacks on our guide on legal aspects of open access points (based on French law), and in particular the fact that the guide was already helping local public authorities and libraries resist pressure to implement illegal surveillance measures and better protect the rights of Internet users. We also discussed the findings of our recent report on how to develop advocacy capacities to influence regulation in the interest of CNs.

2.4.3. General Assembly of the guifi.net community (SAX 2018)

Type: Assembly, community meeting

Date: June 2-3, 2018

Place: Benasque valley, Spain



Figure 2.18: The old castle where FFDN's 2018 General Assembly took place

URL: <https://sax2018.ribaguifi.com/>

Dissemination Level: National

Actors: Different stakeholders involved in guifi.net

Audience: 50 on-site + 200 remote

Participants Roger Baig (on-site), Leandro Navarro (remote)

Description (from the conference material): Yearly Meeting of the guifi.net community network

Summary: A discussion about economic sustainability and ways to implement it. Inspired by business and organizational models developed in netCommons, extended to collect organizational and economic models in different local community networks that are part of guifi.net. Different local groups explained their own local ways to organize and crowdsource economic contributions, voluntary and professional work to expand and maintain the network. Data was collected in forms and the differences were discussed.

2.4.4. Sarantaporo training workshop

Type: Community workshop

Date: March 11, 2018

Place: Flambouro village, Sarantaporo area

URL: N/A

Dissemination Level: National

Actors: Sarantaporo.gr CN community

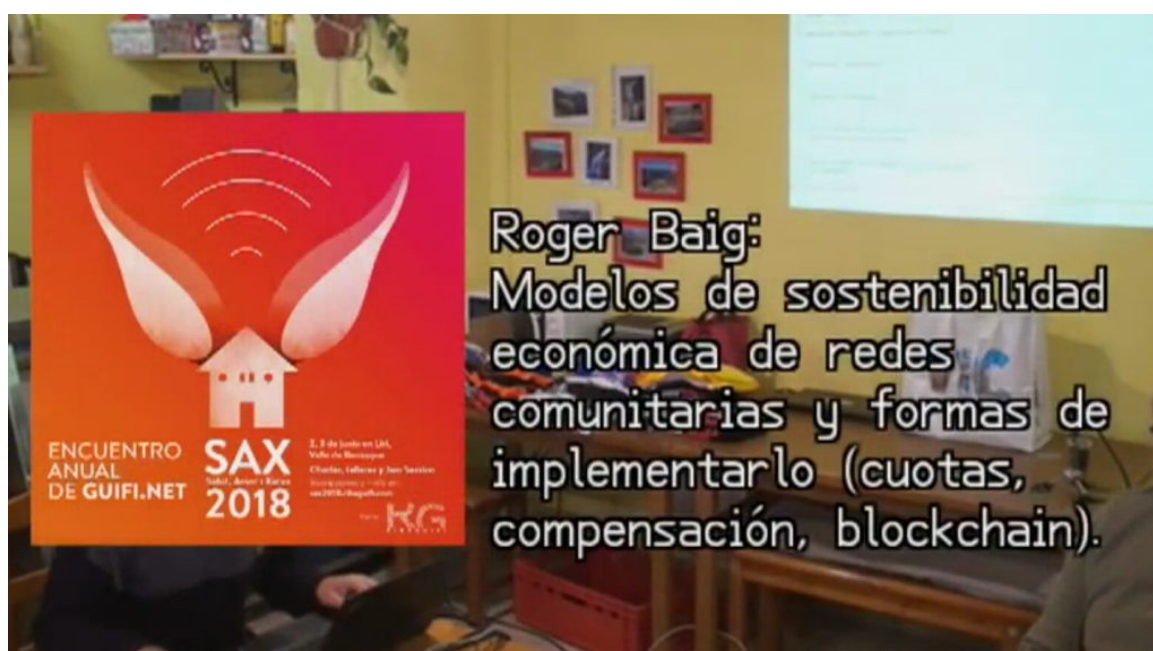


Figure 2.19: The session on economic sustainability of guifi.net

Audience: 30

Participants Panayotis Antoniadis, Alexandros Papageorgiou, Merkouris Karaliopoulos, Aris Pilihos

Description (from the conference material): Sarantaporo organized a training workshop at Flambouro village with the support of ISOC’s “beyond the net” fund and netCommons contributed also and organized a side-event, a participatory design workshop at Flambouro village, documented briefly in Deliverable 3.6 (p.18-22).

Summary: The workshop was very successful in that it managed to engaged a wider range of actors than the previous ones, most importantly many women, and it was a step forward in the appropriation of the Sarantaporo.gr CN by the local community⁹.

Notes: A short video report from this workshop was produced and presented at WSIS conference (see Sec. 2.2.3).

⁹See also a related blog post by Vassilis Chrysos: <https://blog.apnic.net/2018/04/20/empowering-local-communities-to-build-maintain-and-expand-their-community-network/>



Figure 2.20: Training workshop at the Flambouro village

2.5. Public presentations

2.5.1. Economic landscape under the new Telecommunications Code

Type: EU parliament workshop

Date: May 23, 2018

Place: Brussels, Belgium

URL: <https://www.greens-efa.eu/en/article/event/economic-landscape-under-the-new-telecommunications-code/>

Dissemination Level: European

Actors: Policy makers, regulators

Audience: 50

Participants Maria Michalis (UoW) and Panayotis Antoniadis (NetHood)

Description (from the conference material): Competition has been the driver for investment and better services for Europeans under the current legislative framework. The new framework looks towards future deployments and aims to continue a competition based model with added incentives for investment, putting in place a co-investment system for the current and future big market players. Small commercial players and the community networks are the seeds of innovation and have the potential for growth either through better offers or disruptive technologies that cover traditional and previously unexplored markets. For them, it is important to create a framework that provides incentives for competition, investment and does not block their way to operate.

A growth model based solely on incentives is a transitory one, reliant on the lifecycle of the incentives, while a competition based model is sustainable and capable of delivering the best results for consumers. And the



Figure 2.21: EU Parliament workshop "Economic landscape under the new Telecommunications Code"

positive impact on consumers should be the ultimate goal of legislation. In that regard, the event is offering a platform for debate on the obligations for providers, especially small and community networks, the benefits of a clear framework and the potential changes in the relation between the providers and the consumers.

Co-organisers: MEPs Julia Reda, Max Andersson, Jan Philipp Albrecht

Summary: Maria Michalakis and Panayotis Antoniadis together with Ramon Roca remarked, at this important policy venue the importance of supporting CNs for the health of the global communication market in Europe. Further information on this event is reported in Sec. 3.2.3

Notes: The full video recording of the workshop is available [at the event's web site](#).

2.5.2. Human Rights and present / future ICT

Type: Workshop

Date: September 11, 2018

Place: Zurich, Switzerland

URL: <https://www.isoc.ch/archives/3396>

Dissemination Level: Local

Actors: Academia, Policy Makers, Industry

Audience: 30

Organizer ISOC-CH

Participants Panayotis Antoniadis

Description (from the conference material):

Building on the first two events of the Values of Internet Technologies (VIT) series, this third workshop will explore Human Rights and how they relate to the digital sphere. We will delve into the impact of Internet protocol design on Human Rights and look at the protocols existing today. Finally we will discuss the potential of technology for protecting Human Rights and changes needed to strengthen this role.

Summary: A parallel workshop organized by ISOC-CH members in Zurich and Geneva, which gathered a quite diverse set of people interested on the discussion of new technologies from a human rights perspective.

Notes: The slides of Panayotis Antoniadis' presentation are available at http://nethood.org/slides/antoniadis_ISOC-CH.pdf

2.5.3. University of Natural Resources and Life Sciences (BOKU), Vienna

Type: Invited seminar in workshop

Date: June 28, 2018

Place: Vienna, Austria

URL: <http://short.boku.ac.at/q33z5q>

Dissemination Level: Local

Actors: Academia, Policy Makers

Audience: 40

Participants Melanie Dulong de Rosnay

Description: This was the last lecture of the summer term of the LTS LunchTimeSeries on Law, Technology and Society at the Institute of Law, University of Natural Resources and Life Sciences (Universität für Bodenkultur). These are formal seminars given at the Institute of Law open to all members of the University.

Summary: The computing model of peer-to-peer, a type of architecture in which actions are distributed, can be a source of inspiration for a law of the commons. Both movements, as alternatives to the market and state, question the Western concept of individual agency. By attributing rights and responsibilities to collective persons, the commons movement can take inspiration from environmental law and the law applied to artificial intelligence, both of which have succeeded in surpassing the notion of individual person.

It was attended by legal academics and by former PhD and master students of the programme, including an assistant to an MEP working on telecommunications reform. Many questions were raised on the role of law and policy to sustain alternative networks.

Notes: The full report of the lecture is available at the [LTS web site](#).

2.5.4. AFTER: Futuri Digitali

Type: Invited speech in workshop (in Italian)

Date: October 19, 2018

Place: Reggio Emilia, Italy

URL: <https://www.afterfestival.it/programma>

Dissemination Level: Local

Actors: General Public, Local Authorities, Local Stakeholders

Audience: 50

Participants Renato Lo Cigno

Description: A local event sponsored by Reggio Emilia Municipality discussing experiences of bottom-up networking in the aftermath of the deployment of a “municipal network” in Coviolo a small segregated hamlet in the municipality of Reggio Emilia.

Summary: Several interventions spanned from the role played by the local Internet Service Provider (ISP) [Lepida](#) that is fully controlled by ‘Regione Emilia Romagna’ and has the role of providing digital services to all local public sector (municipalities, provinces, region, etc.), plus schools and support for marginal areas, to the [guifi.net](#) experience, the global visions brought by [netCommons](#) and Jan Droege, [BCO support network](#) director.

2.5.5. Persona Non-Data Festival at Gaité Lyrique

Type: Invited panel at festival

Date: December 2, 2018

Place: Paris, France

URL: <https://gaite-lyrique.net/en/event/cultivons-des-reseaux-et-elevons-des-chatons>

Dissemination Level: International

Actors: General public, activists, civil society, CNs

Audience: 60

Participants Panayotis Antoniadis



Figure 2.22: Persona Non-Data Festival at Gaité Lyrique

Description: A panel session on technological sovereignty at the "Persona Non Data" festival at the prestigious Gaîté Lyrique, moderated by Claire Richard, author of the "Petit ouvrage d'autonomie technologique (éditions 369)", with Panayotis Antoniadis (NetHood), Benjamin Cadon (Labomedia), Clara Cuso (Guifi.net) and Spideralex (Tactical Tech).

Summary: It was a very interesting panel offering diverse perspectives on technological sovereignty with special focus on Community Networks.

One of the highlights was the presence in the audience of the president of Franciliens.fr (member of FFDN) who intervened to give a short overview of the situation in France, and also engaged in discussions with the panelists after the event.

2.6. CN Oriented Workshops

2.6.1. 3rd Community Network Summit

As part of the ongoing collaboration with Zenzeleni, APC and ISOC, we co-organized a business model canvas design exercise, based on the results of WPI ([3, 4, 5]) for community networks, with the participants of the 3rd Community Network Summit in South Africa. See Sec. 2.2.4 for details.

2.6.2. CNSIG council assembly

After the IGF 2018, the CNSIG council gathered for the first time after its inauguration (in IGF 2017) and discussed about the current activities of the member CNs and future plans for common action. Special focus given on the development of a strategy for "local content", of special interest for netCommons.

The minutes of the discussion are available at http://nicolasacco.diveni.re/~gio/asciipad/CNSIG_CouncilMeeting20181115Paris/.

2.7. Other

2.7.1. Meeting with MP of the Iceland Parliament

Type: Meeting

Date: June 13, 2018

Place: Reykjavik, Iceland

URL: https://www.hi.is/vidburdir/stafrænn_veruleiki_lagaleg_alitaefni

Dissemination Level: National

Actors: Academia, Local Authorities, Policy Makers

Audience: 5

Participants Melanie Dulong de Rosnay

Description: Private, close meeting with a member of the Iceland Parliament

Summary:

Melanie Dulong de Rosnay, together with 4 other legal academics participating to a conference, met with Björn Leví Gunnarson, a member of the Althingi, the Iceland Parliament, working on technology questions and a member of the Pirate Party.

The country has no CN, despite not being well covered by national commercial ISPs in the rural areas (sometimes visitors roaming between several national ISPs have a better connectivity in the countryside than nationals who are bound with one provider).

The meeting approached topics related to the regulation on telecoms and the development of commons-based alternatives. In particular, the MP had just been working on a bill promoting FabLabs.



Figure 2.23: Mélanie Dulong de Rosneay at the Icelandic Parliament with other meeting participants

3. Advocacy

The work of netCommons on advocacy deserves a separate chapter because of the importance of the topic in times of critical changes of the regulatory and policy European framework, but also because of the significant successes achieved during the 3 years of the project. Obviously this activity overlaps with the participation to the various events described in Chapter 2.

In the following we summarize this work, focusing on the activities during the last year, covered by this deliverable.

3.1. UNESCO's Internet Universality Indicators

The netCommons project managed to successfully intervene in another policy initiative, this time at the international level. netCommons participants from CNRS and the University of Westminster had been invited to contribute to UNESCO's work on Internet Universality Indicators, presented at the International Association for Media and Communication Research (IAMCR) conferences, notably at a panel in Leicester, UK in 2016. They also participated in a panel in Cartagena, Colombia in 2017. On both occasions, CNRS and University of Westminster made the point about the potential of CNs to contribute to Unesco's indicators, raising UNESCO's awareness on the necessity to include Community Networks in their work on Internet Universality Indicators.

Building on these contacts with UNESCO, netCommons was invited to organise a presentation on aspects of the project at the UNESCO headquarters in Paris with a view to provide an input to their Internet Universality Indicators project.

More specifically, the netCommons project, together with members of its Advisory Board, visited the offices of UNESCO on January 30, 2018, as reported [in our web site news](#) . netCommons researchers presented the key ideas of CNs to UNESCO staff, most of whom came from the Division Freedom of Expression and Media Development. In particular, Leonardo Maccari, Maria Michalis and Melanie Dulong de Rosnay gave three short overviews focusing on the technical feasibility and social impact of CNs, the EU telecommunications policy framework and perceptions of CNs by interested people, and the impact of the legal system on CN respectively. All three themes produced an informed discussion with the UNESCO working group on the Internet Universality Indicators, which was extremely fruitful to enlarge the interest on CNs to a wider community, and to improve the indicators and make them inclusive of CNs specific needs, building upon a set of previous documents (Open letter, note to policy-makers) netCommons had previously produced. Following that presentation, the netCommons project was asked to participate in the consultation on the indicators, and to produce a formal written submission. Indeed, in May 2018, netCommons submitted a formal response to UNESCO consultation¹. We worked on targeted suggestions, modifications and additions to the Indicators.

In June 2018, UNESCO released the second draft of Internet Universality Indicators. This version² includes a new indicator under Theme C: Open Markets that explicitly mentioned CNs: **C.6 Are communities able to establish their own networks to provide Internet access? Legal framework for establishment of community networks.**

In November 2018, UNESCO released the final version of the Internet Universality Indicators and the above indicator for CNs has been retained³.

¹See https://en.unesco.org/sites/default/files/ui_c2_en_sub075.pdf

²See https://en.unesco.org/sites/default/files/unesco_internet_universality_indicators_second_version.pdf

³See <http://unesdoc.unesco.org/images/0026/002658/265830e.pdf>

This is a significant achievement with a potential impact for the whole CN movement worldwide. The Indicators will be used by UNESCO and other international bodies as the base criteria to evaluate national policies regarding Internet connectivity and their impact on human rights. It is thanks to netCommons that CNs are now recognized at the UN-level as useful and effective instruments to reduce the digital divide and are now part of the Internet Universality Indicators (whereby their legal support is one component of Internet Universality support by governments).

3.2. EU parliament workshops

During the project, netCommons organised a workshop on the European Electronic Communications Code (EECC) at the EU parliament, Sec. 3.2.1, which was very successful as it led to netCommons partners (and advisory board) being invited in follow-up workshops in the EU parliament, bringing CNs to the policy and regulation table. More specifically, one legal workshop regarding data retention obligations, Sec. 3.2.2, and another economic about co-investment, Sec. 3.2.3.

3.2.1. EU Parliament workshop of 2017 on Community Networking and telecom policy

netCommons co-organised with [Commons Network](#) a workshop on Community Networks at the European Parliament on October 17th, 2017. It focused on Telecom regulation and takes place during the negotiations of the European Electronic Communications Code (EECC).

