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Multidisciplinary research on collective awareness platforms (Internet Science)

netCommons: network infrastructure as commons



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Project Summary

Communications and information distribution are key components of a modern society, and their control is the key to societal development. The advent of the Internet has been often invoked as a remedy for their democratization and the diffusion of fundamental human rights. The light of truth shows today a different picture: the digital divide is widening the gap between those who can access and take advantage of the new systems, and those who remain “disconnected” (with respect to physical access to technology, economic advantages, cultural uses and skills, and democratic impacts). A problem is emerging about the Internet’s sustainability, both socio-economic (large Internet corporations eluding taxes and aggressively commercializing most services) and political-democratic (the global Internet surveillance and the lack of transparency). This, coupled with the complexity of the Internet’s organisation and the diffused lack of awareness about its actual implementation makes the users easy targets of manipulation, and unaware of the possibility to have a bottom-up, democratic, communal organisation of “the Internet”.

netCommons aspires to study, support and further promote an emerging trend, *community-based networking and communication services* that can offer a complement, or even a sustainable alternative, to the global Internet’s current dominant model. Community networks not only provide citizens with access to a neutral, bottom-up network infrastructure, which naturally increases the transparency of data flow, but they also represent an archetype of networked collective cooperation and action, mixing common or communal ownership and management of an infrastructure with a balanced set of services supported by the local stakeholders. Community networks, however, are complex systems that require multiple skills to thrive: technical, legal, socio-economic, and political. They face many challenges and they also need abstractions, models and practical tools to grow and produce a higher beneficial impact on our society.

netCommons follows a dual approach to achieve the maximum possible impact. On the one hand, the project works at the *local level*, mingling with the communities that implement and manage community networks to gather relevant information, elaborate it, and then return to communities advanced conceptual and technical tools helping them to grow and thrive. On the other hand, starting from such hands-on experience and work, **netCommons** contributes to Internet Science by abstracting concepts and opening the perspective to the world of *global communications*. It studies solutions and interpretations of how to build global awareness about the importance of sustainability, participation, co-operation, on-line information, freedom, democracy, peer production, the public and common good, and the role of community networks to help such process. Consequently **netCommons** will foster the implementation of the proper actions (local to communities and global to the regulatory level) that can guarantee that information creation and diffusion remains free, neutral, fair, and respectful of individual rights.

Objectives

Community Networks (CNs) are bottom-up initiatives to realize communication networks with a participatory and grassroots organization that are blooming in several European Countries. Community Networks use peer-to-peer technologies to achieve an ambitious societal goal: the realization of a fairer ICT ecosystem.

netCommons will focus its research on CNs and then generalize its results to the paradigm of CAPS and Internet Science, thus targeting two objectives.

The first objective of netCommons is to produce high-impact interdisciplinary research on, and together with, Community Networks, in order to resolve some of the problems that CNs face, and foster their growth and their long-term sustainability. We identify three open issues that need to be addressed to help the growth of CNs, their **governance models**, their **sustainability** and their **technical decentralization**

The second objective of netCommons is to extend the experience and the results obtained in the context of CNs to a broader research area, **giving a strong contribution to the development of key themes for Internet Science and CAPS**. Thus, we will investigate what **social, legal, political, and economic premises are needed to build a more sustainable ICT world**, and how grassroots initiatives such as Community Networks can **play a role to influence such process**.

Approach

It is not possible to “*observe*” the phenomenon of CNs without participating, and this is why netCommons puts so much effort in the interaction with CNs. **To understand their value it is necessary to work within the communities and study their dynamics; putting our research expertise at work to cooperate with them can be the key to contribute to solve some of their challenges**. Once this process of fusion between research and practice is bootstrapped, it can generate a virtuous loop that will produce concrete positive effects for the CNs and a huge and variegated input set for a wider analysis. The ambition of netCommons is to merge the socio-technological analysis on CNs with an analysis of the current state of ICT that uses the instrument of Political Economy to outline the major criticalities and propose alternative visions

netCommons will achieve these goals with 5 different work-packages, working on the local and on the global domain.

