Celtic-Plus
Smart Connected World

Project Achievements

SMart Advanced Radio Technologies for 4G networks

SHARING

Project ID: C2012/1-8

Start Date: 1 December 2012

Closure date: 30 June 2016

Partners:

Avea Iletisim Hizmetleri A.S., Turkey
Commissariat à l'Energie Atomique et aux énergies alternatives (CEA-LETI), France
EureCom, France
European Communications Engineering (ECE), Finland
IDATE (Institut de l'Audiovisuel et des Télécommunications en Europe), France
Magister Solutions, Finland
Mitsubishi Electric R&D Centre Europe, France
Orange SA, France
Oy L M Ericsson Ab, Finland
Sequans Communications, France
Siradel, France
SUPELEC, France
Thales Communications & Security, France
TTI Norte, S.L. (TTI Telecom), Spain
University of Oulu, Finland

Co-ordinator:

Arturo Ortega Molin

Orange SA

E-Mail: arturo.ortegamolina@orange.com

Project Websites

www.celticplus.eu/project-sharing

www-sharing.cea.fr

SHARING project was created to stimulate the 4G evolution towards 5G mobile networks by developing innovative technologies designed to improve network performance and user experience.

Main focus

SHARING project defined reference scenarios and explored new concepts with a special focus on interference management, cost-power efficient small cell deployments, LTE-A / WiFi convergence, network controlled device-to-device communications, meshed relay-assisted networks, Self-Organized Network (SON) features and architecture evolutions for heterogeneous networks.

Project main achievements include, among others: (1) rationale and forecasts (2015-2020) for worldwide and European small cells, carrier WiFi, D2D and relay markets; (2) advanced techniques required to cope with traffic increase, and to fulfil the objective of "services for everyone everywhere" such as coordinated multi-point, advanced receivers and carrier aggregation; (3) methods that can significantly reduce (up to 50%) average network energy consumption while still maintaining the desired quality of service; and (4) a software solution designed to improve user localization in heterogeneous 3GPP / WiFi networks. Impact on network architecture of all project innovations was assessed giving a hint on compatibility with current standards and implementation straightforwardness.

Approach

SHARING aimed to achieve a major capacity increase by leveraging on:

- Advanced Self-Organizing Network (SON) mechanisms and advanced cooperation technologies,
- Multi-layer and multi-Radio Access Technology (RAT) offloading of macrocell traffic to (a) outdoor small cells, (b) indoor femto cells and Wi-Fi, and (c) enabling Device-to-Device (D2D) communications,
- A flexible interference management approach combining the advantages of interference avoidance and interference cancellation.

Achieved results

SHARING project brought innovations which consolidate small cell technologies related to heterogeneous multi-RAT and multi-layer networks. These innovations are in the following areas:

- Flexible air interface consisting of multi-point coordination transmitters, interference cancelling receivers and coordinat-

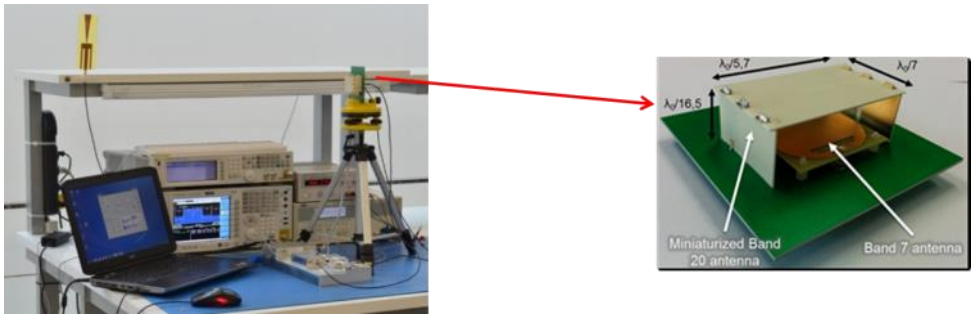

Figure 1: Carrier aggregation demonstrator setup comprising the reconfigurable RF front-end (including a dual band miniature antenna), the control PC and the measurement equipment.

ed interference management tailored for future heterogeneous networks.