This workshop brought for the first time key actors from the CN movement to the policy table. The event, entitled 'Community Networks and Telecom regulation', was divided in two parts.

The first one aimed to assess the role of Community Networks, especially in light of EU broadband policy. Several members of the project explained how community concretely works. Especially, they pointed out how CN activity can promote social inclusion (Leandro Navarro) digital literacy (Leonardo Maccari) and, in the end, fundamental rights.

The second one, focused on identifying legal hurdles to the development of community networks. We stressed issues based on experience of CNs about liability (by Arthur Messaud), but also on access to optical fibers and global interconnection points (by Ramon Roca).

For each part of these panels, an Member of the European Parliament (MEP) was a discussant. We could therefore confront CNs' needs with the ongoing draft of the EECC, so that this major regulation would take into account their peculiar position and concerns.

The impact of our advocacy work on this regulation was described in Deliverable 4.3. The specific timeline and program of this event is described on the netCommons website⁴

Finally, videos recording all interventions and discussions are available at the netCommons [youtube channel](#).

3.2.2. EU Parliament meeting on data retention and coalition-building for the #STOPdataRetention campaign

As one of the main evolution of the legal framework for CNs was data retentions obligations – which forces Internet access providers and host providers to maintain logs regarding the online activities of their users for a duration of up to two years, raising significant privacy issues –, netCommons participated in a European Parliament strategy meeting on “The Future of Data Retention and Targeted Criminal Investigations” on 12 April 2018, as reported on [the netCommons blog](#). Virginie Aubree (UniTN) participated in a panel with very diverse speakers (more than thirty persons) including representatives from non-profit organisations (NGOs)

⁴See <https://netcommons.eu/?q=content/eu-parliament-workshop-community-networks-and-telecom-regulation> and netCommons Deliverable 6.2.

defending digital rights (60%), members of the European Parliament (20%, such as Julia Reda), academics (11%) and members of National Regulation Authorities (3%).

The official purpose of the meeting was to share experience and legal information about data retention national laws –in light of European requirements in terms of fundamental rights– in order for MEPs and civil society at large to coordinate.

The meeting was divided in two parts. The first one focused on data retention per se, and the second one broadened the debate on digital Privacy and Copyright concerns.

First, it is worth noting that the timing as well as the purpose of this meeting was very appropriate to advertise the advocacy strategy devised by netCommons. Especially, we were able to share the project of a litigation campaign on this issue – the #STOPdataRetention campaign (see below Sec. 3.6) – that we were actively supporting in partnership with French digital rights advocacy groups and CNs, and invited participants from other EU countries to join.

Second, Virginie Aubree shared legal information from netCommons research, especially concerning data retention and its application to Community Networks (a topic emphasized in Deliverable 4.3 due to the prominent legal context). Sharing national litigation experience (about Germany and France especially) was really helpful since natives were there to present their policy context and share legal references.

Third, as they are directly part of the process of retention, CNs had specific ethical and technical concerns about data retention, as expressed in the last open letter (described below, as part of the STOPdataRetention campaign). Expressing the shared values of CNs regarding online Privacy was important to point out. Virginie Aubree also presented the current practice of data retention by Community networks, as described in Deliverable 4.2, and highlighted their peculiar perspective about the legal framework. It was interesting and very encouraging to see that most people actually knew Community Networks, their existence as well as their benefit for society.

Now that CNs have finally found a common voice, and are acknowledged by policy-makers, we wanted to help them to extend their advocacy capabilities by joining forces with other allies (such as NGOs and academics).

The meeting was held private, no public invitation was issued, but we could document it on the netCommons website⁵.

3.2.3. EU Parliament workshop of May 2018 on communication policy

On May 23, 2018, three MEPs, namely Julia Reda (one of the hosts of the netCommons organized workshop described in Sec. 3.2.1), Jan Philipp Albrecht and Max Andersonn, organised an event at the European Parliament titled “Economic Landscape under the New Telecommunications Code: How will the New Co-investment Rules and New Obligations Affect Small Providers in the EU.” The whole workshop was recorded and [made available online](#), and it was reported by the [University of Westminster News](#). See also the [news entry at the netCommons web site](#).

Two netCommons partners Maria Michalis (UoW) and Panayotis Antoniadis (NetHood), together with Ramon Roca (guifi.net) member of our advisory board participated in a panel with speakers including representatives from the European Commission (DG CNET), the German Broadband Association (BREKO) –alternative fixed line providers, the Body of European Regulators for Electronic Communications (BEREC), the EU European Union Agency for Network and Information Security (ENISA) (represented by Evangelos Ouzounis, Head of Secure Infrastructure & Services), the small French provider Leonix, and the trade body DigitalEurope.

In terms of content, Maria Michalis and Ramon Roca joined their voices in the first panel to make three important statements:

- The vital contribution that small and community providers can make to strengthen communication markets’ diversity and the establishment of high-capacity networks, a contribution that goes beyond “filling

⁵<https://netcommons.eu/?q=content/data-retention-and-telecommunication-providers-new-eu-parliament-meeting>

the gaps;”

- CNs have for years been relying on co-investment;
- It is crucial that CNs have a seat at the policy table, and important that they are mentioned in the legislation as possible participants in co-investment schemes as this would increase the legitimacy of the CN model.

In the second panel, Panayotis Antoniadis, stressed the importance of language and proposed the analogy between organic agriculture and CNs (the organic Internet) as the right mental frame that this discussion should be placed.

Interestingly, it was through Evangelos Ouzounis that the Greek Telecoms Regulator EETT was subsequently contacted and agreed to participate in the netCommons workshop at Impact Hub Athens (see Sec. 2.1.6), an indication of the successful impact that this EU workshop had for a specific CN (Sarantaporo.gr).

3.3. “Fibre to the Home” (FTTH) advocacy and litigation to open up the fibre market for CNs

Throughout the last year of the project netCommons fostered initiatives taken by CNs to improve their legal framework, as well as their ability to cope with their obligations. As such, we offered a support in their litigation actions to open the fibre market, presented in this section, help them in the drafting of national practices guides (Sec. 3.4), amending the EECC (Sec. 3.5), and fighting blanket data retention models (Sec. 3.6).

Being able to interconnect to the Internet, but also to provide Internet access through fibre is fundamental for CNs to become sustainable and to grow beyond certain limits. In some countries (UK with Broadband for the Rural North (B4RN), in Spain with the success of guifi.net) this is already possible, though with different degrees of accessibility and legal contexts. In others, like France and Italy, this is extremely difficult to say the least. In France there are discriminatory prices and strong entry barriers.

Inspired by CNs from other countries, and in particular by the guifi.net example they came to know through netCommons, the French federation of community network (FFDN) decided to develop a dedicated advocacy action concerning fibre. It is a specific group of ten people within FFDN, mostly engineers but also one lawyer and one person with a human sciences background. netCommons researchers supported this group from the very beginning (June 2017) participating in all the workshops of the group to provide legal and policy expertise. Those workshops took place during a whole weekend every 2-3 months to advance the project. netCommons support included legal information gathered thanks to the deliverables (D4.1, D4.2, D4.3 and D1.5) as well as general knowledge concerning proceedings before courts. We also shared our experience about advocacy projects, helping the design of a structured advocacy action composed of the following three items.

- An open letter sent to the french historical telecom operator (Orange) and the competent national regulation authority (ARCEP)⁶. The purpose is to raise the awareness on this topic and to open a dialogue with the ARCEP.
- A website and interactive map called ‘the Barometer FTTH’ (in French) clearly pointing out which areas are covered by a public network initiative –*Réseaux fibre optique d’Initiative Publiqu (RIP)* in French– and the conditions of access to active offers (if any) for CNs. The tool rate each land in France according to their accessibility for small operators. This part of the project took a lot of energy and patience for FFDN because collecting information was tough and often other operators were clearly reluctant to provide it, even though they have the obligation to do it. netCommons support to the group was key to provide a legal analysis of terms and conditions of contracts and to determine whether offers were reasonable and correct according to their legal obligations.
- Finally, together with the group, we worked to identify illegalities in these various public-private partnerships and we are considering possible litigation strategies to remedy them.

⁶See, in French, <https://www.ffdn.org/fr/article/2018-10-21/lettre-ouverte-sebastien-soriano-et-stephane-richard>

In November 2018, FFDN presented the whole project (in French) in Toulouse within the framework of a large public festival with over 1500 participants. We expect this advocacy project to have a great impact on the French fibre market by enhancing competition.

3.4. French practical guides for Community Networks

As part of the WP4, studying the legal framework of the Community Network and actors interacting with them, netCommons produced short legal practice guides, trying to find synergies with ongoing projects within the communities we're in touch with.

- In the framework of collaboration with FFDN, we published, in January 2018, a guide targeted at french CNs and other organisations offering open access to the Internet via WiFi hotspots⁷. These guidelines were presented to librarians on Monday January 29, 2018 at the 'Bibliothèques des langues orientales', in Paris. They have also been featured in various press outlets related to libraries or local authorities, and are apparently helping people within their organisations to promote open WiFi networks, without privacy-invasive authentication schemes. This short guide is integrated into an FFDN long-term project started years ago to promote open WiFi networks, and actively maintained, so that the netCommons resources are bound to a project that will survive beyond the research project maximizing its impact.
- After the publication of this first guide, we expanded the project and worked with a working group of FFDN to move towards general legal guidelines regarding the creation and operation of grassroots Internet service providers. The netCommons legal team drafted these guidelines in cooperation with FFDN and La Quadrature du Net. We have now reached a final draft. FFDN members are currently reviewing the draft before we can move to publication. It may take a few weeks, but, this way, we will make sure they are accessible to them and cover everything they need in terms of common legal issues.

This practical guide, written in French and based on French law, is divided in three parts:

1. Protecting Privacy: This part focuses on data protection laws and measures that should be taken by CNs to protect Privacy. It describes the framework of collection, processing and retention of data and future access by competent authority.
2. Managing content: This part describes what blocking measures are weighting on Internet service providers and CNs.
3. Accessing to infrastructure: This last part presents the rules framing the management of different infrastructure such as open network, Tor relay and VPN services.

For each category, the guide offers concrete advice on how to respect the legal framework, thereby facilitating the work of emerging CNs or those expanding their operation, offering clear insight on how to deal with the legal framework to expand their infrastructure and run in a way that maximize the protection of users' fundamental rights.

- This work was also key in helping us draft the Template terms of use for Community Networks, annexed to Deliverable 4.5 and which will be part of a book of guidelines to be released in the coming months. The terms of use, written in English, offer clear legal guidelines on the reciprocal legal obligations of CNs and their users.

Overall, the impact of these guides is to facilitate the appropriation by CN practitioners of the complex regulatory environment they evolve in, thereby improving compliance with the legal framework, improving their ability to debate various choices in dealing with the law as well as increasing their knowledge and resources to engage in advocacy so to change telecom policy when needs be, and finally to improve the protection of the human rights of their users.

⁷<https://www.netcommons.eu/?q=content/french-practical-guide-cns-and-organisations-providing-open-access-internet>

3.5. Amending the European Code of Electronic Communications

In parallel with the EU parliament workshops discussed in Sec. 3.2, and synergistic with the effort to have CNs recognized by UNESCO as discussed in Sec. 3.1, netCommons has pursued a strategy to transpose the research on the legal and policy needs of CNs into actual legislation, in part by collaborating with digital advocacy groups like La Quadrature du Net. This was a success, since EU law now provides for special provisions regarding Community Networks, paving the way for policy change that will enable their development.

As already reported in D6.2 [6], in March 2017, more than 30 European CNs and 35 supporting organizations wrote an open letter to EU telecom policy makers⁸. The letter came at a particular, strategic moment of the EU policy-making process. The EU Parliament was then initiating the legislative process on several proposals reforming the legal framework for telecom regulation, culminating with the adoption of the new EECC. The goal of the action was to get recognition from EU lawmakers of the specific, fundamental role of Community Networks for the health of the telecommunication market as well as human rights in Europe, and to call on them to modify the policy framework to sustain the development of Community Networks. Following the open letter, netCommons and La Quadrature du Net created a mailing list allowing the 65 organisations who had signed the open letter to coordinate on future policy developments.

To influence the policy-making process, the advocacy group coordinated by netCommons and La Quadrature du Net suggested amendments favorable to CNs, and then analysed the various amendments tabled on the text by the three competent European Parliament (EP) committees (Industry, Research and Energy (ITRE), Civil Liberties, Justice and Home Affairs (LIBE), and Internal Market and Consumer Protection (IMCO)). We prepared voting list for each of these committees where we assessed the amendments in accordance with the interests of CNs, giving negative opinions on those which would hamper the development, and positive ones to the favourable amendments:

- To the ITRE: https://wiki.laquadrature.net/Paquet_Telecom_2017/amendements_ITRE
- To the LIBE: https://wiki.laquadrature.net/Paquet_Telecom_2017/amendements_LIBE
- to the IMCO: https://wiki.laquadrature.net/Paquet_Telecom_2017/amendements_IMCO

To prepare for the crucial committees' votes, netCommons' legal and policy team also wrote a detailed brief sent to Members of the EU Parliament to explain how some of the key amendments that we identified would impact CNs, based on some of our fieldwork (and thereby giving an on-the-ground analysis of how the said amendments would impact CNs⁹).

After a crucial committee vote in September 2017 on which netCommons and its allies commented, the EU Parliament directly entered into negotiations with Member States with the goal of reaching an agreement on a final text. A netCommons workshop organized on the premises of the EU Parliament on October 17th, 2017 ensured that key MEPs taking part in these negotiations understood the potential of CNs and the urgency to lay the ground for a recognition of these initiatives by EU policy-makers.

The trilogue process took almost a year, concluding in June 2018. The final agreement brings significant improvements to the regulatory framework, echoing some of the crucial demands formulated by CNs in the open letter. These are analyzed in a policy brief released in November 2018, presented at the Internet Governance Forum in Paris on November 12th [7]. The brief is meant to facilitate the work of CNs as they engage with local, national and European policy-makers¹⁰

These improvements can be summarized in the following items.

- The new EU telecom framework lifts administrative burdens for Community Networks.

⁸<https://netcommons.eu/?q=news/open-letter-eu-policy-makers-community-networks>

⁹The brief is reported as attachment to the relative blog post on netCommons web site: <https://netcommons.eu/?q=content/notes-european-electronic-communications-code-decisive-votes-european-parliament>

¹⁰See <https://www.netcommons.eu/?q=content/netcommons-guidelines-telecom-policy-makers> & <https://www.netcommons.eu/?q=content/enabling-telecommons-guidelines-policy-makers>

- Regulators are asked to invite Community Networks to the policy table. Article 3.3.e) agreed upon in the latest negotiations posits that National Regulatory Authorities (NRA), national governments and EU policy-makers should “take due account of the variety of conditions relating to infrastructure, competition, end-user and consumers circumstances that exist in the various geographic areas within a Member State, including local infrastructure managed by individuals on a not-for-profit basis.” This language covers most, if not all, of CN models and suggests that regulators should actively mobilize the knowledge of Community Networks in the development of telecom policy.
- Regulators will still be able to safeguard competition on FTTH networks. The notion of “regulatory holidays” favored by incumbent operators and the EU Commission has been significantly delimited, and NRAs will have the tool they need to ensure that private networks rolled out by large players remain open to smaller players, including CNs, on reasonable financial and technical terms.
- Unlicensed access to spectrum is encouraged by new provisions. This is key for wireless Community Networks who have difficulties to operate in urban areas where WiFi bands are getting increasingly saturated, but more generally to build resilient and affordable long distance wireless networks.
- Policy-makers and telecom providers are banned from hindering the right to share one’s Internet connection. This is key for CNs like Freifunk which rely on the ability of subscribers to traditional telecom operators to share their connections with people in their vicinity.

The policy brief is featured in a blog post to be published on the Media & Policy Blog of the London School of Economics [8].

3.6. Strategic litigation against data retention: the #STOPDataRetention campaign

A second fundamental advocacy work conducted in cooperation with la Quadrature du Net has been the support of an international litigation and advocacy campaign against blanket data retention.

