

ULOOP: User-centric Wireless Local Loop

ULOOP brings in a fresh approach to user-centricity by exploring user-provided networking aspects in a way that expands the reach of a multi-access backbone. ULOOP main expected results are user-centric open-source software and a large-scale realistic demonstrator.

At A Glance: ULOOP

**User-provided
Local Loop**



Project Coordinators

Olivier Marcé (Alcatel-Lucent BellLabs France)

Tel: +33 628630182

Email: Olivier.Marce@alcatel-lucent.com

Rute Sofia

University Lusófona

Tel: +351 217515500

Email: rute.sofia@ulusofona.pt

Project website: <http://www.uloop.eu/>

Partners: Alcatel-Lucent BellLabs,, COFAC/University Lusófona, Huawei Technologies Duesseldorf GmbH, ARIA S.p.A, Caixa Mágica Software, FON Wireless Ltd, Technische Universität Berlin, University of Kent, Université de Genève, Teleinform S.p.A., University of Urbino.

Duration: September 2010 – August 2012

Funding scheme: STREP

Total Cost: € 6,7 m

EC Contribution: € 3,9 m

Contract Number: INFISO-ICT-257418

Main Objectives

The flexibility inherent to wireless technologies is giving rise to new types of access networks and allowing the Internet to expand in a user-centric way. This is particularly relevant if one considers that wireless technologies such as *Wireless Fidelity (Wi-Fi)* currently complement Internet access broadband technologies, forming the last hop to the end-user. This fact becomes even more significant due to the dense deployment of Wi-Fi Access Points that is nowadays common in urban environments. Due to such density, a relevant aspect that can be worked upon is leveraging such “wireless local-loop” by developing networking mechanisms that allow adequate resource management and a future Internet architecture to scale in an autonomic way. Such wireless local-loop could then reach rates closer to the ones provided by current broadband access technologies. This is the underlying idea of ULOOP, which shall provide software functionality to sustain a user-centric robust, secure, and autonomic network growth. ULOOP objectives are two-fold. Firstly, to develop and to validate identified core mechanisms that aid in the development of user-centric robust, trustworthy, low-cost, and indirectly energy-efficient wireless local-loops. Secondly, to bring awareness to the topic of user-centric networking from a standardisation and legislation perspective.

ULOOP empowers the end-user as active stakeholder for Future Internet connectivity models.

Innovation in ULOOP

ULOOP addresses the user as a key component of networking services in future Internet architectures. Building upon current (commercial) examples ULOOP explores not only the adequate technical sustainability of user-centric models, but also legislation implications and the potential of community-driven services and how these new aspects may give rise to novel business models both from a user and from an access perspective.

Technical Approach

ULOOP has a three-year lifetime. ULOOP workplan includes 5 workpackages. **WP1 (Project Coordination and Management)** relates to the global coordination and management of ULOOP and is jointly provided by Alcatel-Lucent BellLabs France and University Lusófona.

WP2 (ULOOP Framework) relates to the definition of the ULOOP framework, including constraints, assumptions, as well as requirements. It will also provide an analysis on the socio-economic sustainability of ULOOP models.

WP3 (ULOOP Framework Design and Implementation) is dedicated to the devising and implementation of the ULOOP functionality.

WP4 (Pilot Deployment and Validation) is dedicated to the development of a large scale ULOOP demonstrator which includes demonstrations on the last year of the project in Madrid and on the S. João da Madeira Industrial living lab, which is managed by Sanjotec.

WP5 (Dissemination and Exploitation) covers the adequate dissemination of results in ULOOP. Exploitation of results and the organisation of events dedicated both to academic and to industrial market segments are part of this WP.

Key Issues

ULOOP is focused on the recent trend of user-centric networking and addresses four main aspects: *cooperation incentives and trust management, resource management, mobility aspects*. These are aspects that shall be tackled both individually and from a strongly integration perspective.

Cooperation incentives are the basis to assist autonomic networks to scale. Technical incentives must be in place and be appealing enough to assist the end-user as an active stakeholder in an Internet connectivity model. Such incentives must be adapted depending on the network need in terms of bandwidth and connectivity: the greater

the demand, the more relevant the incentive becomes.

Resource management is essential to allow the ULOOP architectures to grow steadily and to automatically adjust to changes. Main resource management aspects that are to be addressed in ULOOP relate to the capability to develop a robust and scalable wireless local-loop on-the-fly as well as to increase the spectrum and energy efficiency. Cooperative resource management techniques are to be addressed from an OSI Layer 3 and an OSI Layer 2 perspective. Cross-layer aspects will be considered whenever necessary.

Mobility aspects in ULOOP relate to a social behavior. Some nodes (the majority) are expected to be carried by the end-user and therefore will move based upon social aspects. Mobility support in ULOOP is also complicated by the fact that a ULOOP cannot rely on a fixed mobility management infrastructure - whereas current mobility management solutions (e.g. SIP or MIP) make use of central mobility anchor points to keep an association

between previous and current identities for a mobile node that moves between different access points and across different networks. Another mobility aspect to tackle is the discovery of the target handover access point, which may be located in the same ULOOP, another ULOOP, or in operator-owned infrastructure.

Expected Impact

ULOOP follows an evolutionary methodology to assist the evolution of the Internet. Expected impact in the 2009-2010 programme is:

- Increase awareness to user-centric networking in terms of business opportunities, impact on telecommunications legislation, and standardisation.
- Introduce adequate technology to sustain the growth of user-friendly wireless architectures from a user and access perspective.

