All Wireless Community Based Networks for Smart Cities

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Principal Topics

— Internet of Personal Things ;
— Community Networks
— Personal and Community based Autonomous Systems ;
— Privacy / Anonymity, crowd sensing

Context

Internet will soon face a huge explosion of its usages and applications : in particular, the development of Smart-cities (-buildings, etc.) currently lead to a colossal number of devices that continuously push and retrieve data in a fashion that was not expected with the initial Internet design. In the current and traditional architecture, Wireless Access Networks (WLAN) simply push data to a collection of opaque data centers whose locations do not guarantee any routing performances and privacy concerns. This classical centralized and hierarchical data forwarding model does not favor the development of local communities and stakeholders, and may create bottlenecks.

We propose to create a decentralized infrastructure, with local exchanges, preserving the privacy. Traffic offloading represents the first step : the network operator pushes some data to local Access Points to increase globally the throughput. We aim at going further : exchanges should be localized and should not pass through a centralized backbone, hierarchically organized.

Scientific Objectives

The PhD student will study how we may set-up a Community Based Architecture. He will have to face to several key challenges :
— to propose an architecture based on Communities (of interest, location, etc.)
— to provide mechanisms for stable inter-communities routing, each community being able to guarantee its privacy ;
— to propose to adapt the Software Defined Networking (SDN) concepts [1, 2] to this multihop topology ;
— to propose mechanisms for crowd sensing in this architecture while preserving anonymity ;
— to experiment in real-life his propositions.

Skills

The expected skills are :
— C language ;
— system (Linux, shell)
— distributed algorithms ;
— wireless networks (protocols and radio propagation) ;
— energy efficient networking stack ;
— SDN would be a plus.
Applicants should possess good verbal and written English skills. French is not a requirement, since the research group hosts several nationalities.

Supervision

The Ph.D. student will be jointly supervised by :
— Dr. Fabrice Théoleyre (CNRS / Univ. of Strasbourg, France)
— Dr. Pascal Mérindol (CNRS / Univ. of Strasbourg, France)
— Prof. Rolando Menchaca Méndez (Mexican National Polytechnic Institute)

Références

[1] Alexander Hom and Willilam Kasch. Software defined networking (sdn) for military networks. In Military Communications (MILCOM), Baltimore, USA, 2014. IEEE.

[2] Christian Esteve Rothenberg, Marcelo Ribeiro Nascimento, Marcos Rogerio Salvador, Carlos Nilton Araujo Corrêa, Sidney Cunha de Lucena, and Robert Raszuk. Revisiting routing control platforms with the eyes and muscles of software-defined networking. In ACM HotSDN, 2012.