The initiative stems from a litigation group in France, named “the Exegetes,” which works closely with French CNs of the Federation FDN and NGOs defending digital rights, in particular La Quadrature du Net. These organisations had made a first call for a joint action in November 2017. netCommons, in line with the spirit of supporting existing communities rather than building new ones, joined this effort to support the abrogation of illegal national data retention laws, a demand formulated in the [Open Letter of March 2017](#), also presented during the workshop with Members of the European Parliament organised in October 2017 (see Sec. 3.2.1). Virgnie Aubrée therefore joined a group of a half-dozen people working on this campaign.

The #STOPdataRetention campaign started from an observation: a wide part of Member States’ legislation on data retention does not comply with EU law requirements regarding fundamental rights. Indeed, since EU Court of Justice’s decisions, Digital Rights Ireland in 2014 and all the more since Tele2 in 2016, it is clearly stated that general and indiscriminate collection of data is precluded. However, most of member States did not take action to repeal or adapt their legislation after the first ruling of the CJEU, nor after the second one. Confronting this collective inertia, this action intended to join forces and coordinate at the European level, by coordinating individual actions (as an alternative to regular national and isolated litigation).

- First, we set up a [campaign website](#) whereby a Community Network, an organisation, or an individual could use a template document we had prepared to lodge an individual complaint with the European Commission against their national provisions regarding data retention in breach of EU law.
- Second, we drafted a [joint open letter](#) explaining our strategy, highlight the coordinated aspect of the action and express our common concerns regarding blanket data retention in terms of human rights.

We played a key role in these two tasks, and also co-drafted the the press-release to be published on CNs and NGOs’ websites, and several members of netCommons helped translate the complaint and open letter in Spanish and Italian. We participated strongly in the coordination work by relying on advocacy capacity built in the past months, for instance through the telecommons mailing list.

3.7. Universal Deployment Model

The guifi.net Foundation, in its struggle to fairly access optical fibres, proposed a universal deployment model that can be applied at many different levels, from municipalities, to whole countries and super-national coverage too. In this model, new deployments by a private requester are allowed as long they provide enough resources that simultaneously allow for three uses:

- private for the requester,
- internal service for the public administration, and
- shared use on a commons base.

The principle, albeit developed initially for a municipality, can be extended to apply to any other regional or even international infrastructure deployed in non-private land; the proportion of resources for each uses should be carefully adjusted to meet a correct economic balance¹¹. The effect of this model is the deployment of private infrastructures generate a direct return as infrastructure for shared use, and shared, commons based use can contribute to deliver universal connectivity, which should be in the charter of all public administrations.

netCommons (Roger Baig and Leandro Navarro from UPC) has collaborated with the guifi.net Foundation in the revision and generalisation of the document¹², now in version 30 in the Catalan version, with a draft version in English¹³ including material in English.

The issue is simple: to allow and regulate the deployment of private networking infrastructures (such as private cables, towers) over public areas, that literally or conceptually belong to everyone, in a way that generates a return to everyone, which preserves and directly contributes to universal connectivity. That return is in the form of paths of appropriate cost, or not cost at all in specific cases. This way any investment in connectivity infrastructure for private lucrative benefit, always results in an added value infrastructure for everyone. Instead of an “abstract” monetary tax return for private deployments, land and submarine cables should generate a mandatory return in terms of a portion of infrastructure sharing. In general terms, this return will be as open-access fiber managed collectively, as a commons. Many stakeholders may be interested in it, allowing scaling up of commons initiatives, as it is well known (from the engineering community) that optical fibres provide a communication infrastructure much more reliable than wireless communications and with virtually unlimited capacity.

We extend the concept of universal deployment defined for the municipal scope, to the state level, and multi-state in the case of undersea cables. The proposal builds on the universality of participation in the Internet from the recent UNESCO Universality Indicators (Sec. 3.1).

The goal is to define the principle of mandatory infrastructure sharing for private deployments on public space and commons infrastructure. This principle is related to the recommendations of the ITU¹⁴ on the benefits of infrastructure sharing, the related work by APC on the topic to “maximize access and minimize the resources needed for communication infrastructure, making it much less costly and faster to deploy”¹⁵, and the EU directive on cost reduction in the deployment of high-speed broadband networks¹⁶. In the recent IRTF GAIA¹⁷ working group, as part of the IETF 102 (see Sec. 2.1.7), we introduced the generalised universal deployment

¹¹We are well aware that this model is indeed not entirely new, and that in many places in Europe and in the world there are similar schemes enforced by local (sometimes national) administrations; however, none of these schemes devised comprises all the three categories, in general leaving out the commons concept. The point is to scale these un-coordinated initiatives into a structured framework that can be used to reduce the digital divide.

¹²See <https://www.netcommons.eu/?q=content/universal-deployment-model> for a public note about this effort.

¹³Ramon Roca, Lluís Dalmau and Roger Baig from the guifi.net Foundation have created and coordinated the development of this document that can be found at https://fundacio.guifi.net/en_US/page/documentos

¹⁴Trends in Telecommunication Reform 2008: Six Degrees of Sharing, at <http://www.itu.int/ITU-D/treg/publications/trends08.html>

¹⁵Infrastructure Sharing for Supporting Better Broadband and Universal Access, at <https://www.apc.org/en/infrastructuresharing>

¹⁶Digital Single Market: EU rules to reduce cost of high-speed broadband deployment, at <https://ec.europa.eu/digital-single-market/en/cost-reduction-measures>

¹⁷Global Access to the Internet for All Research Group (GAIA), at <https://irtf.org/gaia>

proposal¹⁸ These concepts have been published, both as an article in the PoliTICs journal in Brazilian portuguese [9] and as a public report in English [10].

¹⁸The slides at IETF 102 are a joint effort that we continue to elaborate with other activists and researchers.

4. Local actors and stakeholders

Since Community Networks are by definition local projects, often grassroots, the relationships between CNs and local actors is critical for their growth and sustainability. netCommons has contributed significantly in initiating, establishing, nurturing, and advancing such relationships in the different countries where netCommons partners are based, and beyond.

In the following we report on activities carried out during the third year of the project, spanning from the collaboration with local CNs in Europe, all the way to support in developing areas as Latin America and Africa.

4.1. Iberian peninsula

The activity in this geographical area is centered on the guifi.net community network (see Sec. 6.3 for the direct collaboration with guifi.net), with interventions, in several of the different localities where guifi.net is present or active, on municipalities, regional authorities, local interest groups, and other administrative or economic entities relevant for the CN activity.

Members of the guifi.net community in different locations expressed interest, co-designed and deployed Cloudy as a way to run local services, in most if not all cases, to run network management related services or applications. Interestingly, the locations are quite widespread and diverse, such as Madrid around the Medialab Prado¹, a rural area in the Ribargorza² area of the Pyrenees, or several participants spread across the urban area of Barcelona.

Diverse authorities have shown interest and given support to CN related initiatives, such as several municipalities interested in the development of networking infrastructures (the Universal Deployment Model presented in Sec. 3.7 was born out of these activities).

A long-term collaboration has emerged in relationship to local participation and commons-based models driven by the city council of Barcelona, specifically with the department for Social Economy, Local Development and Consumption. Many of these are part of Barcola³, a city-wide working group of social and public actors around that topic. We have established an ongoing contact with the regional government of Catalonia (The ICT Centre). We have participated in the yearly event of the Solidarity Economy Fair (FESC) organized by the The Solidarity Economy Network (XES), through the stands of the guifi.net community and participated in diverse talks and round tables around commons models and specifically community networks and clouds.

As part of the Concurrency and Distributed Systems Spanish network, UPC has disseminated and established collaborations with other universities (research groups) in the area interested in supporting local initiatives promoting universal connectivity, community clouds, and related research on the topic at national level⁴. UPC has also continued joint research⁵ with INESC-ID on project related activities as part of the Erasmus Mundus Joint Doctorate in Distributed Computing.

¹Medialab Prado: A citizens' laboratory supported by the city council of Madrid, that serves as a place of encounter for the production of open cultural and digital projects <https://www.medialab-prado.es/en>

²Ribaguifi: A cooperative offering community connectivity to several villages in that county: <https://www.ribaguifi.com/>

³Barcola: Collaborative Economy and Commons Based Peer Production in Barcelona: <http://wiki.p2pfoundation.net/BarCola>

⁴For instance, the XXV Workshop on Concurrency and Distributed Systems: <https://www.dsi.uclm.es/retics/jcsd2018/>

⁵3 joint PhD projects during the lifetime of netCommons

4.2. Italy

Various activities have been carried on with Italian CNs and other entities based in Italy. WP3 had a continuous interaction with the ninux Italian CN, as reported in Sec. 6.4. We participated to activities organized by ninux (like the MERGE-it meeting Sec. 2.4.1), internal meetings in the ninux island of Florence (almost weekly), and maintained constant contacts with several more ninux islands. This produced a virtuous feedback loop with the community, that participated to the experimentation with PeerStreamer-ng, it sparked ideas that led to project proposals and joint activities. Among these activities the most relevant are the following.

- The participation of two ninux communities in the use of PeerStreamer-ng (see D3.5 [2]).
- The participation of ninux Florence in the experimentation of the Participatory Design Methodology (see D3.6 [11]).
- One project proposal submitted to RIPE (already mentioned in D2.7 [12], submitted in 2017). It was unfortunately not successful, but opened the way to further activities in 2018, such as the Google summer of code which Leonardo Maccari supervised on the Turnantenna project, which is now in the process of becoming a start-up (see D3.5 for the technical part, while Appendix A.1 reports the letter sent by the project leader to netCommons).
- support to the ninux Calabria island on the re-organization of their statute which was reported in D4.5 [13], but whose impact is further stressed by the appreciation letter from ninux Calabria reported in Appendix A.2.

Furthermore, netCommons team in Italy has maintained relations with some local administrations in Trentino, but most notably in Emilia Romagna, which lead to the invitation to the event described in Sec. 2.5.4.

4.3. Greece

As documented in previous deliverables, the Greek landscape is rather challenging for approaching and engaging local actors. We report on the direct interaction with Sarantaporo.gr in Sec. 6.2.

One of the reasons is that the most prominent CN, Athens Wireless Metropolitan Network (AWMN), has been traditionally placing itself “outside” the Internet. So, it has not engaged in legal and policy battles, like for example Freifunk or guifi.net, and legal and policy issues related to CNs have not bothered significantly the local authorities until recently.

However, at the last plenary meeting of netCommons a significant success was realized to this respect, and more specifically a workshop titled “The new EU telecommunications code in Greece and its effect on community networks,” organized at Impact Hub Athens and reported in detail in Sec. 2.1.6.

In this workshop three key actors were present together in the same panel: Vassiliki Gogou, President’s Office, EETT (Hellenic National Telecommunications and Posts Commission, National Regulator), Konstantinos Champidis, Chief Digital Officer, City of Athens, and Prodromos Tsiavos, Member of the board of GFOSS, responsible for Policy Recommendations, Open Content and Intellectual Property.

Having these three key actors in the same room with key people from the CN community like Jane Coffin, Director, Development Strategy, Internet Society (ISOC), and Steve Song, Village Telco, together with the netCommons partners and advisory board was already a success.

The discussion after the initial presentations was very interesting and various expressions of interest for future collaborations were expressed. Time will show how fast these will materialize, but the first seed has been placed.



Figure 4.1: The poster presented at the Swiss Inter- Trans-disciplinary Day 2018 [1], describing the concept and vision of the space L200.

4.4. Switzerland

In Switzerland, during the last year of netCommons, there have been developments in two fronts.

First, the initial contacts with various cooperative housing projects, resulted to an interesting “encounter” of local actors with the researchers and activists from the CAPS project MAZI (see D5.5 [14]), which led to additional interactions.

The most promising development to this end, is the participation of NetHood in a nation-wide working group on Internet access sharing for new cooperative housing projects, opening a new important area for CNs recognition, which is the appropriate networking infrastructure building and management in large (and small) housing projects, starting from cooperative housing, but possibly expanding to other forms of housing projects.

Second, the new space, L200, co-founded by NetHood in the context of the Task 5.5 has already engaged a wide variety of actors⁶, including the ISOC-CH chapter whose latest event was organized at L200⁷ by Panayotis

⁶See <http://langstrasse200.ch/pub/projekte> & <http://langstrasse200.ch/pub/digital/>

⁷Announcement and agenda at <https://www.isoc.ch/events/how-can-digitalization-mitigate-current-challenges-of-humanity-listen->

Antoniadis. Panayotis Antoniadis has also been elected member of the board and leader of the Social impAct Committee (SAC)⁸.

The fact that a real urban space in a very central location in Zurich is used as a hub for various actors outside the project, many of them in non-technological areas (housing, food, economy, . . .), L200 has already engaged over 70 members in the first 8 months of operation, provides good evidence that the concept of the “right to the hybrid city” presented and described in D5.5 is rising attention and interest, and it has materialized in something very concrete (the L200 space) and promising for the future.

4.5. Latin America and the Caribbean

As part of the preparation of the WALC course on “Community Networks course in Latin America and the Caribbean” (See Sec. 2.1.8), we had exchange of ideas with Rhizomatica and RedesAC, organizations supporting several CNs in the south of Mexico, Colombia and Brazil. As part of the WALC 2018 training on community network, we spent part of the course (2 full-time days) applying the content of the course into the design of three CN projects in the region (Panama, Mexico and Dominican Republic). Several national governments and universities in the region have shown interest in community networks, including public infrastructure operators and telecom regulatory agencies such as those from Costa Rica, Dominican Republic, Mexico (with participants from these agencies involved in the course) and supported by the [Inter-American Telecommunication Commission \(CITEL\)](#) of the [Organization of American States \(OAS\)](#). The experience was perceived as very successful by everyone involved, and the plan is to repeat it in future editions of WALC.

4.6. Africa

Training in the series of community network summits in Africa, that started first in Kenia 2017, and continued this year in the Zenzeleni community in South Africa with the support of Internet Society in the region and globally, see Sec. 2.6.1, where a training and workshop about business model canvas for community networks as reported in D1.3 and D.14 [4, 5] was held. Several African governments have considered and even supported the model, such as the South African government with an explicit award and recognition to the Zenzeleni CN, and several African CNs have developed the model, and adopted it in successive local training.

from-zurich

⁸See <https://www.isoc.ch/committees-bodies/sac> of ISOC-CH focused on building awareness and stimulate learning on the processes and internal workings of the Internet

5. Other dissemination activities and achievements

5.1. Videos

During 2018 netCommons produced two short “video reports” from two interesting events organized by the Sarantaporo.gr NPO and guifi foundation. It also released the videos from all talks during the EU parliament workshop.

5.2. Miscellaneous written pieces

5.2.1. Press

- F. Tréguer, 2018, Directive sur le droit d’auteur: l’affrontement factice des deux têtes du capitalisme informationnel¹.
- “Hyperlocal radio and do-it-yourself networks bring information closer to home” is the title of an article by Rex Merrifield published on *Horizon The EU Research & Innovation Magazine*, Jan. 10, 2019, discussing community communication and networking, including material on netCommons deriving from a couple of interviews with Renato Lo Cigno

5.2.2. Blog posts

F. Tréguer, 2018, EU telecom reform paves way for policies tailored for community networks, LSE Media Policy Project blog post².

5.3. Translations

The article “How to build a more organic internet (and stand up to corporations)” by Panayotis Antoniadis was translated in Greek by MediaLibre.³ and the book chapter “The Organic Internet: Building Communications Networks from the Grassroots”⁴, is being translated in Spanish in collaboration with Altermundi,⁵ and in French and Italian in collaboration with C.I.R.C.E.⁶

5.4. Collaboration with industry and start-ups

The results of wireless community networks, such as the Barcelona mesh in guifi.net (QMPSU), combined with the results in the netCommons project, has brought interest from industry. The huge amount of underserved

¹ Available at https://www.lemonde.fr/idees/article/2018/09/09/directive-sur-le-droit-d-auteur-l-affrontement-factice-des-deux-tetes-du-capitalisme-informationnel_5352566_3232.html

² <http://blogs.lse.ac.uk/mediapolicyproject/2018/11/27/eu-telecom-reform-paves-way-for-policies-tailored-for-community-networks/>

³ <https://medialibre.net/2018/05/24/pos-na-oikodomisoyme-ena-pio-organiko-diadiktyo-kai-na-antitachthoyme-stis-megales-etaireies/>

⁴ https://link.springer.com/chapter/10.1007/978-3-319-66592-4_13

⁵ <http://altermundi.net>

⁶ <http://circex.org>

and unconnected, in the range of billions, has brought industrial interest both from established and emerging initiatives. After initial interactions with several prospective industrial groups, UPC reached an agreement for research under the framework of the Ammbr Research Labs (ARL)⁷. For that, several preparatory meetings and many weekly conference calls were held. An industrial partnership was signed between UPC and ARL, from February 2018 until the end of 2018, to do applied research on several topics and develop a prototype and pilot sites to build wireless mesh networks that include blockchain-based automated economic compensation systems that allow self-provision of a crowdsourced client Internet access over a set of access-points, a mesh network and Internet gateways. The collaboration has allowed to customize Cloudy and develop several components for that purpose.

