

Cognitive radio and cooperative strategies for power saving in multi-standard wireless devices

C2POWER main objective is to research, develop and demonstrate energy saving technologies for multi-standard wireless mobile devices, exploiting the combination of cognitive radio and cooperative strategies while still enabling the required performance in terms of data rate and QoS to support active applications.

At A Glance: C2POWER

Cognitive radio and cooperative strategies for power saving in multi-standard wireless devices



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Main Objectives

Energy is a critical resource in the design of wireless networks since wireless devices are usually powered by batteries. Without any new approaches for energy saving, 4G mobile users will relentlessly be searching for power outlets rather than network access, and becoming once again bound to a single location. To avoid the so called 4G "energy trap" and to help wireless devices become more environment friendly, there is a clear need for disruptive strategies to address all aspects of power efficiency from the user devices through to the core infrastructure of the network and how these devices and equipment interact with each other. The C2POWER project is the vehicle to address these issues through cognitive and cooperation techniques. The key objectives are to research, develop and demonstrate energy saving technologies for multi-standard wireless mobile devices, exploiting the combination of cognitive radio and cooperative strategies, while still enabling the required performance in terms of QoS to support active applications.

Avoiding the "energy trap" of the Network of the Future

C2POWER requires a wider European approach in order to fulfil the ambitious objectives laid out and to secure a high technology impact factor through standardisation. In the first instance, the consortium structure is highly complementary and driven by academia; bringing large manufacturers, leading edge research organisations together with highly innovative SMEs and more immediate market oriented industry players. Concerning the technology impact, the partners involved are active members of various standardisation organisations (that include IEEE 1900.6, Bluetooth Special Interest Group (SIG), Femto forum, and the ETSI EMTEL Working group) and are capable and committed to place the key project outcomes in these relevant standards.

C2POWER tangible outputs includes demonstrators for energy efficient short-range cooperation, and vertical handovers; where the aim is to reduce the power consumption at the mobile device by up to 50%.

Technical Approach

The implementation of the C2POWER scenarios will progress along collaborative parallel activities that include:

- **Context awareness and signalling for power saving strategies:** investigation and implementation of energy efficient network and node discovery modules;
- **Energy-efficient reconfigurable radio transceivers:** to investigate and implement a transceiver platform that is multi-standard in nature, flexible and energy efficient;
- **Cooperative short range communications for power saving:** to investigate and implement energy efficient algorithms/protocols for short-range communications that include: cooperation protocols based on Utility functions; routing, and cooperative relaying;
- **Energy-efficient cognitive handovers procedures and policies:** to investigate and implement energy efficient cognitive handover algorithms (including femto-cells) and the validation framework;

The aforementioned HW module/components

will be integrated in the proof-of-concept phase to validate two major technology showcases on cooperative short range for power saving using UWB (Ultra Wideband), and energy-efficient cognitive vertical handovers.

Key Issues

The key components of the project includes one, the dominant, specifically dealing with technical aspects and the second one addressing business /management models related to the topic cooperation. At the technical level the key issues are:

- Investigate how context information can be used by cooperative strategies to achieve power efficiency at the wireless interface of mobile devices and save battery lifetime.
- Investigate and demonstrate the potential of cooperative techniques based on advanced short range communications for the goal of power/battery lifetime saving of mobile wireless devices.

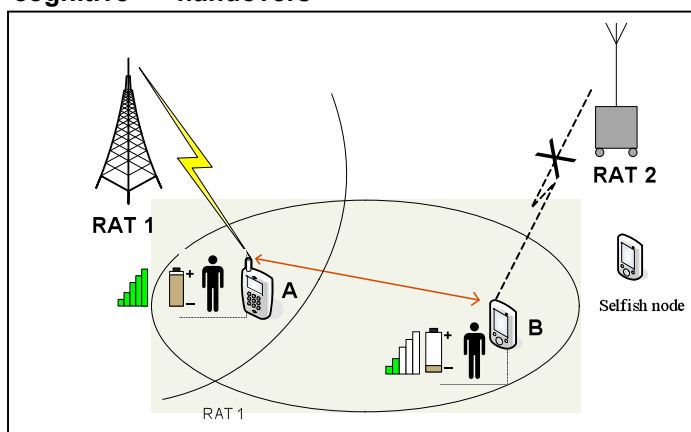
- Investigate and demonstrate minimum energy consumption handover procedures and policies between heterogeneous technologies and associated tradeoffs in realistic scenarios.
- Investigate, design and demonstrate energy efficient reconfigurable multi-standard transceivers (BB and RF) able to switch from one standard to another according to a power saving strategy.

At the management/ business level, the key issue addresses methods and incentives to encourage cooperation among users/handsets and develop attractive business models for the network/service providers to stimulate and motivate cooperative networking among users and between heterogeneous networks.

Expected Impact

C2POWER project targets to impact European Industry and Society on various levels.

The combination of cognitive radio and cooperative networks is still in its infancy and Europe can be considered to be currently level with its major competitors in the USA and Far East. However, this situation is only short-term unless European industry undertakes a concerted research effort on these new disruptive technology paradigms.



The energy saving approaches investigated and developed in C2POWER will assist to make future European communication products and systems more competitive, strengthening their market position. Furthermore, the reduction in energy consumption together with the lowering of the "radio pollution" through energy-aware and more effective radio resource usage will help facilitate more sustainable ICTs in Europe. This is particularly relevant in the context of the Lisbon Agenda and the aim to make the EU "the most dynamic and competitive knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion, and respect for the environment by 2010".

C2POWER will contribute to decrease the growing gap between the energy of emerging radio systems and what can be achieved by battery technology evolution accelerating the uptake of of the next generation of network and service infrastructures.