WP1, WP2 and WP3 work in a local domain, address specific issues critical to the life of CNs and thus need a constant feedback and contamination from the CNs themselves. For these reason we plan to have regular meetings with CNs, aligned with the various international meetings that European CNs autonomously organize, and with the national meeting several CNs organize locally. netCommons will get involved in the support and organization of a number of such meetings, participate and thus maximise the information interchange with several communities. During those events netCommons will collect the needs, the requirements and the proposals from people running CNs, and researchers will expose the approach of netCommons, and gather feedback on them. We will later work and elaborate solutions based on this input and will produce both scientific results (publications, guidelines, white papers, etc.) and the foundations (application schemes, recommendations, software, etc.) for the application of results to the CNs. We will then deliver the results of our work to the CNs, involve them in their review and testing, help CNs in the deployment.

At a global level, WP4 and WP5 will frame the problems researched within CNs in a global perspective and project the elaborated solutions on a wider scale. In particular, we will consider

key factors that characterize the life of CNs and can be extended to a global domain, such as the governance models that CNs experienced and their definitions of *sustainability*.

The input from the local domain will be enriched by: the analysis of the regulatory domain; a focussed survey to understand how the political values and social instances that are at the base of CNs can be used in a broader scope; and the Interdisciplinary research from related themes to frame CNs in the area of *Alternative Internets*, but also in the context of the *right to the city*.

The output of this research will be directed to a broader audience: academic, regulatory bodies, territorial administration, it will produce scientific publications as well as procedures, guidelines, check-lists, etc. for both policy makers, governing bodies, and people involved in CNs.

Partners and Work-Packages

netCommons is participated by 4 universities, one research center and one ONG (UniTn, UPC, AUEB-RC, UOW, CNRS, Nethood, respectively from Italy, Spain, Greece, UK, France and Switzerland). The coordinator is UniTn via the ANS group led by Renato Lo Cigno.

The consortium puts together some of the most active and strong research groups and institutions in the area of “networks” and collaborative platforms: technical, social, legal. Its human resources form a pool of motivated researchers with a common goal: defining a new interdisciplinary approach able to understand and support the evolution of Cooperative Networking and Service Creation toward the final goal of making the Internet not only a commercial platform, but also a global platform supporting awareness and action on the global challenges faced by of knowledge creation and diffusion, and information generation and management.

netCommons is organized in five principal work-packages:

1. WP1, led by UPC, analyzes and clarifies the internal organizational model of different CNs. Organizational models influence both the socio-economic and management aspects of the network and the way relationships with external entities are implemented. The goal of this WP is to create a portfolio of organizational models that CNs can adopt to improve their internal governance, for a better and more democratic exploitation of their resources and to have a stronger impact on external society.
2. WP2, led by AUEB-RC, investigates the sustainability of CNs, it will identify its political and ethical values, the incentives to make CNs grow and the tools that CNs can use to monitor that the ethical values are kept intact with the growth of the network. It will clarify the political values of CNs, and the related aspects of sustainability for CNs.
3. WP3, led by UniTn, is dedicated to open-source applications for CNs. This WP will build on existing open source projects for P2P cloud and streaming applications and use them as building blocks to develop applications that can exploit the potential of CNs for local communications in the fields of distributed cloud systems and P2P video streaming. We will also develop a participatory methodology to improve the self-production of applications by CN members, with special attention to CAPS, and applications for crowd* use of the technical and social resources of CNs.
4. WP4, led by CNRS will analyse CNs in relation to their surrounding socio-legal environment and produce general policy guidelines for the internal management of the CNs and for policy makers to preserve CNs as a commons. It will raise awareness of the CNs managers and users on the legal constraints of their activity and produce recommendations for the policy-makers based on the CNs needs.
5. WP5, led by UOW provides a strong interdisciplinary contribution to some key themes of Internet Science revolving around the topic of Alternative Internet/s. We will discuss the premises on which we can build an alternative, more sustainable model for the Internet, starting from experiences of existing “Alternative Internets”, such as Cns.