The collaboration between UniTN and ninux helped the creation of a Florence-based start-up on a concept named Turnantenna. The Turnantenna (better described in D3.5 [2], Chapter 3) comes from the effort of two people in ninux that were supported and sustained by UniTN through netCommons in two ways: directly, mentoring the initial design of the Turnantenna software and providing material to build the prototype; indirectly, providing the documentation that strengthened the idea that a CN can become a sustainable social enterprise.

The collaboration with the ninux helped the creation of a Florence-based start-up on a concept named Turnantenna. The Turnantenna (better described in D3.5) comes from the effort of two people in ninux that were supported and sustained by netCommons in two ways: directly, mentoring the initial design of the Turnantenna software and providing material to build the prototype; indirectly, providing the documentation that strengthened the idea that a CN can become a sustainable social enterprise.

5.5. Teaching and Courses

Leonardo Maccari held a Ph.D course at the university of Trento named: “Connecting the Unconnected: Mixing Graph Analysis, Large-Scale Mesh Networks and Blockchains for Universal Internet Access”. The course deals with the technologies and the open research issues related to the growth and expansion of CNs.

Renato Lo Cigno and Leonardo Maccari introduced, in Academic Years 2017/18 and 2018/19 roughly 16 hours dedicated to Community Networks and Wireless Mesh Networks in the course [Wireless Mesh and Vehicular Networks](#) offered at the Master (Laurea Magistrale) in Computer Science of the University of Trento.

⁷A company part of the AmmbrTech group: <http://ammbrtech.com/>.

6. Impact on the Community Networks Movement

6.1. Overall impact

All of the dissemination work of netCommons, as analyzed in the previous sections, had a significant impact on and for the CN movement as a whole.

The inclusion of Community Networks in the Internet Universality Indicators, the three workshops in the EU parliament, the numerous publications in scientific venues and popular press, the organization of events, and the production of different types of guidelines and methodologies, have all contributed to the collective knowledge and the amplification of the voice of CNs around the world.

In addition, netCommons has worked very closely with some European and non European CNs, with additional explicit impact, as summarized in this chapter.

6.2. Sarantaporo.gr CN

Sarantaporo.gr has been a very important case study for the netCommons project, and also one of its success stories in terms of direct impact.

As, documented in netCommons D3.1 [15] (p. 47) when the netCommons project started the overall impression was that, with a few exceptions, many people from the local community “hold a position of distrust.” More specifically,

“despite long and persistent efforts to mobilize local inhabitants from Sarantaporo village to actively participate to the community network, the prevalent mentality has been one of “committal”, in the sense that people expected from some actor (prominently the municipality) to provide them with the whole service. In large part the majority failed to see the community side of the project. The Sarantaporo.gr team repeatedly tried to inform the local population, but the “battle” was really tough: a strong mentality of resignation and self centeredness became the fertile land for rumors, such as “they are from some political party,” or “they receive tons of money from various funds”. Combined with a lack of permanent local presence from the Non-Profit Organizations (NPOs) members (no member of the NPO is currently a permanent inhabitant in the village) and perhaps lack of communication skills, this led to multiple misunderstandings and even a certain negative disposition towards the team and its work by influential members of the local community. The only way to resume dialogue with the local community passed, unfortunately, through the decision of the NPO team to temporarily disconnect the local access network. Eventually this fact motivated some members of the local community to get more actively involved. Currently the NPO team is collaborating with these people to set the operation of the local network to a more participatory course. This incident highlights the necessity to have local opinion leaders on board the project from a very early stage and to profoundly understand their motives. If one earns their support, it is expected to have a strong local ally to one’s cause.”

Almost three years afterwards, Sarantaporo.gr has renewed and expanded both its backbone and access networks, with support of complementary funding from ISOC¹, started a knowledge transfer in collaboration with P2PLab supported by Fund Action², was invited to participate in related panels in IGF 2017 & 2018, and IETF

¹See <https://www.internetsociety.org/beyond-the-net/grants/2017/sarantaporo-gr-community-network/> and <http://www.sarantaporo.gr/node/405>

²See <http://www.sarantaporo.gr/node/408>

101, had a dedicated documentary on national TV³, but most importantly has successfully engaged the local community in a long-term learning and engagement process with a brand new economic model and around 50 node owners (among which 13 women) active in the corresponding telegram group⁴.

Of course, netCommons has not been the only actor that contributed to this impressive progress of this small Community Network in rural Greece. But there have been several important interventions by netCommons partners that have definitely played a role. More specifically:

Community engagement and trust building: This was primarily achieved through coordinating a series of local events with external visitors that attracted publicity and made locals appreciate more the effort put in the CN.

- The participatory design workshop on November 26, 2016⁵ increased the interest and trust of the influential farmer community (e.g., as evidence immediately after the workshop 2 nodes were installed in farms) and set the scene for a new phase in the relationships between the local community and the Sarantaporo.gr NPO.
- The interview, in Greek, by the national television ERT3 called “Antidrastirio,” broadcasted on May 25th and May 29th⁶, contributed to the decision by the same program to dedicate a full episode on Sarantaporo a few months later⁷. The presence of the national TV in this abandoned rural area, was yet another important push for the Sarantaporo.gr NPO and the realization of the importance of the Sarantaporo.gr CN.
- The presentation of Sarantaporo.gr CN as a success story in the EU parliament at the European Commons Assembly, November 16, 2016⁸, and the CAPS workshop in Rome (D6.2 [6], p. 28), and the very popular article on “The Conversation”⁹ with over 13600 readers, increased the overall awareness of this case study in key people and organizations like the Commons Network, the P2P foundation, and more.
- The organization of a knowledge transfer session in the context of a training program at the Sarantaporo village (D3.3, p.23), including the invitation of Nicolas Pace from Altermundi and Vasilis Niaros by P2PLab, also invited in the first participatory design workshop, but this time with an extra guest from the Ioannina municipality, contributed to the increase of trust toward the Sarantaporo.gr NPO by the local community. It also initiated the collaboration between Sarantaporo.gr NPO and P2PLab that led to the knowledge transfer funded project by FundAction¹⁰.
- The international conference with distinguished guests like Jane Coffin and Steve Song, combined with the workshop at ImpactHub Athens with key local stakeholders (see Sec. 2.1.5 and Sec. 2.1.6), have put a strong basis for even more fruitful international and national collaborations in the future. E.g., the fact that members of the Sarantaporo.gr NPO met for the first time with the Greek Telecom regulator can lead to developments of significant impact for this and other CNs in Greece.
- The production of a video report from Sarantaporo, presented in the WSIS conference (see Sec. 2.2.3) created quite some impact in the DC3 mailing list with a lot of praise, generating even more attention toward the Sarantaporo.gr CN.
- The contribution by Alexandros Papageorgiou (NetHood) to the GISWatch report on Sarantaporo.gr CN¹¹ helped to highlight the community perspective in the description of this case study in such a

³See <https://webtv.ert.gr/ert3/antidrastirio/05mar2018-antidrastirio-kinotiko-asyrmato-diktyo-sarantaporo-gr/>

⁴See <https://www.youtube.com/watch?v=FDanOsKu2js>

⁵See <https://netcommons.eu/?q=content/agricultural-sector-ict-innovations-and-commons-towards-building-synergies>

⁶See <http://webtv.ert.gr/ert3/25me2017-antidrastirio-kina-ke-kinoniki-allilengya-ikonomia>

⁷See <https://webtv.ert.gr/ert3/antidrastirio/05mar2018-antidrastirio-kinotiko-asyrmato-diktyo-sarantaporo-gr/>

⁸See <https://www.youtube.com/watch?v=XEWDstHb8Bg>, at 1h2m17s

⁹See <https://theconversation.com/diy-networking-the-path-to-a-more-democratic-internet-67216>

¹⁰See <http://www.sarantaporo.gr/node/408> and <http://www.sarantaporo.gr/node/413>.

¹¹See <https://www.giswatch.org/en/country-report/infrastructure/greece>

prestigious publication with large diffusion and significant potential impact.

Funding resources: The presentation of P. Antoniadis on Sarantaporo.gr CN in the GAIA workshop in Cambridge¹², initiated the contact with ISOC. The contact was developed further and Sarantaporo.gr, with the help of Nethood, bid and won a grant that helped them renew their network.

Training: The training session at Pythio village organized by netCommons on March 4, 2017 (D3.3, p.15), with the use of the real map and toys for representing the different parts of the networks as suggested by the participatory design methodology (see D3.1 and D3.3 [15, 16]), was identified by members of the Sarantaporo.gr NPO team members as a milestone for the engagement of people in the practical aspects of the network maintenance.

Software: Part of the netCommons heritage is the Android mobile app AppLea, an online assistant for logging and analyzing the farming activities and sharing data about them. The long-term impact of the app remains to be seen, however, it has already had an impact on the local community through the participatory way it was designed and developed. The overall participatory design process led by NetHood and software development process led by AUEB (see D3.2, D3.4 and D3.5 [17, 18, 2]) evolved with several additional participatory design sessions in the villages, the set up of a beta testing team out of local members, regular interactions through a dedicated telegram group, generating further interest in the CN and strengthening its importance for the local community.

Organizational model: The AUEB team has had a series of discussions with Sarantaporo.gr about the possible legal hypostasis of the team, which is currently a non-profit civil partnership. The two options that Sarantaporo.gr has been iterating on are a) setting up a small ISP entity, under the expectation that small ISP entities will not be subject to the mandatory prerequisites normal ISP are; b) launching a cooperative for sharing the Internet connectivity, in conjunction with an entity that will maintain the CN. Both options have a mix of positive and negative aspects.

Economic model: In 2017, Sarantaporo.gr changed its subscription model towards a model that the AUEB team has called "collective subscriptions". The dynamics of this model have been analyzed in a research paper by the AUEB team [19]. Moreover, AUEB has forwarded to Sarantaporo.gr information about the economic models of two of the most successful CN funding models worldwide, those of guifi.net and B4RN.

6.3. The guifi.net CN

The intense collaboration with guifi.net has produced very significant results with mutual influence, where netCommons has contributed to elaborate, consolidate, disseminate, or measure impact on several result areas. Proximity with the UPC group, with frequent meetings on a daily, weekly and near monthly basis with several members of the community and employees of the guifi.net Foundation help to build this relationship¹³. The main interactions and result areas are the following:

Organizational models: As a result of WP1, there has been an evolution towards the consolidation of the sustainability and organizational models applied to guifi.net as a whole and specific groups. A workshop as held on organizational models of different local groups as part of the guifi.net assembly, see Sec. 2.4.3, where several groups (around 6) drafted a canvas and table description of their local organization, that lead to a debate and exchange of different ways to handle common issues. Definition of a guifi.net-based commons model for community cloud services, as reflected by the [20] journal paper.

¹²See <http://dsg.ac.upc.edu/gaia-cn-ws> and <https://netcommons.eu/?q=content/gaia-community-networks-sustainability-regulation-workshop>

¹³One Foundation employee is doing an industrial doctorate at UPC since 2016, one former Foundation employee and still member of the community has started his PhD at UPC in 2018, several other community members collaborate with research and other activities with UPC, and several UPC staff are guifi.net volunteers.

Software: Maintenance of the Cloudy distribution that incorporates several guifi.net services, and therefore facilitates the deployment of several legacy and current services.

Sustainability: Elaboration of the sustainability model of guifi.net and lessons learned (DC3) [21].

Policy: Elaboration of a revised version of the Universal Deployment Model as a template for municipal ordinances, and generalization of the model, as presented in the GAIA WG, see Sec. 2.1.7, and reported in a journal by invitation from the editor of the Brazilian poliTICs journal [9] in Brazilian and open-access in English [10].

Economic: Elaboration of the economic model of guifi.net (report), specifically the economic compensation system, and exploration of scalable models using blockchain models.

Dissemination: Participation and publications in different international events such as the Internet Governance Forum 2018, see Sec. 2.2.5, the Global Information Society Watch (GISWATCH) 2018 report about guifi.net [22], or the “Community Networks course in Latin America and the Caribbean”, see Sec. 2.1.8, different guifi.net related presentations in the GAIA IRTF.org working group such as mentioned before about the universal deployment model (see Sec. 2.1.7 and Sec. 3.7).

6.4. ninux

Ninux was included in the project in several ways, and this process of involvement, discussion and feedback produced impact on the community under several aspects. We actively participated and helped to organize two ninux meetings (in Florence and in Bologna), plus one open meeting (the MERGE-it) with several other communities in Italy. We followed the work of one community (the one in Florence) with almost weekly participation to the meetings of the community. We also maintained tight relationships with the community in Rome and Cosenza. The three main areas in which we had a measurable impact are.

Organizational models: In the course of the project we studied and we interacted with ninux in order to outline the shortcomings of the model that the community adopted so-far. We verified that ninux was using a model that was hiding some critical points of failure behind the definition of “distributed network”. We provided some metrics and software libraries to quantify this phenomenon, and we provided to the OpenWISP community the necessary software to visualize such metrics. One of ninux community (Cosenza, Calabria) started a process of re-work of their internal governance, inspired by the analysis we provided (see Appendix A.2). The community is now growing with a more balanced and sustainable model than before.

Software: We involved ninux Florence and Cosenza in the experimentation with both the participatory software design methodology and the testing and adoption of the PeerStreamer software. On the one side, the methodology received interest and inspired the development of software in ninux. For instance, the Turnantenna project by Marco Musumeci, thanks to the guidelines included in the methodology, opened up from a one-man hobby to a team-work that produced a new cooperative start-up. The letter in Appendix A.1 mentions the participation to an Italian seed program, and it was received before its results were available. **At the time of writing this deliverable we know that the start-up was financed with a monetary prize plus 6 months training for all the components of the group.**

PeerStreamer produced a renewed interest in internal services and it was used to broadcast public events. It is now a instrument that people in ninux can keep using and experimenting with.

Legal aspects: In Y2, as reported in D4.2 [23], we helped clarify the legal aspects of community networks in Italy, as well as in other European countries. This served as an encouragement for ninux communities. This activity continued in Y3 with a less formal structure, giving specific feedback (normally via jitsi or skype calls) in order to improve the clarify legal provisions for ninux in the Italian system.

Improved Narrative and presentation: we produced documentation and diffused information that made the case of Community Networks clear to the public and to stakeholders. We contributed to extend the

idea of CNs from hacker experiments to solid initiatives with a social background that helped to develop a cooperation with other actors. We mention the cooperation of ninux with ARCI (the largest non-profit, non-ecclesiastic organization in Italy) documented in D2.7 [12], as well as the fact that ninux was asked to participate to the future experimentation with the AMMBR hardware, as soon as this will be available¹⁴.

6.5. Other CNs globally

Several CN initiatives in Africa such as Tunapanda or Zenzeleni have been influenced by the results of netCommons that build on previous direct collaborations with UPC. In the last years and particularly in 2018 the results on organizational and sustainability models have been explored and partially adopted by these CN, as part of an invited and jointly organized session on the recent “Third Summit on Community Networks in Africa” (see Sec. 2.2.4).

The WALC course in December 2018 about community networks for Latin America and the Caribbean is another example of influence in the region, combining the results of netCommons with the reputation and experience of guifi.net and the common language and cultural links with the team at UPC. The most direct outcome has been the direct interaction and exchange of ideas, models, results, with the Mexican CNs supported by Rhizomatica and RedesAC, that brought one of the directors (Erick Huerta) as part of the instructors team, together with members of UPC and guifi.net. We expect that the presence of multiple stakeholders including governments, public network providers, telecom regulators, community members, regional authorities such as Latin American and Caribbean Internet Addresses Registry (LACNIC), Inter-American Telecommunication Commission (CITEL), and Internet Society will help develop a more favorable environment for emerging CN in the region (see Sec. 2.1.8).

¹⁴Note the presence of the ninux logo in AMMBR.com, which points to an entry in the ninux blog that explains the availability of the community to participate to the experimentation, together with the ethical constraints the community poses.

