Advanced Dynamic Spectrum 5G mobile networks Employing Licensed shared access

European Commission FP7-ICT-2013-11 Project (under ICT-2011.1.1 Future Networks)

Grant agreement no: CNECT-ICT- 619647, ADEL Project

Specific targetted research project (STREP)

Start date: December 2013,   Duration: 36 months

Total Funding: 2.571.000 €   AIT's Funding: 384.550 €

Project Summary

To deliver the next order of magnitude gains in terms of overall spectral and radio efficiency envisioned for 5G networks, wireless access will have to be revisited both from a policy as well as from a technology innovation perspective. On the policy side, with the emergence of heterogeneous and small cell networks, the original "licensed vs. unlicensed" spectrum usage model has been recently enriched by the "licensed shared access (LSA)" paradigm wherein incumbent operators may allow other ones to share their spectrum at specific times and places, according to an agreed set of rules. LSA constitutes an evolution of the cognitive radio (CR) concept, and is defined as follows by the EU Radio Spectrum Policy Group:

An individual licensed regime of a limited number of licensees in a frequency band, already allocated to one or more incumbent users, for which the additional users are allowed to use the spectrum (or part of the spectrum) in accordance with sharing rules included in the rights of use of spectrum granted to licensees, thereby allowing all the licensees to provide a certain level of QoS

ADEL's goal was to propose advanced LSA systems by exploring, beyond the original LSA concept:

1. Collaborative sensing techniques in order to achieve the sensitivity requirements set by regulatory authorities at a minimum communication overhead between collaborating nodes,
2. Dynamic, radio-aware resource allocation techniques (both distributed and centralized), in order to offer the desired network features such of scalability, trust-control and efficiency,
3. Cooperative communication techniques for spectrum sharing with fast decision making and small control overhead,

with the final goal of providing an order of magnitude improvement in spectral efficiency while at the same time improving energy and cost efficiency of mobile broadband networks.

ADEL developed a novel network architecture that allows its advanced spectrum sharing techniques, while respecting the latest regulatory LSA trends. It addressed three major network scenarios (small cell, macrocell, railway) and developed the corresponding channel, signal and interference models for the subsequent development of its technology solutions. Besides the developed techniques in all these areas, the project also delivered a number of over-the-air proof-of-concept demos and a system-level simulator that showed over an order of magnitude gains in spectrum utilization, consistent with its original vision. Its demo booth, which demonstrated its over-the-air collaborative sensing, as well as its Massive MIMO experiment and system-level simulator, won the "Best Booth Award" at EUCNC 2016.
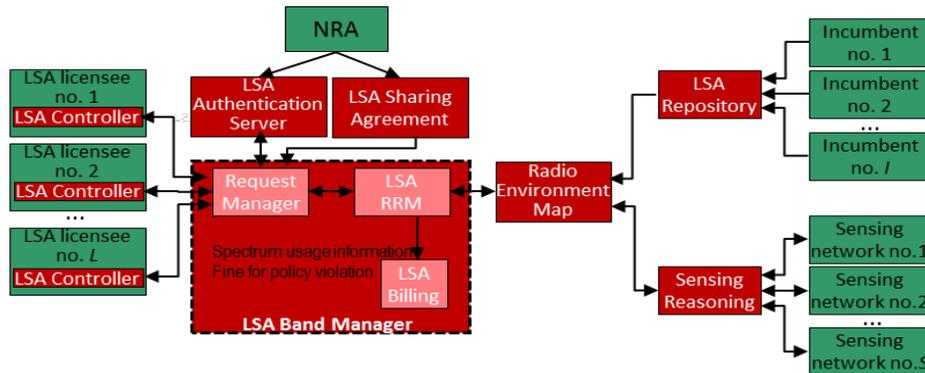
ADEL's Architecture for Licensed Shared Access Networks

AIT's Role

Technical management, leader of spectrum sharing policy and medium access / control plane protocols

Project partners

University of Edinburgh, Athens Information Technology, Thales Communication & Security, Technical University of Darmstadt, Intel Mobile Communications, Eurecom, Trinity College Dublin, Portugal Telecom Innovacao.

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