

activities have been accompanied by the validation of key technologies, which will help to promote the concept and contribute to the overall proof-of-concept.

Achieved results

The main advancements of WINNER+ beyond the state-of-the-art have been to propose, develop, evaluate and describe innovative concepts suitable for standards within ITU-R IMT-Advanced and beyond, and to act as the European Evaluation Group for the 3GPP LTE-Advanced based technology proposal.

The innovation work focused on six main areas:

- ◆ Advanced RRM concepts, including distributed self-optimising, autonomous, traffic and service aware RRM algorithms designs.
- ◆ Flexible spectrum usage related functionalities to provide a set of functionalities usable in IMT-Advanced technologies.
- ◆ The integration of innovative transmission techniques into the system concept: Peer-to-Peer communication and Network Coding.
- ◆ The optimisation of system aspects of advanced antenna schemes, such as inter-working with RRM and feedback reduction schemes design.

- ◆ Coordinated multipoint systems, where geographically remote antennas can be fruitfully exploited in close cooperation; these possible approaches involve joint transmission/reception by either distributed base station antennas or several access points (base stations and/or relays), and interference avoidance through access points coordinated transmission.

- ◆ Innovative platforms for trials and demonstrations that are able to visualise the operation of proposed functionalities like the coordinated multipoint (CoMP) and specific MIMO modes. New circuit designs as well as SW signal processing functionalities were allocated in an optimal way to enable operation in real-time or in a unique non-real time mode. Over the Air testing methodologies were improved in the project.

The suitability of the innovations as technology enablers for improving current systems, in particular IMT-Advanced and beyond, was analysed. These innovations include such items as an efficient and flexible scheduling and spectrum allocation process; the continuous and non-continuous carrier aggregation with respect to the spectrum identification in WRC-2007; femtocells and flexible spectrum use to increase the capacity of a cellular network; the relaying related innovations and combining them with CoMP; the concepts

involving multi-user MIMO systems; the QoS related innovations; the CoMP with the focus on the joint processing and coordinated beam forming schemes.

Impact

The ITU-R process has provided a unique opportunity for the WINNER+ project to contribute technical concepts suitable to the preparation of candidate proposals in 3GPP towards ITU-R. Also, acting as an External Evaluation Group of technology proposals has allowed the WINNER+ project to ensure that the competencies of the European telecommunications industry are fully exploited in the process. This is supposed to give maximum benefits to the industry when the systems will be commercialised.

The consortium, which is composed of major players in the telecommunications industry, has been in an excellent position to facilitate consensus building in an early stage and to ease thereby the standardisation process towards a potentially more harmonised solution compared to 3G.

The project has submitted many conference papers, and arranged WINNER+ specific sessions in the ICT Mobile Summit conferences both in June 2009 and June 2010. Furthermore, work package leaders of WINNER+ have organised a special issue of the IEEE Communication Magazine on "IMT-Advanced and Next Generation Mobile Networks" (publication date: February/March 2011), and act as guest editors.

About Celtic

Celtic is a European research and development programme, designed to strengthen Europe's competitiveness in telecommunications through short and medium term collaborative R&D projects. Celtic is currently the only European R&D programme fully dedicated to end-to-end telecommunication solutions.

Timeframe: 8 years, from 2004 to 2011

Clusterbudget: in the range of 1 billion euro, shared between governments and private participants

Participants: small, medium and large companies from telecommunications industry, universities, research institutes, and local authorities from all 35 Eureka countries.

Celtic Office

c/o Eurescom, Wieblingen Weg 19/4,

69123 Heidelberg, Germany

Phone: +49 6221 989 405, e-mail: office@celtic-initiative.org

www.celtic-initiative.org