7. List of Publications (2018)

We list here the scientific and position manuscripts published in 2018 together with those submitted but not yet accepted or published.

Book Chapters

- 1) Roger Baig-Viñas, Leandro Navarro, and Ramon Roca-i-Tió. “Multiple Dimensions of Community Network Scalability”. In Belli et al. [24], pages 133–158. ISBN 9788595970298. URL <http://bibliotecadigital.fgv.br/dspace/handle/10438/25696>

A detailed report that combines the lessons learned in guifi.net with the experience in netCommons. We analyse the overall strategies and tackle scalability from what we consider the four main dimensions of CNs: social, legal, economic, and technological dimensions. We utilise the experience and lessons learned from guifi.net and other CNs to illustrate the discussion and the ways to achieve scalability in CNs.

- 2) Félix Tréguer. “Federating Community Networks: A case study from France”. In Belli et al. [24], pages 159–176. ISBN 9788595970298. URL <http://bibliotecadigital.fgv.br/dspace/handle/10438/25696>

This chapter posits that, despite some difficulties, FFDN represents an interesting precedent for other national and regional CN environments willing to foster collective cohesion. We start by offering a brief history of the CN movement in France up to the creation of Fédération FDN in 2011, before surveying the federation’s main organisation features and accomplishments. Although communities in other states have explored other forms of coordination, this process of federation provides an interesting model for ensuring the coordination of various CNs with different models, and for establishing solidarity and fostering resiliency in the face of the many challenges entailed by the maintenance and defence of CNs.

- 3) Virginie Aubrée and Mélanie Dulong de Rosnay. “Fostering sustainability of Community Networks: Guidelines to Respect the European Legal Framework”. In Luca Belli, editor, *The community network manual: how to build the Internet yourself*, pages 177–188. FGV Direito Rio Edition, 2018

This chapter proposes guidelines to help Community Networks (CNs) to cope with the applicable European legal framework and mitigate legal risks while protecting users’ rights and enforcing core values such as privacy. It covers three main topics that are key to the activity of CNs: civil liability, data protection, data retention and provides concrete recommendations on the legal choices to be made, as well as suggestions for CN governance choices.

- 4) Panayotis Antoniadis, Jens Martignoni, Leandro Navarro, and Paolo Dini. “Complementary Networks Meet Complementary Currencies: Guifi.net Meets Sardex.net”. In Belli et al. [24], pages 189–222. ISBN 9788595970298. URL <http://bibliotecadigital.fgv.br/dspace/handle/10438/25696>

A comparison between different aspects of community networks and community currencies. The long-term objective is to build a better common understanding of the individual models but most importantly the stimulation of synergies and collaborations of researchers and activists from both sides.

- 5) Panayotis Antoniadis and Jens Martignoni. “What Could Blockchain do for Community Networks”. In Luca Belli, editor, *The community network manual: how to build the Internet yourself*, pages 223–248. FGV Direito Rio Edition, 2018

This Chapter builds on previous work establishing an analogy between Community Networks (CN’s) and Community Currencies (CC’s), highlighting the variety of possible models that exist in both domains.

We advance this work by exploring two different ways through which an alternative currency model can support an existing Community Network. Although blockchain could be the underlying implementation solution for any alternative currency, we discuss separately recent blockchain solutions.

- 6) Steve Song, Carlos Rey-Moreno, Anriette Esterhuysen, Mike Jensen, and Leandro Navarro. “Introduction: The rise and fall and rise of community networks”. volume 1. Association for Progressive Communications, November 2018. ISBN 978-92-95113-06-0. URL <https://www.giswatch.org/community-networks>

An introduction to the GISWATCH book and the overall role and opportunities of community networks.

- 7) Leandro Navarro, Leonardo Maccari, and Renato Lo Cigno. “At the limits of the internet: Technology options for community networks”. volume 1. Association for Progressive Communications, November 2018. ISBN 978-92-95113-06-0. URL <https://www.giswatch.org/community-networks>

An overall description of the technological elements and choices for community networks in the recent years, and implications in these infrastructures.

- 8) Roger Baig, Leandro Navarro, Ramon Roca, and Felix Freitag. “Catalonia, guifi.net: scaling up a community network”. volume 1. Association for Progressive Communications, November 2018. ISBN 978-92-95113-06-0. URL <https://www.giswatch.org/community-networks>

A description of the situation in Catalonia with respect to the expansion and challenges of cooperative network infrastructures, and the case of the guifi.net community network.

- 9) Leandro Navarro. “Network infrastructures: The commons model for local participation, governance and sustainability”. Association for Progressive Communications, Feb. 2018. URL <https://www.apc.org/en/pubs/network-infrastructures-commons-model-local-participation-governance-and-sustainability>

An issue paper by APC about network infrastructure commons models in the context of community networks.

- 10) Panayotis Antoniadis. “The Organic Internet as a Resilient Practice”. In Kim Trogal, Irena Bauman, Randal Lawrence, and Doina Petrescu, editors, *Architecture and Resilience: Interdisciplinary Dialogues*. Routledge, 2018. ISBN 978-1-138-06581-9. URL <https://www.routledge.com/Architecture-and-Resilience-A-Series-of-Interdisciplinary-Dialogues/Trogal-Bauman-Lawrence-Petrescu/p/book/9781138065819>

Popular internet platforms that currently mediate our everyday communications become more and more efficient in managing vast amounts of information, rendering their users more and more addicted and dependent on them. Alternative, more organic options like community networks do exist and they can empower citizens to build their own local networks from the bottom up, from the grassroots. Since digital communications are today necessary for supporting a wide variety of participatory processes, especially in cities, such resilient practices in the digital domain can have a strong effect on other domains of local action, as well. This chapter aims to make clear that digital tools are not neutral facilitators and they are subject themselves of the “right to resilience”.

Journal Papers

- 11) Leonardo Maccari. “Detecting and Mitigating Points of Failure in Community Networks: a Graph-based Approach”. *Accepted for publication on IEEE Transactions on Computational Social Systems*, 2019

Wireless Community Networks are generally unplanned and non-layered, and the community tries to mirror the same approach in its governance, avoiding unnecessary management structures and relying on selforganization and spontaneous interactions. This paper analyses ninux.org, the largest community network in Italy, and one of the eldest in Europe. The goal of the paper is to understand if the spontaneous growth of the network and the community leads to a technically robust network and a socially robust community, or it hides the presence of (potentially interdependent) points of failure. We will show that,

in spite of the original motivations of the ninux community, the network is fragile under several aspects, and we suggest ways to improve it. The paper is one of the main results from T2.4.

- 12) Mennan Selimi, L Cerdà-Alabern, Felix Freitag, L Veiga, Arjuna Sathiaselalan, and J Crowcroft. “A Lightweight Service Placement Approach for Community Network Micro-Clouds”. *Journal of Grid Computing*, 2018. ISSN 1570-7873. doi: <https://doi.org/10.1007/s10723-018-9437-3>

This article describes service deployment models that allow locality and capacity of local cloud services, ensuring performance and resilience. The separation from resource allocation from service provision by this platform service is key.

- 13) Roger Baig, Felix Freitag, and Leandro Navarro. “Cloudy in guifi.net: Establishing and sustaining a community cloud as open commons”. *Future Generation Computer Systems*, 87:868–887, Oct. 2018. doi: [10.1016/j.future.2017.12.017](https://doi.org/10.1016/j.future.2017.12.017)

In this paper, we explore the feasibility and sustainability of community clouds as open commons: open user-driven clouds formed by community-managed computing resources. We propose organising the infrastructure as a service (IaaS) and platform as a service (PaaS) cloud service layers as common-pool resources (CPR) for enabling a sustainable cloud service provision. On this basis, we outline a governance framework for community clouds, and we have developed Cloudy, a cloud software stack that comprises a set of tools and components to build and operate community cloud services. Cloudy is tailored to the needs of the guifi.net community network, but it can be adopted by other communities. We have validated the feasibility of community clouds in a deployment in guifi.net of some 60 devices running Cloudy for over two years. To gain insight into the capacity of end-user services to generate enough value and utility to sustain the whole cloud ecosystem, we developed a file storage application and tested it with a group of 10 guifi.net users. The experimental results and the experience from the action research confirm the feasibility and potential sustainability of the community cloud as an open commons.

- 14) Ester López and Leandro Navarro. “Coordinated detection of forwarding faults in Wireless Community Networks”. *Journal of Network and Computer Applications*, 109:66–77, 2018

In this paper we present KDet, a decentralized protocol for the detection of forwarding faults by establishing overlapping logical boundaries that monitor the behavior of the routers within them. KDet has been designed with Wireless Community Networks (WCN) in mind. WCN have three intrinsic characteristics that make forwarding faults more likely: inexpensive equipment, non-expert administration and openness. These characteristics hinder the robustness of network connectivity. KDet is designed to be collusion resistant, ensuring that compromised routers cannot cover for others to avoid detection. Another important characteristic of KDet is that it does not rely on path information: monitoring nodes do not have to know the complete path a packet follows, just the previous and next hop. As a result, KDet can be deployed as an independent daemon without imposing any change in the network, and it will bring improved network robustness.

- 15) Panagiota Micholia, Merkouris Karaliopoulos, Iordanis Koutsopoulos, Leandro Navarro, Roger Baig, Dimitris Boucas, Maria Michalis, and Panayiotis Antoniadis. “Community Networks and Sustainability: a Survey of Perceptions, Practices, and Proposed Solutions”. *IEEE Communications Surveys & Tutorials*, 20, March 2018. doi: [10.1109/COMST.2018.2817686](https://doi.org/10.1109/COMST.2018.2817686)

In this paper we approach sustainability in community networks as a broad term with an economical, political, and cultural context.

- 16) Axel Neumann, Leandro Navarro, and Llorenç Cerdà-Alabern. “Enabling Individually Entrusted Routing Security for Open and Decentralized Community Networks”. *Ad Hoc Networks*, 79:20–42, Oct. 2018. doi: [10.1016/j.adhoc.2018.06.014](https://doi.org/10.1016/j.adhoc.2018.06.014)

Existing community networks are vulnerable to various attacks and are seriously challenged by the obligation to find consensus on the trustability of participants within an increasing user size and diversity.

We propose a practical and novel solution enabling a secured but decentralized trust management. This work presents the design and analysis of securely-entrusted multi-topology routing (SEMTOR), a set of routing-protocol mechanisms that enable the cryptographically secured negotiation and establishment of concurrent and individually trusted routing topologies for infrastructure-less networks without relying on any central management. SEMTOR extends BMX6, one of the most popular mesh routing protocols in wireless mesh based community networks.

- 17) Leonardo Maccari, Mirko Maischberger, and Renato Lo Cigno. “Where have all the MPRs gone? On the optimal selection of Multi-Point Relays”. *Ad Hoc Networks, Elsevier*, 77:69–83, Aug. 2018. ISSN 1570-8705. doi: <https://doi.org/10.1016/j.adhoc.2018.04.012>. URL <http://www.sciencedirect.com/science/article/pii/S1570870518301537>

OLSR is a widespread routing protocol in wireless mesh networks: static, mobile, ad-hoc, and even sensor networks. The selection of MPR that form a signaling backbone is at the heart of the protocol and it is a crucial process to reduce the signaling overhead. Since the protocol proposal and specification, the original heuristic for MPR selection has been largely studied showing it has good local properties; however, this does not give insight about the properties of the global set of MPRs. Here lays the contribution of this paper: First we define the problem of the minimization of the global MPR set (the union of all the MPR sets) as a centralized integer linear programming problem, which is NP-hard. We are able to solve it for networks of practical size, up to 150 nodes. Second, we define a bound that we call the “distributed optimum,” which we show to be a lower bound for distributed MPR selection algorithms, still requiring considerable power to be computed. Finally, we set-up an experimental performance evaluation methodology and we show that a heuristic that we recently proposed performs very close to the distributed optimum, and always outperforms the original heuristic.

- 18) Leonardo Maccari and Renato Lo Cigno. “Improving Routing Convergence With Centrality: Theory and Implementation of Pop-Routing”. *IEEE/ACM Transactions on Networking*, 26(5):2216–2229, Oct. 2018. ISSN 1063-6692. doi: 10.1109/TNET.2018.2865886. URL <https://ieeexplore.ieee.org/document/8457534>

One of the key features of a routing protocol is its ability to recover from link or node failures, recomputing routes efficiently without creating temporary loops. Indeed, in real conditions, there is always a trade-off between the overhead due to the periodic generation of control messages and route convergence time. This paper formalizes the problem of the choice of timers for control message generation as an optimization problem that minimizes the route convergence time, constrained to a constant signaling overhead. The solution requires the knowledge of nodes’ centrality in the topology and can be obtained with a computational complexity low enough to allow on-line computation of the timers. Results on both synthetic and real topologies show a significant decrease of the transient duration with the consequent performance gain in terms of reduced number of unreachable destinations and routing loops. Our proposal is general and it can be applied to enhance any link-state routing protocol, albeit it is more suited for wireless networks. As a concrete example, we present the extension of OLSRv2 with our proposal, named Pop-Routing, and discuss its performance and the stability of centrality metrics in three large-scale real wireless mesh networks. This exhaustive analysis on traces of the topology evolution of real networks for one entire week shows that pop-routing outperforms the non-enhanced protocol in every situation, even when it runs with sub-optimal timers due to centrality computation on stale information.

- 19) Ramon Roca, Lluís Dalmau, Roger Baig, and Leandro Navarro. “Modelo de implantação de Rede Universal para Conectividade Universal”. *poliTICS*, 2(28), 2018. ISSN 1984-8803. URL <https://politics.org.br/edicoes/modelo-de-implanta%C3%A7%C3%A3o-de-rede-universal-para-conectividade-universal>

There is interest in the deployment of cable and other networking infrastructure for private use in public land, but the lack of clear guidelines to regulate deployment in public land can block authorization decisions, which can be controversial due to the consequences of the private ownership and use of a private infrastructure in public space. The guifi.net Foundation proposed a universal deployment model for

municipalities, where new deployments by a private requester are allowed as long it provides paths that simultaneously allow for three uses: self-service for the city council, private for the requester, and shared or common use for everyone else. The principle can be extended to apply to any other regional or even international infrastructure deployed in non-private land, although the proportion of resources for each uses can be adjusted. The effect of this model is that the deployment of private infrastructures generate a direct return as infrastructure for shared use by everyone can contribute to deliver universal connectivity. In Brazilian Portuguese, English version [10]:

Conference with Proceedings

- 20) Leonardo Maccari, Merkouris Karaliopoulos, Iordanis Koutsopoulos, Leandro Navarro, Fèlix Freitag, and Renato Lo Cigno. “5G and the Internet of Everyone: Motivation, Enablers, and Research Agenda”. In *IEEE European Conference on Networks and Communications (EuCNC)*, pages 429–433, June 18–21 2018. doi: <https://doi.org/10.1109/EuCNC.2018.8443200>. URL <https://ieeexplore.ieee.org/document/8443200>

As mobile broadband subscriptions grow twice as fast as the fixed ones and the Internet of Things comes forth, the 5G vision of the Internet of Everything (people, devices, and things), becomes a substantial and credible part of the near future. In this paper, we argue that the 5G vision is still missing a fundamental concept to realize its societal promise: the Internet of Everyone (IoEO), i.e., means and principles to overcome the concerns that the current 5G perspective raises for the digital divide and the network neutrality principle. We discuss open-source software and hardware, Community Networks, mobile edge computing and blockchains as enablers of the IoEO and highlight open research challenges with respect to them. The ultimate objective of our paper is to stimulate research with a short-term, lasting impact also on that 50% (or more!) of population that will not enjoy 5G anytime soon. Internet of Everyone, community networks, 5G, mobile edge computing, network neutrality, community cloud computing.