UniTN activities

UniTN, apart from the coordination work is involved in two tasks, related to the Assegno di Ricerca:

Task 2.4: Monitoring instruments for CNs.

This task will produce instruments to monitor the sustainable growth of CNs in its technical and social aspects. These instruments will be open source libraries that the CNs will be able to embed into the web-based platforms they already use to manage their communities. The metrics under consideration for measuring the 'pulse' of the CNs include:

- Centrality and robustness indices of the network topologies to verify that the network, albeit formally distributed, does not degenerate to a centralized network depending on a critically small number of nodes;
- Distribution of ownership across the network nodes to prevent the centralisation and the hegemony of a few people on the whole infrastructure;
- Participation level in the on-line social tools (mailing lists, forums etc.) to monitor the inclusiveness of the on-line participation;

The task evolves in two time-wise overlapping phases. The first one involves the development of the monitoring software. The second one consists in the actual monitoring phase, which will produce open data as results, and propose the adoption of our software by communities to help them take informed decisions on several technical and social aspects of their life.

Base References:

- Leonardo Maccari, and Renato Lo Cigno, "A week in the life of three large Wireless Community Networks" in AD HOC NETWORKS, v. 24, n. Part B (2015), p. 175-190. - URL: <http://www.sciencedirect.com/science/article/pii/S1570870514001474>
- Maccari, L. (2016). On the Technical and Social Structure of Community Networks. In *The First IFIP Internet of People Workshop, IoP*. URL: <https://ans.disi.unitn.it/users/maccari/assets/files/bibliography/IoP2016.pdf>

Task 3.3: PeerStreamer in CNs

T3.3 will explore how live P2P video streaming techniques, forming the base for key applications like local event broadcasting, e-learning platforms and group video conferencing, can be applied to CNs. The task will experiment with PeerStreamer, an open source live streaming platform, developed by UniTN and adopted in several research projects. Since PeerStreamer is originally designed for Internet usage, it needs specific development work to fully exploit the characteristics of a CN. In particular, CNs offer links with symmetric bandwidth, contrary to the bandwidth asymmetries of typical Internet connections. This property, if fully exploited, can make P2P live streaming a killer application with even better performance than Internet-based cloud services. The experimentation encompasses two main activities:

- Tailoring PeerStreamer to CNs and optimizing it for such environments following the early results and guidelines obtained in previous works
- P2P video conferencing: extending the current possibilities of PeerStreamer to include P2P group video-conferencing with privacy enhancements.

Along the task, in contact with T3.1 we will also introduce PeerStreamer and P2P-TV to community networks, and incentive the adoption of such technology both as a decentralized TV system and as a privacy-preserving personal video conferencing system.

Base References:

- Baldesi, L., Leonardo, M., & Lo Cigno, R. (2016). Optimized Cooperative Streaming in Wireless Mesh Networks. In *The 15th IFIP Networking Conference (NETWORKING)*. URL: <https://ans.disi.unitn.it/users/maccari/assets/files/bibliography/NETWORKING2016.pdf>
- Luca Baldesi, Leonardo Maccari, and Renato Lo Cigno, "Improving P2P streaming in Wireless Community Networks" in *COMPUTER NETWORKS*, v. 93, Part 2, (2015), p. 389-403. - URL: <http://www.sciencedirect.com/science/article/pii/S1389128615003448> .
- Maccari, Leonardo; Baldesi, Luca; Lo Cigno, Renato; Forconi, Jacopo; Caiazza, Alessio, "Live Video Streaming for Community Networks, Experimenting with PeerStreamer on the Ninux Community" in *Proceedings of the 2015 Workshop on Do-it-yourself Networking: An Interdisciplinary Approach (DIYNetworking '15)*, proceedings of: *MOBISYS/DIYNetworking '15*, Florence, Italy, 18 May, 2015. - URL: <http://www.sigmobile.org/mobisys/2015/>