- Novel strategies for seamless intra- and inter-RAT traffic offloading.
- Self-organized methods for managing mobility, interference, spectrum and radio resources.
- Fronthaul solutions covering advanced relaying and device-to-device communications.
- Heterogeneous network architecture enablers needed by device-to-device communications.

The project also developed cost efficient technologies and solutions, namely:

- Effective interference mitigation and management in heterogeneous networks.
- Smart and efficient traffic steering strategies taking into account the actual operational conditions.
- Innovative cost effective fronthaul architectures for heterogeneous networks
- RF front-end (reconfigurable energy efficient Power Amplifier and miniature frequency agile antenna), as enablers for Carrier Aggregation.

SHARING project contributed to take current offload solutions to next generation smart Multi-RAT Heterogeneous Networks, thereby contributing significantly to economic and energy efficiency of access networks.

Impact

During the SHARING project the focus in 3GPP was on Release 12 finalization and the initiation of the Release 13 specifications of LTE-Advanced systems. Some of 3GPP activities that are the most relevant to SHARING project are Device-to-Device communications, interworking between LTE and WLAN, ON/OFF energy savings and small cells. The project contributed to 29 technical contributions to 3GPP RAN1, RAN2 and RAN3.

SHARING project also contributed to the improvement of a significant variety of products including power amplifiers, dual connectivity solutions, interference cancellation chipsets, relaying and carrier aggregation solutions, radio propagation models, and RF fingerprint positioning platform, and seamless multi-RAT connectivity solutions.

A great deal of effort was also spent in dissemination activities leading to a significant number of publications in prestigious conferences (78), journals (33) and workshops (11); and to the organisation or co-organisation of 6 workshops or special sessions. The project has also issued 1 book and has obtained 2 best paper awards.

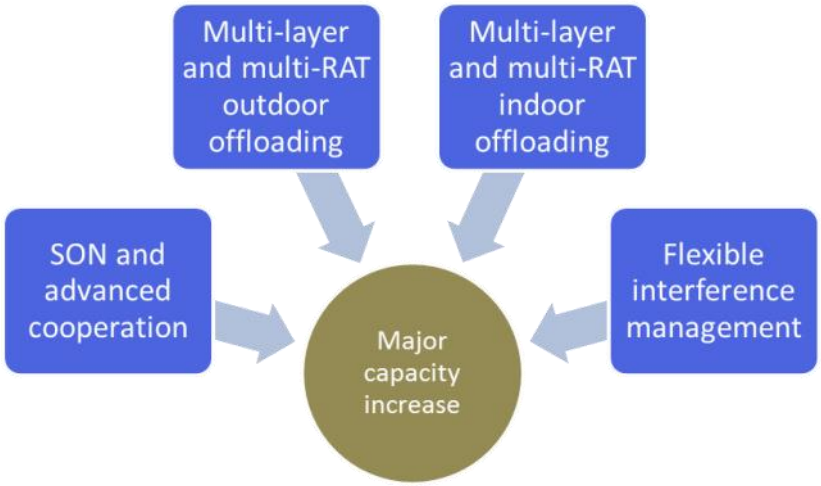

Figure 2: Sharing overall target

About Celtic-Plus

Celtic-Plus is an industry-driven European research initiative to define, perform and finance through public and private funding common research projects in the area of telecommunications, new media, future Internet, and applications & services focusing on a new „Smart Connected World“ paradigm. Celtic-Plus is a EUREKA ICT cluster and belongs to the intergovernmental EUREKA network. Celtic-Plus is open to any type of company covering the Celtic-Plus research areas, large industry as well as small companies or universities and research organisations. Even companies outside the EUREKA countries may get some possibilities to join a Celtic-Plus project under certain conditions.

Celtic Office

c/o Eurescom, Wieblinger Weg 19/4

69123 Heidelberg, Germany

Phone: +49 6221 989 381
E-mail: office@celticplus.eu
www.celticplus.eu

EUREKA