- 21) Leonardo Maccari, Lorenzo Ghio, Alessio Guerrieri, Alberto Montresor, and Renato Lo Cigno. “On the Distributed Computation of Load Centrality and Its Application to DV Routing”. In *37th Annual IEEE International Conference on Computer Communications (INFOCOM)*, pages 2582–2590, Honolulu, HI, USA, Apr. 16-19 2018. ISBN 978-1-5386-4128-6. doi: <https://doi.org/10.1109/INFOCOM.2018.8486345>. URL <https://ieeexplore.ieee.org/document/8486345>

Centrality metrics are a key instrument for graph analysis and play a central role in many problems related to networking such as service placement, robustness analysis and network optimization. Betweenness centrality is one of the most popular and well-studied metric. While distributed algorithms to compute this metric exist, they are either approximated or limited to certain topologies (directed acyclic graphs or trees). Exact distributed algorithms for betweenness centrality are computationally complex, because its calculation requires the knowledge of all possible shortest paths within the graph. In this paper we consider *load centrality*, a metric that usually converges to betweenness, and we present the first distributed and exact algorithm to compute it. We prove its convergence, we estimate its complexity and we show it is directly applicable—with minimal modifications—to any distance-vector routing protocol based on Bellman-Ford. We finally implement it on top of the Babel routing protocol and we show that, exploiting centrality, we can significantly reduce Babel’s convergence time upon node failure without increasing signalling overhead.

Our contribution is relevant in the realm of wireless distributed networks, but the algorithm can be adopted in any distributed system where it is not possible, or computationally impractical, to reconstruct the whole network graph at each node and compute betweenness centrality with the classical approach based on Dijkstra’s algorithm.

- 22) Lorenzo Ghio, Leonardo Maccari, and Renato Lo Cigno. “Proof of Networking: Can Blockchains Boost the Next Generation of Distributed Networks?”. In *14th IFIP/IEEE Annual Conf. on Wireless*

On-demand Network Systems and Services (WONS), pages 29–32, Isola 2000, France, Jan. 2018. ISBN 978-3-903176-02-7. URL <http://dl.ifip.org/db/conf/wons/wons2018/index.html>

The recent explosion of interest in blockchains led to a plethora of proposals for their application, including attempts to decentralize some centralized network functions. At the same time, real “distributed wireless networks” are emerging. Community networks, for instance, are large mesh networks made of hundreds of nodes built by communities primarily to solve digital divide, and they are thriving. The challenges these networks face are not only technological: they deal with creating incentives to participate, with the business model they may adopt, and with their internal governance. Very few models have been proposed to apply blockchains to bottom-up distributed networks: we instead expose how they can solve many problems which so far hindered the diffusion of such networks. Maybe we can push this further: a network is, in essence, a system in which all nodes find a rough consensus on the best paths to connect a node with another. Can we use this consensus method to run a distributed ledger and a cryptocurrency within the network itself, rather than simply applying to networks the effects of a blockchain defined in a separate system? This paper introduces this concept, named “Proof of Networking”, and discusses its potential avails.

- 23) A. M. Khan, F. Freitag, V. Vlassov, and P.H. Ha. “Demo abstract: Towards IoT service deployments on edge community network microclouds”. In *IEEE INFOCOM 2018 - IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS)*, pages 1–2, Apr. 2018. doi: 10.1109/INFOCOMW.2018.8406840

Internet of Things (IoT) services for personal devices and smart homes provided by commercial solutions are typically proprietary and closed. These services provide little control to the end users, for instance to take ownership of their data and enabling services, which hinders these solutions’ wider acceptance. In this demo paper, we argue for an approach to deploy professional IoT services on user-controlled infrastructure at the network edge. The users would benefit from the ability to choose the most suitable service from different IoT service offerings, like the one which satisfies their privacy requirements, and third-party service providers could offer more tailored IoT services at customer premises. We conduct the demonstration on microclouds, which have been built with the *Cloudy* platform in the *Guifi.net* community network. The demonstration is conducted from the perspective of end users, who wish to deploy professional IoT data management and analytics services in volunteer microclouds.

- 24) Felix Freitag. “On the Collaborative Governance of Decentralized Edge Microclouds with Blockchain-based Distributed Ledgers”. In *BCT4MAS 2018 - 1st International Workshop on Block Chain Technologies 4 Multi-Agent Systems (BCT4MAS) at WI 2018*, Dec. 2018

Today’s commercial model for edge computing services consists in lightweight devices at the network edge connected through the Internet to remote cloud data centers. Microclouds are an alternative vision of edge computing, where the cloud infrastructure runs at the network edge leveraging decentralized resource contributions of a community. But current attempts to build such microclouds lack a collaborative governance system to operate successfully. In this paper we discuss the opportunity to implement with blockchain technologies key services to enable the decentralized collaborative governance of microclouds. A multi-agent approach could further contribute to improve the efficiency in the decision making in the collaborative governance service.

- 25) Khulan Batbayar, Emmanouil Dimogerontakis, Roc Meseguer, Leandro Navarro, Esunly Medina, and Rodrigo M. Santos. “The RIMO Gateway Selection Approach for Mesh Networks: Towards a Global Internet Access for All”. *MDPI Proceedings*, 2(19), 2018. ISSN 2504-3900. doi: 10.3390/proceedings2191258. URL <http://www.mdpi.com/2504-3900/2/19/1258>

Community wireless mesh networks have emerged as cooperative initiatives to provide Internet Access in areas where traditional ISP costs are not affordable for the population. It is common in wireless mesh networks sharing several capacity limited Internet gateways to provide Internet access. As routing does not handle capacity planning, end-users have to select gateways in such a way that the overall

capacity of all gateways could be used effectively. An efficient gateway selection should minimize the processing logic and measurements over the mesh network. Selecting a high performance gateway can also ensure that the overall network load is balanced. This paper presents RIMO, a standalone best-effort algorithm for client nodes to select their preferred gateway without interacting with other client nodes. RIMO-based selection matches the gateway performance of the reference brute-force and omniscient algorithms for 60% of the test duration while reducing the gateway performance measurement cost from a factor of n to 2. With a reduced overhead and high efficiency, the RIMO algorithm automates the aggregation of multiple Internet gateways in wireless mesh networks, which results in robust last mile Internet connectivity to people in vulnerable situation.

- 26) K. Batbayar, R. Meseguer, L. Navarro, R. Sadre, and E. Dimogerontakis. “Collaborative informed gateway selection in large-scale and heterogeneous networks”. In *IFIP/IEEE International Symposium on Integrated Network Management (IM)*, Apr. 2019. URL [N/A](#)

In wireless community access networks, clients tend to reach the Internet through multiple gateway nodes instead of a single default gateway. The mapping of gateways to clients should take into account the perception of network performance from each client node. Network conditions and traffic load can fluctuate and make repeated client-gateway measurements necessary. However, frequent measurements would result in a high communication overhead as well as high processing overhead in gateways and clients. We propose a lightweight client-side gateway selection algorithm by crowd-sourcing monitoring information from neighbor clients, without requiring explicit topology information or a detailed view of the network, while providing an accurate selection as compared to an ideal omniscient approach. Our collaborative gateway selection algorithm achieves good end-to-end performance, such as low latency perceived at client nodes, and fair distribution of the measurements over the gateway nodes. The number of performance measurements triggered by clients is reduced drastically, from n down to 2 measurements per node in each period. An experimental evaluation of our approach shows more than 80% precise estimation of the gateway performance in the majority of the considered cases. We propose two variants of the gateway selection algorithm, collaborative-best, and collaborative-fair, which yield near-optimal gateway selection while utilizing partial information.

- 27) Merkouris Karaliopoulos and Iordanis Koutsopoulos. “Mobile App User Choice Engineering Using Behavioral Science Models”. In *Proc. 19th IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), 2018*, pages 1–5, June 2018

When interacting with mobile apps, users need to take decisions and make certain choices out of a set of alternative ones offered by the app. We introduce optimization problems through which we engineer the choices presented to users so that they are nudged towards decisions that lead to better outcomes for them and for the app platform. User decision-making rules are modeled by using principles from behavioral science and machine learning. Such instances arise in (i) mobile crowdsensing campaigns, where tasks are assigned to users through the app, and the goal is to optimize the quality of fulfilled tasks; (ii) smart-energy apps, where energy-saving recommendations are issued through the app, and the goal is to optimize energy savings; (iii) mobile advertising, where ads or offers are projected to the user, and the aim is to optimize revenue through user response to ads. Each user is modeled as a vector of feature values for a set of features. In an important class of decision-making models in behavioral science, the lexicographic fast-and-frugal-tree (FFT) heuristics, user decision emerges through a ranking of features that in turn gives rise to a decision tree. Having the incentive as a controllable feature that guides the user decision process, we study and characterize the complexity of the problem of allocating choices and incentives to users out of a limited budget. Numerical results indicate important performance gains when the incentive allocation policy adapts to user lexicographic choices.

- 28) Iordanis Koutsopoulos. “Incentive allocation to sequential decision-making sensors in Mobile Crowdsensing”. In *IEEE International Conference on Pervasive Intelligence and Computing (PICom)*, pages 1–5, Aug. 2018. doi: 10.1109/DASC/PiCom/DataCom/CyberSciTec.2018.00-18. URL <http://cyber->

science.org/2018/picom/

In this work in progress, we consider incentive allocation to a set of measurement sensors in the context of mobile crowdsensing. The novelty stems from considering a new model perspective for each sensor, that of a rational sequential decision-maker. At each time slot, each sensor observes the time-varying cost it undergoes for submitting measurements and the advertised reward for submitting measurements to the platform. Its decision policy at each time slot is whether to become active and submit measurements or stay inactive. The sensor decision problem is shown to be described as an optimal stopping one, and the sensor policy that maximizes its expected net benefit over a time horizon is shown to be of threshold nature at each time slot, where the threshold is non-increasing with the elapsed time. With the derived optimal policies for sensors, we next seek to determine the optimal price per time slot paid by the platform to each sensor so as to maximize the expected total quality of collected measurements, subject to a budget constraint. Finally, we introduce the problem of centralized sensor activation in a dynamically varying system so as to maximize the longterm average utility stemming from the quality of collected data. The characterization of distributed sensor equilibrium policies and the assessment of their impact on the global performance metric compared to the optimal centralized policy, are outlined as important directions that warrant further investigation.

- 29)** Iordanis Koutsopoulos. “The impact of Social-network diffusion on wireless edge resource allocation”. In *International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM) 2018*, pages 1–3, June 2018. doi: 10.1109/WoWMoM.2018.8449791

Content providers (CPs) increasingly deploy network infrastructures that oftentimes reach up to the wireless network edge, i.e. base stations or small cells. Hence, they are interested in optimizing resource allocation and relevant performance metrics for that infrastructure. On the other hand, mobile apps featuring streaming content (e.g. video, music) come with social-networking and content-sharing capabilities among users. These need to be taken into account in resource allocation since they decisively shape content demand. In this work, we introduce mathematical optimization problems about resource allocation at the wireless network edge, which obtain interesting twists when social-network diffusion is considered. Specifically, we consider, (i) the problem of content caching and user targeting through the recommender system of the app, with the goal to maximize the social diffusion effect of cached content, and (ii) the problem of user targeting through the mobile app recommender system, so that the available wireless bandwidth is utilized as efficiently as possible.

- 30)** Luca Baledesi, Leonardo Maccari, and Renato Lo Cigno. “On the Properties of Infective Flooding in Low-Duty-Cycle Networks”. In *15th IFIP/IEEE Annual Conf. on Wireless On-demand Network Systems and Services (WONS)*, Jan. 2019. URL <http://2019.wons-conference.org/>

Broadcasting information in a network is an important function in networking applications. In some networks, as wireless sensor networks or some ad-hoc networks it is so essential as to dominate the performance of the entire system. Exploiting some recent results based on the computation of the eigenvector centrality of nodes in the network graph and classical dynamic diffusion models on graphs, this paper derives a novel theoretical framework for efficient information broadcasting in mesh networks with low duty-cycling without the need to build a distribution tree. The model provides lower and upper stochastic bounds with high probability. We show that the lower bound is very close to the theoretical optimum and that a preliminary implementation provides results that are very close to the lower bound on classical graph models.

Conference Presentations

- 31)** Renato Lo Cigno. Wireless 2035: New Technologies or New Architectures? “IEEE European Conference on Networks and Communications (EuCNC) – Invited Speech”, June 18–21 2018

Wireless technologies in the past 40 year have evolved and changed as fast as any other ICT sector,

maybe more. Links' speed has grown 6 orders of magnitude or more; spectrum efficiency has increased too, and all transmission-related technologies followed a similar trend. The network architecture instead as changed only marginally (compared transmission technologies!), and we are stuck with WiFi-like, one-hop access and GSM-like cellular networks, with 5G promising the final solution (just like UMTS before ...), but indeed introducing marginal modifications presented as revolutions because they are based on SDN/NFV paradigm. What shall we research and invest on in the next 15 years? How can we expect transmission technologies to change? Can we imagine a different architecture empowering all people to have proper an appropriate access to mobile technologies and, at the same time wireless networks supporting advanced and sophisticated Cyber-Physical Systems that require by nature reliable, low-latency and also large capacity mobile communications, like autonomous and cooperative driving? This short talk tries to focus what is needed and how we can achieve it, underlying what is instead useless overhead.

- 32) Ileana Apostol, Panayotis Antoniadis, and Thomas Raoseta. "The right to the hybrid city: central space as a commons", 2018. URL <http://www.transdisciplinarity.ch/td-net/Veranstaltungen/ITD-CH-2018/Posters.html>. Poster paper presented at the Swiss Inter- Transdisciplinarity Day 2018 with theme "Inter- and Transdisciplinarity in a Digital World"

Fifty years after Henri Lefebvre published on 'the right to the city', we propose to discuss the concept under the current digital and physical spatial condition. Today urban spaces shall be conceived as hybrid, physical and digital, due to the advance of ICTs and their impact on almost every aspect of social life; a key question arises, how the different rights to the hybrid urban space can be claimed by citizens. NetHood, a transdisciplinary association undertaking research and learning within the hybrid spatial conditions, focuses on the right to centrality and to difference, for which the city of Zurich brings particular challenges and opportunities. For example, because of high value real estate and due to a long experience with democratic urban practices. In context a promising project was initiated recently: the co-creation of a neighbourhood space in a key location of the city center, by the name L200, conceived as a hybrid urban node run collectively; as a commons managed by the L200 association of neighbourhood small shops, initiatives and non-profit organizations; at the crossings of manifold urban networks such as those of paths and spaces for public life, of communication and information, of trade, exchange and networking, etc. The idea is to use digital technology both as an enabler of such a complex and demanding collaborative project and as a proof of concept on how our rights to the digital space can be exercised in creative and democratic ways toward better coordination, organization, information sharing, deliberation as well as social learning in the long term. In this sense, L200 is developed as an urban living lab for hybrid tools that can help small neighbourhood shops to create economies of scale in a distributed and decentralized way, or allow a diverse group of organizations and individuals to share the space and its street windows efficiently over time. It will also become a pilot project for DIY networking tools, like the MAZI toolkit, which can facilitate the creation of digital spaces that are collectively owned and are literally attached to the physical ones, in our case the L200 space, a feature that allows for many playful and creative ways to build collective identity and memory in a participatory way. We document in this work the transdisciplinary process of producing hybrid space through various actions including petitions and claims for favourable action, applied projects in the neighbourhood, and recent shifts toward formulating guidelines based on the experience built at L200. The project describes a potential blueprint for creating hybrid infrastructure, and in the near future urban policies may be devised to bring such grassroots initiatives to reality at the city scale.

The poster is available at http://nethood.org/publications/nethood.L200_netCommons.MAZI.ITD.Poster_final.pdf

Others / Miscellanea

- 33) Leandro Navarro. “Network infrastructures: The commons model for local participation, governance and sustainability”. Association for Progressive Communications, Feb. 2018. URL <https://www.apc.org/en/pubs/network-infrastructures-commons-model-local-participation-governance-and-sustainability>

This is an issue paper published by the Association for Progressive Communications in February to clarify the concept of the commons model as it applies to network infrastructures. Network infrastructures provide connectivity, a critical resource for our digital lives, and are therefore key for social inclusion and public participation. There are many technical, economic and operational ways to provide internet connectivity. In this paper we describe a model to develop network infrastructure as common property, governed under the principles of common-pool resources.

The model is based on the principles of cooperation instead of competition – because universal connectivity can only be achieved if everyone has the right to create their own connectivity. There are many examples of how communities have succeeded in organising to achieve this. The result is local community network infrastructures that are open, sustainable and adapted to local conditions, which can produce abundant connectivity and support local socioeconomic development, everywhere and for everyone.

