Advanced Dynamic spectrum 5G mobile networks
Employing Licensed shared access

At A Glance: ADEL

Advanced Dynamic spectrum 5G mobile networks Employing Licensed shared access

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Funding scheme: STREP
Total Cost: € 3,698,172
EC Contribution: € 2,571,000
Contract Number: CNECT-ICT- 619647

Main Objectives

The ADEL consortium consists of eight partners from UK, Greece, France, Germany, Ireland, Portugal and its goal is to explore the potential of licensed shared access as a key enabler for 5G mobile broadband networks.

Key driver: to meet the growing capacity demands in cellular networks imposed by the increasing customer base and data-hungry mobile applications.

Key concept: The “Licensed Shared Access” (LSA) (a.k.a. “Authorised Shared Access” – ASA) paradigm wherein:

incumbent operators may allow others to share their spectrum at specific times and places, according to an agreed set of rules.

State-of-the-art: the use of spectrum in commercial applications is either licensed or license-exempt. Cognitive radio is another approach but it has been met with scepticism by cellular operators and has led to very limited deployments (e.g. 802.22).

ADEL aims at facilitating the reform of spectrum licensing, highly improving the efficiency landscape for personal wireless communications, thus greatly benefiting the citizens. ADEL, while promising a technology breakthrough, also has the advantage of targeting the European spectrum allocation needs and constraints of the years to come. Carrying out the work at a European level will result in the advancement of wireless networking by European researchers and in the related commercial exploitation, providing partnership opportunities among ADEL partners, and among European players and stakeholders. Such efforts will energize investment, mobilize resources and create new job opportunities, while improving competitiveness in Europe. The consortium plans to release a few white paper contributions, framing the technical problem addressed by ADEL; the project will align and possibly contribute its results to upcoming 5G standardisation activities and also present the LSA benefits to national and European regulatory bodies. The additional spectrum bands considered by ADEL for wireless broadband networks can mutually benefit both incumbent and LSA licensed operators.
Technical Approach

To deliver the next order of magnitude gains in terms of overall spectral and radio efficiency envisioned for 2020, 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 recently given way to 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.

We plan to address the following key challenges within the LSA wireless access paradigm: i) the dynamic and optimised allocation of spectral and power resources at a short time scale (on the order of seconds to even milliseconds); ii) the guarantee of Quality of Service to the users of all participating spectrum-sharing networks; iii) the minimisation of the overall energy expenditure of LSA networks.

As key technology enablers towards these goals, we propose the utilisation of: i) decentralised spectrum sharing techniques that allow both faster decision making and less control overhead; ii) advanced collaborative sensing between the cooperating wireless networks and individual nodes for better network coordination; iii) advanced frequency agile transceiver techniques; iv) self-optimisation techniques at the LSA networks to further minimise the EMF radiation and the interference caused to the incumbent network parts.

Key idea: To explore the potential of LSA as a key enabler of 5G mobile broadband networks by developing:

- Collaborative sensing
- Dynamic, radio-aware resource allocation
- Cooperative communication

with the final goal of providing an order of magnitude improvement in spectral efficiency, and more energy & cost efficient mobile broadband networks.

Expected Impact

- 10 times overall improvement of capacity metrics (such as sum rate capacity, power constrained capacity)
- minimize European operators’ CAPEX & OPEX investments
- reduce the global CO2 emissions and electromagnetic field exposure
- unlock harmonised spectrum across Europe
- manage spectrum more efficiently, in a way that guarantees the right of use of the different players
- improve wireless connectivity, QoS and energy efficiency with low-cost technologies, reinforcing Europe’s position in the world market
- guide the technical work in the direction of practical and commercially relevant R&D and pave the way for the adoption by wireless operators of spectrum flexible wireless systems by 2020

Possible Scenarios

Possible scenarios envisioned by ADEL are: LSA, heterogeneous infrastructure-based networks, heterogeneous ad hoc networks, and traditional cognitive radio networks.