

# Preface

User centricity promises to become one of the main driving principles of the Internet value chain. The flexibility and the widespread diffusion of Wi-Fi technologies, combined with the cooperative attitude typical of online community members, have determined the emergence of user-centric initiatives aimed at sharing services and resources to extend Internet access networks beyond the coverage of the infrastructures managed by established operators. In *user-centric networks* (UCNs), individuals share subscribed Internet access and network resources in exchange of specific incentives from social, economic, and technical viewpoints. Community members make use of their Wi-Fi-enabled equipment to cover the so-called *last mile* and allow other members to establish a local loop and take advantage of services and Internet backhauling. The success of such new models of Internet connectivity would not be the same without users involved actively in the provision of contents, applications, and services, rather than just being the recipients of those made available by established providers.

The user-centric character of a user-friendly and plug and play connectivity model and the need to assist the autonomic deployment of user-centric wireless local loops were the subject of study for the EU ULOOP (User-centric Wireless Local Loop) project, funded by the EU IST Seventh Framework Programme (FP7/2007–2013). The main aspects under investigation were classified into the following themes: general aspects of user-centric networking, trust management and cooperation incentives, resource management, mobility aspects, and marketplace issues. The structure of this book reflects such a classification into five parts and presents the main problems faced and the solutions developed within the ULOOP framework.

Part I of this book provides a general introduction to *User-Centric Networking*. Architectural models and technological aspects are presented to provide the basis to discuss the potential, the features, the feasibility, and the applicability of user-centric environments. Living examples are used to illustrate the key concepts and to point out the benefits that they bring and the challenges that they raise.

In Part II, trust management is introduced for the specification of trust relationships assisting users in the selection of trustworthy entities to cooperate with. Cooperation is considered as an enabling condition for a successful transformation of the end-user from the typical consumer of Internet services to an active hop (i.e., a *prosumer*) of the connectivity and service distribution chain. In spite of the

widespread cooperative attitude that has determined the success of, e.g., social networks, content sharing systems, and peer-to-peer applications, the willingness to cooperate cannot be taken for granted in terms of sharing network functionality. The typical constraints of Wi-Fi technologies in terms of bandwidth, energy consumption, and computation resources, contribute to keep users from prosocial behaviors. Last but not least, cooperation involves also economic dynamics in which Internet stakeholders and operators play a role essential to guarantee socioeconomic sustainability. Hence, cooperation incentives are fundamental to avoid selfish behaviors, provide motivations to sharing, and extend the benefits to external actors. In the setting of ULOOP, incentives of different nature are combined that include reputation-based management of trust on the fly as well as virtual currency-based reward management.

Part III is focused on resource management as a basis for an efficient maintenance of ad-hoc wireless infrastructures. A fair and self-organizing use of network resources depends on several factors, and solutions ranging from the adoption of cooperative trust-based strategies to the implementation of resource allocation algorithms and workload/congestion control mechanisms. In this context, it is essential to take into account the growth of the community, which can be highly dynamic because of traffic fluctuations due to mobile stations that leave and join the community continuously.

Mobility aspects are treated in Part IV, which surveys on challenges and requirements for mobility management in user-centric networks. In the case of ULOOP, the main difficulties are related to the dynamic, erratic behavior of users and to the interoperability to other systems. Mobility management entails issues like, e.g., tracking, which is supported by estimation models based on the analysis of human social behaviors, and handover, which pursues the ideal of the *always best connection*. The challenge consists of predicting the right gateway to which any ULOOP node shall connect to, while moving, in order to maintain as transparently as possible connectivity and quality of experience.

To conclude the survey, Part V is dedicated to a perspective on market analysis and exploitation in the framework of user-centric wireless local-loop networks, with a particular emphasis on the analysis of the ULOOP case study.

In order to provide an adequate analysis of the ULOOP impact and sustainability from the socioeconomic standpoint, a deep investigation of Wi-Fi-related regulatory frameworks was performed at the beginning of the project. A prominent result is a collection of definitions taken from European Community Directives that are relevant in the framework of ULOOP and that we report in the glossary following this preface. Based on a logical, concept-driven order, such definitions make it clear the general notions of Service and Universal Service, and then introduce the specific notions related to the service deployment through electronic communication means, i.e., Electronic Communications Network, Public Communications Network, Network Termination Point, Electronic Communications Service, Publicly Available Electronic Communications Services, Associated Services, Associated Facilities, Access, Local Loop, Interconnection Conditional Access System, Provision of an Electronic Communications Network. Afterwards,

regulatory issues are clarified through the notions of National Regulatory Authority, General Authorisation, Exclusive Rights, Special Rights, while all the involved actors are defined via the terms Operator, Service Provider, Established Service Provider, Commercial Communication, Recipient of the Service, User, Consumer, Subscriber, End-User. Application-specific terms complete the list, i.e., Enhanced Digital Television Equipment, Application Program Interface, Traffic Data, Location Data, Communication, Call, Consent, Value Added Service, Electronic Mail. For the sake of accessibility, the glossary is proposed in alphabetical order. Moreover, it is integrated with ULOOP specific definitions that will be helpful for the reader prior to, or while, reading the book.

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