- 34) Merkouris Karaliopoulos, Iordanis Koutsopoulos, Leonardo Maccari, Renato Lo Cigno, and Leandro Navarro. “Wireless Community networks and 5G: the 7-Billion-user challenge”. IEEE European Conference on Networks and Communications (EuCNC) – Tutorial, June 18–21 2018

As the 5G vision gets unfolded and the requirements of its ambitious key performance indicators are better understood, it also becomes clearer that there will not be a single realization path for this vision. Large parts of the worldwide population, including those living in rural areas of developed countries and those in developing regions will probably not be served by ultra- dense networks and super-fast radio links. This tutorial aims to delineate the role that community networks emerging out of citizens’ grassroots activities could play in the realization of the 5G vision.

Works In Press

- 35) Melanie Dulong de Rosnay. “Regard sur le droit et les communs : un droit pair-à-pair”. In Danièle Bourcier, Jacques Chevallier, Gilles Hériard Dubreuil, Sylvain Lavelle, and Emmanuel Picavet, editors, *Dynamiques du Commun. État, Marché et Société*. Publications de la Sorbonne, 2020. in press

Dans ce chapitre, je postule que le modèle informatique du pair-à-pair, un type d’architecture dans lequel les actions sont distribuées, constitue une source d’inspiration pour le droit des communs, qui adopte également la décentralisation en tant que principe de design. Ces deux mouvements constituent des alternatives au marché et à l’Etat d’inspiration libérale, et contribuent à renouveler les fondements du système juridique occidental. Ce dernier a en effet été conçu pour s’appliquer à des personnes, physiques ou morales, en tant qu’entités individuelles, alors que les communs et les architectures distribuées conceptualisent l’agentivité et la responsabilité de collectifs humains ou agents artificiels aux membres non identifiés et fluctuants. Du faisceau de droits d’Elinor Ostrom aux licences Creative Commons, le droit des communs réussit à fragmenter le droit de propriété en un ensemble d’attributs, entre un ensemble de personnes non définies. Afin de préserver les communs et développer un droit adapté à ces formes, il est nécessaire de transformer la culture politique, économique, et juridique issue du paradigme libéral, afin de reconnaître des droits et des responsabilités à des personnes collectives. Le mouvement des communs peut s’inspirer du droit de l’environnement et du droit appliqué à l’intelligence artificielle qui ont tout deux réussi à dépasser la notion de personne individuelle. Ce chapitre reprend des portions d’un article en anglais par l’auteure : Mélanie Dulong de Rosnay, 2016. “Peer to party: Occupy the law”, *First Monday*, Volume 21, Number 12. ¹

¹<http://journals.uic.edu/ojs/index.php/fm/article/view/7117/5658>

- 36) Félix Tréguer and Dominique Trudel. “From Internet Access Provision to Political Advocacy: The History of the French Data Network”. *Histoire et informatique*. in press

Based on interviews conducted with founding members and leaders of the French Data Network (FDN) (Benjamin Bayart, Laurent Chemla, Jean-Philippe Nicaise, and Christian Paulus), this paper chronicles the history of FDN, from the early concern with Internet access and education to a broad conception of Internet rights, as exemplified by the creation of a mirror site of Wikileaks (2011) or by providing VPN access to political dissidents during the Arab Spring (2012). In doing so, this paper simultaneously contributes to the development of a French national history of computer networks, to the ongoing diversification of the historiography of digital rights activism (that has long been dominated by Anglo-Saxon perspectives, see Jordan & Taylor, 2004; Levy, 2001; Postigo, 2012), as well as to future comparative works. In the French context, state and public actors were central in the development of early networks such as Cyclades, RENATER, and Minitel. While these actors already received scholarly attention (see Schafer, 2012; Schafer & Tuy, 2013), very little consideration has been given to the political action of civil society actors and in their role in the co-shaping of computer networks, their politics, and their users

- 37) Félix Tréguer, Dominique Trudel, and Melanie Dulong de Rosnay. “Learning from the History of Alternative Networks”. *Journal of Alternative and Community Networks*. in press

This article explores the legal, economic, and governance challenges to the sustainability of contemporary alternative Community Networks by drawing lessons and parallels from eight historical precedents. Building on academic literature related to alternative and community media, the article lays out an encompassing definition of alternative networks (or “alternets”), and develops a multidisciplinary approach to comparative history. After briefly presenting eight case studies (three independent telephone networks of the late 19th century, three Free Radios of the 1950s, 1960s, and 1970s, two Community Networks providing Internet access in the 1990s), the paper then draws from these case studies to identify key recurring challenges that can inform present-day initiatives, namely: the articulation of local community with global connectivity, the development of political advocacy capacities aimed at influencing the law and technology, the creation of appropriate resources aimed at resisting co-optation, and the need to build collective cohesion and mechanisms to handle disagreements.

Works Invited for Publication

- 38) Panayotis Antoniadis, Dimitris Dimitar, and Melanie Dulong de Rosnay. “CNs and the Commons”, . Invited for inclusion in the edited book “Our Commons: Political Commons-Ideas For A New Europe” by Thomas De Groot

An online conversation between Panayotis Antoniadis (NetHood Zurich), Melanie Dulong de Rosnay (CNRS) and Dimitar Parvanov Dimitrov (Wikimedia), moderated by Thomas de Groot (Commons Network) on Digital Commons.

Works Under Review

- 39) Leonardo Maccari, Gabriele Gemmi, Renato Lo Cigno, Merkouris Karaliopoulos, and Leandro Navarro. “Assistive Growth: Towards Scalable Community Networks Topologies”. *Submitted to Ad Hoc Networks*

The growth of Community Networks is mostly unplanned, depending on the one hand on the willingness of people to participate, and on the other hand on the feasibility of the wireless links connecting the home of the potential participant to the infrastructure. Exploiting open source resources, such as Open Street Map and LIDAR-based data on building altitudes, this paper presents a methodology to stochastically forecast the growth of a Community Network given the area where the community starts building it. This base methodology, implemented into an automated tool, takes into account the technical and economic

feasibility of adding nodes to the network, as well as guaranteed limits on the per-node performance of the network in saturation. The methodology is coupled with simple economic incentive schemes to explore if proper incentives mechanisms can influence (and improve) the growth of the network in four different scenarios: Urban, Suburban, Intermediate, and Rural areas. Results in all four scenarios highlight the characteristics of the topology that spontaneously emerge from the natural growth of the network, and the advantages that properly crafted incentives bring to this process, improving the size, the performance, and the resilience of the network emerging from this spontaneous process.

This paper is based on several results produced in netCommons, like the network characterization done in WP1 and the incentives and graph analysis produced in WP2.

- 40) Mennan Selimi, Adisorn Lertsinsruttavee, Arjuna Sathiaselan, Llorenç Cerdà-Alabern, and Leandro Navarro. “PiCasso: Enabling Information-Centric Multi-tenancy at the Network’s Edge”, Jan. 2019. URL <https://www.journals.elsevier.com/computer-networks>

In the context of edge computing, in this paper, we propose to leverage lightweight virtualisation, Information-Centric Networking (ICN), and service deployment algorithms to overcome these limitations. The proposal is implemented by the PiCasso system, that utilises in-network caching and name based routing of ICN to optimise, combined with our HANET (HARDware and NETwork Resources) service deployment heuristic, to optimise the forwarding path of service delivery. We analyse the data collected from Guifi.net, the biggest CMN worldwide, to develop a smart heuristic for the service deployment. Through a real deployment in Guifi.net, we show that HANET improves the response time up to 53% and 29% for stateless and stateful services respectively. PiCasso achieves 43% traffic reduction on service delivery in our real deployment, compared to the traditional host-centric communication. The overall effect of our ICN platform is that most content and service delivery requests can be satisfied very close to the client device, many times just one hop away, decoupling QoS from intra-network traffic and origin server load.

- 41) Aniruddh Rao Kabbinala, Emmanouil Dimogerontakis, Mennan Selimi, Anwaar Ali, Leandro Navarro, and Arjuna Sathiaselan. “Blockchain for Economically Sustainable Wireless Mesh Networks”. *Under review in Concurrency and Computation: Practice and Experience*, 2018. URL <https://onlinelibrary.wiley.com/journal/15320634>

Decentralization, in the form mesh networking and blockchain, two promising technologies, is coming to the telecommunications industry. Mesh networking allows wider low cost Internet access while blockchain enables complete transparency and accountability for investments and revenue or other forms of economic compensations from sharing of network traffic, content and services. Crowdsourcing network coverage combined with crowdfunding costs can create sustainable yet decentralized Internet access infrastructures, where every participant can invest in resources, and pay and be paid for usage. While mesh networks and mesh routing protocols enable self-organized networks that expand organically, cryptocurrencies and smart contracts enable the economic coordination among network providers and consumers. We explore and evaluate two existing blockchain software stacks, Hyperledger Fabric (HLF) and Ethereum geth with Proof of Authority (PoA), deployed in a real city-wide production mesh network, and in a centralized laboratory network. We quantify the performance, bottlenecks and identify the current limitations and opportunities for improvement to serve the needs of wireless mesh networks.

- 42) Merkouris Karaliopoulos and Iordanis Koutsopoulos. Collective subscriptions: towards sustainable funding of community network infrastructures, 2019. URL <http://www.wi-opt.org/>

Community networks (CNs) are initiatives led by communities of people, who collectively contribute time, effort and resources to their purpose. Over the last two decades, they have proven their capacity to provide affordable connectivity in areas outside the coverage of commercial operators, but also strengthen local community bonds. Nowadays, the realization of ambitious broadband connectivity agendas, the desire to bring online another billion of people in developing countries, but also concerns about concentration in the telecom market, motivate a more integral role of CNs in the global networking infrastructure.

Prerequisites for this role are funding models that ensure their sustainable operation. In our paper, we study collective subscriptions, a novel subscription model that CNs experiment with for self-funding their activities. With collective subscriptions, a fixed subscription fee is charged per CN node and shared between all individuals or households subscribing to those nodes. We analyze this subscription scheme in two scenarios. First, we formulate the problem of subscription revenue maximization when the assignment of users to subscriptions is centrally coordinated, e.g., by the CN operator (CNO). We show that the problem has a non-trivial objective function and we identify special instances admitting more trivial solutions. Then, we consider the game that emerges as the CN operator announces the node subscription fee and CN users respond strategically by joining (or not) a collective subscription. We prove the existence of equilibrium states in pure strategies, we propose ways to compute them, and analyze their efficiency. Our evaluation of the scheme against both real and synthetic data shows that it achieves both higher subscription revenue and increased community inclusion when compared to the default fixed price individual subscription scheme. On a practical note, our analysis helps the CN operators understand and optimally use this funding tool for sustainably operating the CN and engaging the community into the CN activities.

- 43) Merkouris Karaliopoulos and Iordanis Koutsopoulos. “Infrastructure and service provider games in crowdsourced networks”, 2019. URL <https://www.sigmobile.org/mobihoc/2019/>

Ambitious plans for ubiquitous broadband connectivity call for huge investments in network infrastructures. Sharing the deployment costs of these infrastructures increasingly appears to be inevitable, but its exact form and the involvement of different actors may vary across the world. Our paper analyzes the role that crowdsourced network infrastructures such as Community Networks (CNs) could undertake in realizing these ambitious visions and coping with their financing needs. Key to this role are open business models fostering synergies of CNs with commercial Internet Service Providers (SPs). In such synergies, the SPs make their pricing policies commensurate with the investment of the community, in order to fuel the CN growth and generate a market for their services. At the same time, they compete with each other for customer shares in this market. We formulate the leader-follower game that emerges out of the strategic interactions of the actors and compute numerically its equilibrium states under a broad range of scenarios, built out of real data. In all cases, our results point to mutual profits for all actors, turning such synergies to win-win strategies.

- 44) Leandro Navarro, Ignacio Castro, Arjuna Sathiaselan, Emmanouil Dimogerontakis, Mennan Selimi, Felix Freitag, and Roger Baig. “Blockchain models for universal connectivity”. *Under review in Telecommunications Policy Journal*, -(-), 2018. ISSN 1084-8045. URL <https://www.journals.elsevier.com/journal-of-network-and-computer-applications>

Universal connectivity is still a dream for half of the global population, despite being used to provide crucial services and enable participation in societies around the world. Decentralised infrastructures create an opportunity for local entrepreneurship, mainly in underserved areas, where connectivity can expand incrementally and be sustainable through service fees obtained from the demand and consumption of services that compensate the cost of the services provided by network devices that mesh with each other. While the data flow is supported by routing decisions, the economic flows can be supported by the use of blockchain transactions, combined with networking devices such as wireless mesh or fibre networks that offer Internet access to clients using Wi-Fi, TVWS or cellular access points, combined with Internet backhaul links. We discuss the characteristics of different service models, the technological opportunities of combining blockchain with mesh networks, the options for pricing and investment models, validated in our case studies, laboratory and field experiments. We find that blockchain and mesh networking technologies enable decentralised models to bootstrap and scale-up crowdsourced networking services that aim to be socially and economically sustainable.

- 45) Melanie Dulong de Rosnay, Félix Tréguer, and Panayotis Antoniadis. “Commonswashing by information technologies and online platforms, the semantic appropriation of the commons”. Submitted to the

International Association on the Study of the Commons (IASC) 2019 conference

Enclosure of the commons by private actors is an old phenomenon. With information technologies and digital commons, we noticed a tendency to coopt or claim elements of language of openness and the ethics of sharing to designate for-profit endeavours. Our paper proposes to inscribe these trends within larger policy trends, while building on examples from internet connectivity and Community Networks. We argue that such appropriations lead to new forms of “enclosure” of common resources, as private actors come to dominate the governance structures for the commons-based production of a good or the provision of a service, thereby perverting some of the key features and values of commons-based production (for instance through financialization and quantitative management approaches).

Works Under Submission

- 46)** Félix Tréguer and Melanie Dulong de Rosnay. “The Political Defence of the Commons: The Case of Community Networks”. To be submitted to a journal on communications and policy

This article analyses experiences of political advocacy which have been led by Community Networks activists in Germany, France and Spain to support the sustainability of these bottom initiatives aimed at building community-owned telecom infrastructures. By identifying advocacy methods that illustrate the diversity of action repertoires used by various Community Networks across Europe, the case studies point to the potential to democratise policy-making in the telecom sector, an area that are prone to regulatory capture by special interests. Examples of advocacy tactics used by Community Networks also offer a set of reproducible tactics that are often available to very small actors without dedicated advocacy staff nor budget. They speak to the inventiveness of these grassroots initiatives, and serve to illustrate both the potential and pitfalls of political advocacy for small-scale social movements working for the political defence of the Commons.

- 47)** Melanie Dulong de Rosnay. “Community Networks: From Top-Down Citizen Science to Bottom-Up Citizen Policy Makerspaces”. To be submitted to a Science and Technology Studies journal

The article studies the impact of the decentralization of certain aspects of citizen science projects, the production of knowledge, including science and policy. Community wireless networks (CNs) constitute local, commons-based alternatives to commercial internet service providers, formed by routers and devices in people’s houses interconnected according to specific topologies. I use them as an example to test and push the boundaries of the definition of citizen science centralized around a professional researcher, and consider decentralized peer production as a means model of production of scientific knowledge by citizens. This article is exploring CNs as a case study of both citizen science and peer production, leading to the improvement of scientific knowledge in several disciplines, including the participation to public policy, through the co-production of a techno-legal agenda evidenced by underlying scientific knowledge.

- 48)** Stefano Crabu, Melanie Dulong de Rosnay, and Paolo Magaudda. “Socio-technical governance of Community networks as co-produced commons. A comparative research”. To be submitted to a Communication Science journal

This article aims to foster analysis and debate on the co-production and governance of emerging distributed infrastructures for digital communication, generally defined as Community Network. CNs are ‘distributed’ local communication infrastructures, often based on a commons paradigm, as they are usually built, self-managed and owned by collectives of people (Smith, et al., 2017), including hackers, geeks, engineering students, political activists and lay people. In these last few years several CNs have been built in many European cities or regions to strengthen the neutral access to digital communication networks (Franquesa and Navarro, 2017) and to cope with specific needs, such as fight the digital divide. These communication infrastructures are conceived by their developers as a political alternative to the global, business-oriented governance of the Internet (Chenou 2014). Thus, CNs represent a peculiar type of commons, distinctively characterised by the need to collectively cooperate in building, maintaining

and governing material and technical infrastructures for digital communication. This type of commons is achieved thanks to the creative adaptation of technologies of communication operated by collectives of activists and concerned group of engaged citizens, which share a techno-political strategy to cope with critical issues, and political concerns about the pervasiveness of neoliberal digital sharing economy (Martin 2016). Drawing from a conceptual framework relying on the governance of the commons (among many others Ostrom, Frischmann), the article has the purpose to disclose the multimodal forms of governing CNs, by showing how the shaping and everyday organizing of digital commons resides on situated “commoning” practices (Esteve, 2014) concerning a collective competence in managing both technical, political and legal issue at stake in contrasting the hegemonic and mainstream infrastructures for digital communication. With this general aim in mind, the article presents the main results of a qualitative comparative study about two wireless community network (CN), one developed in France and the other in Italy. We provide a comparative understanding of the different governance rules, e.g. organizational principles and every day practices adopted in managing such communities, and then we demonstrate how the governance principles of CNs are the emerging outcome of the entanglement between local policy, technical and legal (or policy?) elements. In this way, we highlight that governing CNs require to enact bottom-up, within specific local settings, different knowledges (i.e. political, technical) and technologies, rather than to implement abstract or normative principles. Furthermore, by adopting a comparative approach we are able to better define different kind of governance models of CNs operating in the Europe, informing possible factors of success and risk.

- 49) Virginie Aubrée and Melanie Dulong de Rosnay. “The Aftermath of Digital Rights Ireland and Tele2 ECJ cases: a diversity of data retention national practices”. To be submitted to a Law and tech journal

In 2018, Data retention obligations – the collection and storage of metadata communication by telecom operator for future access by police authority – is at a crossroad in the legal field with the entry into force of General Data Protection Regulation, the implementation process of the Directive 2016/680 and the current negotiation of the ePrivacy Regulation. Beyond the pure legal debate, Data retention is a key point in the technological discourse of mass surveillance policy schemes, raising (serious) democratic issues about State domination in a digital era. In both a practical and ethical point of view, Community Networks – alternative local telecom operators managing their networks as commons – are all the more involved in this issue as they promote a high standard of Privacy of their users. Thus, as a survey conducted by netCommons in 2017 pointed out, 60% of the CNs respondents do not retain any data to comply with national law as these go against their core values of providing Internet access and services. Some regular telecom operators seem to follow the same path of refusal to retain, which does not appear unreasonable regarding the current legal framework. Since Digital Rights Ireland case law and all the more since Tele2, national laws implementing the previous data retention directive are very likely to be inconsistent with EU law and the Charter of Fundamental Rights. Many authors offered a throughout analysis of EU law as well as national frameworks, but also cross-analysis and even comparative material beyond EU. Joining numerous calls from legal doctrine for harmonization at a EU level, this paper aims to complete and update this overview of national frameworks – with an emphasis on France, Italy, Germany, Greece and Spain. Through this scope, this study intends to decipher different socio-legal and cultural approach of Data retention throughout Europe and how they could match or clash in the current negotiation of the ePrivacy Regulation. To fully understand the diversity of Member States’ reactions to this European framework (Par. III), a technical (Par. I) and legal (Par. II) introduction should be provided beforehand.

- 50) Ileana Apostol, Panayotis Antoniadis, and Thomas Raoseta. “The right to the hybrid city: Central space as a commons”. To be submitted at an Urban Studies journal

This paper presents three aspects of an ongoing attempt to bridge the struggles for the right to the Internet with those for the right to the city. The term ‘the right to the city’ was coined by Henri Lefebvre (1996), following his active involvement in the 1968 street unrest in France, in order to denominate a ubiquitous ‘cry’ for the democratization of urban space. Through adapt Lefebvre’s formulation to the current hybrid

spatial condition, and bring into the discourse a set of fundamental rights within this ongoing struggle, which are relevant for both physical and digital space. The narrative of this paper presents a tangible manifestation of previous theoretical approach on the ‘right to the hybrid city’ [68], noting that in both processes of spatial design and in the design of digital technology is critical to create collective awareness of the implications, benefits and threats of the hybrid condition of space. On the one hand, there is a historic take on the provision of infrastructures and services as public goods. Stories of development of network infrastructures have great potential to bring to light useful analogies, capable to provide insights on the role of regulation for keeping a power balance between the different actors. On the other hand, there is an action approach in the form of organizing a series of ‘encounters’ in various locations, between digital and urban researchers and activists, and at the same time, the ongoing process of building an association that runs a very central space in Zurich with exceptional visibility. This space, called L200 from its address Langstrasse 200, is shaped as a hybrid urban node and a living lab for co-creating tools that empower citizens to claim their rights to the hybrid city.

- 51)** Panayotis Antoniadis, Ileana Apostol, and Alexandros Papageorgiou. Reflection-in-action in participatory design, . To be submitted at C&T Conference, 3-7 June 2019, Vienna

This is an account of NetHood’s recent exploration of a methodology for participatory practices, which is capable to include many voices and to mediate conflicting interests, and is also flexible to accommodate different working habits and various disciplinary cultures. The methodology is meant to facilitate the engagement of people in design processes, in particular in the design of community networks. Thus this paper elaborates on the process to devise some of its main characteristics, including researcher’s reflections while working on this task, which are critical to note in the spirit of Donald Schön’s reflection-in-action. Although the methodology is still work in progress, we present here some methodological guidelines that are inspired by musical composition processes, building on a concrete case study of the Sarantaporo community network in Greece.

8. Conclusions

The dissemination activity of netCommons in the third year of the project has been huge, reaching wide and large in (almost) all possible directions and touching all levels of the inner and outer loop as designed in the DoA. The impact of the work is already extremely relevant, and we think it will still increase in the months and years to come.

It is difficult, among all the activities presented, to select one that we deem more important than the others, or that we can claim is the one with the highest impact. Surely the interventions at the EU Parliament level and with UNESCO must be cited for the global relevance they have: Community Networks are now recognized as important infrastructures to spread the Internet global accessibility, and their principles are included and protected by the European Electronic Communications Code (EECC). Still at the level of global visibility and outer loop, the presence in ISOC and IETF, as well as the publications with APC, are extremely visible and bring netCommons contributions to the widest possible dissemination level. We also have very high expectations from the book that will be published by APC based on D4.5 [70], the outcome of the booksprint writing residence organized at the birthplace of guifi.net, in Seminari de Vic, Catalonia, where the first guifi.net node was installed: a location with high symbolic value for the entire Community Networks movement.

At the other extreme, meaning the inner loop, the interaction with CNs in Spain, France, Italy, Greece and to some extent also Germany, UK and many spots around the globe, especially in South America and Africa, has been very fruitful giving these CNs practical support and the feeling that they are not pariah of the Internet, but part of a vast movement whose goal is to reduce the digital divide and to influence the future development of the Internet toward a more democratic and sustainable structure.

Finally, it is worth mentioning that netCommons, albeit investing an enormous effort in the interaction with communities and in advocacy and public dissemination activity, has produced, in the third year alone, more than 50 scientific papers, tutorial, presentations that appeared (or will appear in the near future) in leading journals and conferences covering all the disciplines involved in netCommons, from law to engineering, from sociology to computer science and political economy. Regarding this specific aspect, and also including results from years one and two, more will be reported in Deliverable 7.5, the “Report on the publications and data download, use, and citation.”

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A. Letters of Appreciation

We report here the letters and statement of appreciation we received from ninux members after some of the “non institutional” activities we carried out with them. These are mostly the interactions that served to bootstrap, or to foster, or simply to revive activities and initiatives that CNs were nurturing since some time, but did not find the resources to start.

A.1. Marco Musumeci on the Turnantenna Project

I'm Marco Musumeci and I'm a mechanical engineering student of Florence University. Around September 2017 a friend of mine introduced me to the Ninux community. During the first meeting I attended, I was struck by the passion of this people to the technology and by their commitment to the community. I was discovering a Wireless Community Network (WCN) district: Ninux. Since that first meeting I started keeping in touch with that community.

One day Salvatore Moretti, a Ninux fellow, talked to me about the Turnantenna, a project that was born in the community. Then I decided that I would have liked to contribute with my mechanical skills; so I started working on that. Turnantenna is a motor device that is able to point a ninux device by remote, without need of human intervention. It has a mechanical part (the engines and the mechanical rods) and a software part (the driver and the interface).

Leonardo Maccari, introduced me to the *Participatory Design Methodology* from the netCommons project. It seemed to be an interesting approach. In particular I liked the idea behind the method: to merge together social interaction with innovative projects development; so we decided to use it to schedule our work for the Turnantenna. Then we started programming new activities in different branches, for instance *how to improve other Ninux islands engagement to the project, how to collect and exploit technical skills, and how to make the hard work visible to the outer people*. All concepts derived following the methodology.

Working as a community, the project moved on and the Turnantenna gradually came to life. As scheduled, after the first minimum viable prototype production we presented the idea during the national Ninux meeting in November 2017 in order to collect improvement and suggestions for further developments. We gathered a lot of informations so I started working on a next-generation prototype.

This was the right time to present it to the people from other communities. We scheduled a series of talks in different events: the Turnantenna was presented, together with most important open source projects in Italy, during the Merge-it conference in Turin (March 2018); it was shown to a world wide WCN audience during the Battle of the mesh in Berlin (June 2018). Following the methodology we also tried to gather sources of funding, and as a consequence, Turnantenna was selected for being a Google Summer of Code project during the last summer, and the mechanical study I did became my bachelor degree thesis.

In fall 2018 I proposed the Turnantenna for the Maker Fair in Rome, the largest exhibition of innovators, makers and technology passionates in Italy, and the European version of the US-based Maker Fair. The turnantenna was selected as an innovative project, and I was invited to the Maker Faire in Rome, where I also won a *blue ribbon* award as “maker of merit” (October 2018). Several weeks later, I discovered that our project was also cited in the EngineeringNet magazine.

During these events the Turnantenna was a success, and I’m in touch with many people that want to know how it will grow. That’s why I decided to keep working on the project. Right in these weeks, I’m trying to team-up with other people to upgrade my project from a personal project to a start-up. We have created a good base team and now we are among the seven finalists of an open selection that will provide initial funding to the best three.

In this phase, Leonardo has also directed me to more results of the netCommons project, in particular the deliverables concerning the legal aspects of community networks. This material helps me to strengthen my start-up project, which deals with how to access Internet access using community networks, reducing the costs of maintaining a network using Turnantenna. The results contain a lot of useful information to make my proposal legally strong and also many links to European initiatives that justify my proposal also from a commercial point of view.

In conclusion, in my experience as a member of Ninux Florence, the netCommons project has been instrumental in guiding my choices, and therefore my contribution to the Ninux network.

24/12/2018



A.2. ninux Calabria community on the interaction with netCommons



My name is Stefano De Carlo and I am a member of Ninux Cosenza, as well as secretary of Hacklab Cosenza, an association deeply rooted in the territory that for many years promotes the use of free technologies.

I came into contact with the netCommons project thanks to Leonardo Maccari, who actively participated in our community and I was deeply impressed by the results of the project. Firstly, we appreciated the results of the analyzes produced on the Ninux network which showed how the growth of the Rome network was driven by an unsustainable model. We decided that in order to avoid a similar development of our network in Cosenza, we would have had to change both the technological and the organizational approach. In this second aspect, the netCommons project has provided us with solid foundations concerning the governance and legal aspects, and thanks to the dialogue with the netCommons experts we decided to change the "picopeering agreement", which is the basic set of rules that keep our community together. Now our network is in a growth phase and we expect that with the change in approach that we have had, this growth is sustainable. The results produced by netCommons have influenced our path very positively.

Answers to the questionnaire:

- 1) Were you, or someone in your community, involved in the development or use of open source software realized in the netCommons project? Please briefly describe your experience.

In the last period we have also adopted one of the software produced by netCommons, the Open Source PeerStreamer-ng program. We were positively impressed by the first tests we carried out with its public instance and decided to install PeerStreamer-ng in three instances in our network.

- 2) What is the added value that such software brought to your community?

PeerStreamer-ng solves an evident problem that afflicts the other streaming platforms, which is the centralization due to the use of a single server, and the relative overload due to the use of multiple video streams.

- 3) Are you planning to keep using the netCommons software after the end of the project?

Our experience with PeerStreamer-ng has been positive, it is used for videoconferencing among the users of the network and we have appreciated its performance and simplicity.



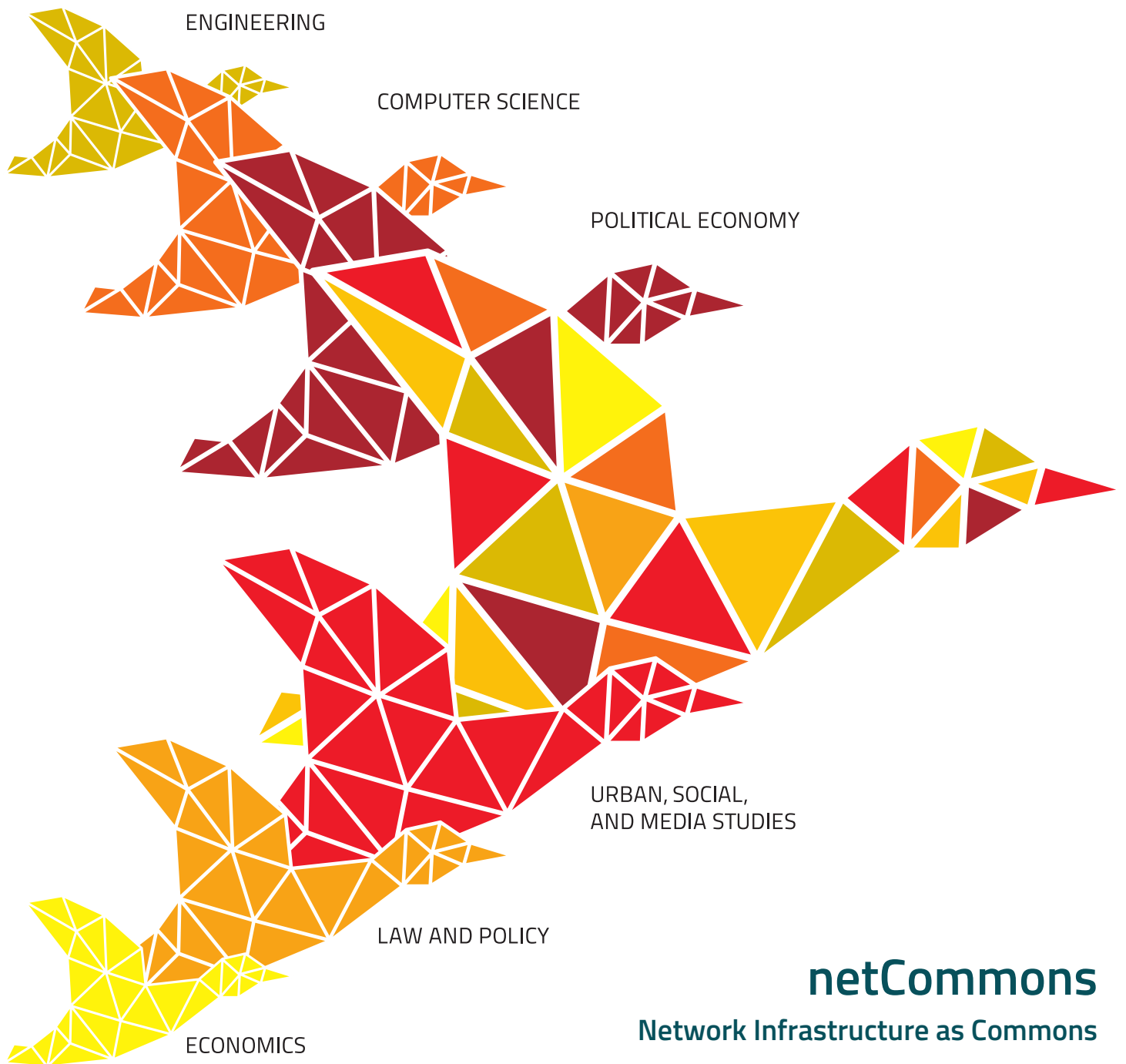
We plan to continue using it and to increase the number of nodes in our network in the next year.

- 4) Where you involved in the use of the participatory methodology developed in the netCommons project? If yes, was it useful to the co-creation and use of applications in your community network? if not briefly describe why.

No, we were not involved in development activities recently, so we did not use the mentioned methodology.

Overall, I want to show my full support for the results obtained by netCommons. The project has been extremely useful for us, it has helped us to change our path, and I think that its successes (both from a technological point of view, but also form a legal one) are useful for the whole movement of community networks.

Cosenza, 27/12/2018



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