Project Achievements

CELTIC
Telecommunication Solutions

MOBility concepts for IMT-Advanced

MOBILIA

Project ID: CP5-016

Start Date: 1 April 2008

Closure date: 30 September 2010

Partners:

Centro Tecnológico de Telecomunicaciones de Catalunya, Spain

Creativ IT, Spain

Instituto de Telecomunicações, Portugal

Sigint Solutions LTD, Cyprus

TTI, Spain

TST Sistemas, Spain

Universidad Cantabria, Spain

Wavecom, Portugal

Co-ordinator:

Miguel Peña

TTI, Spain
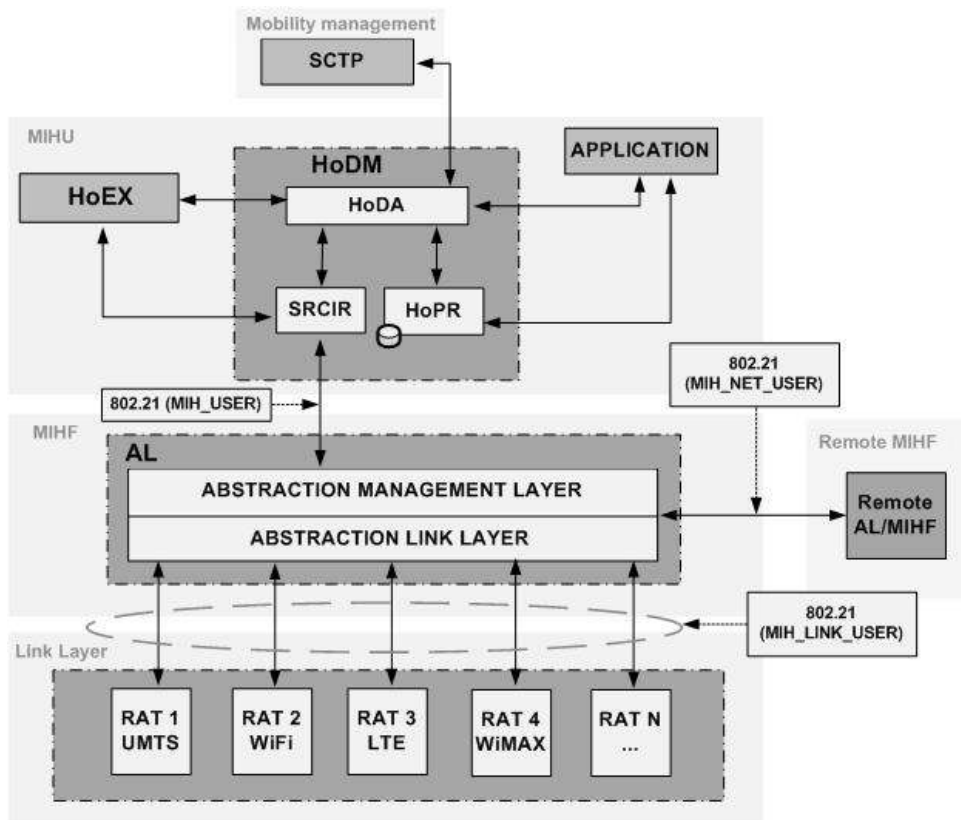
E-mail: mpena@ttinorte.es

Technical Co-ordinator:

Ramón Agüero

Universidad Cantabria, Spain

E-mail: ramon@tlmat.unican.es

Project Websites:

www.celtic-initiative.org/projects/mobilia
http://www.mobilia-project.org/

MOBILIA has focused on some of the most interesting challenges which will be brought about with the upcoming wireless communication technologies. In particular, MOBILIA has concentrated on WiMAX, and has analyzed relaying, cooperative schemes, scheduling, heterogeneous accesses, etc. The assessment of these aspects has been carried out by means of simulations, as well as over a real test bed.

Main focus

MOBILIA project targets ITU IMT-advanced requirements for future wireless systems, i.e. peak data rates of 100 Mbps for mobile applications and 1 Gbps for low mobility. The IMT-advanced vision of future network, as being formed of inter-working access systems, will also be con-sidered. A derived target is to obtain an increased aggregate throughput/user satisfaction vs. existing systems.

MOBILIA has addressed these various challenges, mainly in the context of Wi-MAX, covering at least IEEE802.16m, 802.16j and beyond. Other complementary technologies have been also analyzed, e.g. Wi-Fi, to perform relaying in the framework of IEEE 802.16e. For that, MO-BILIA has studied the following enabling technologies:

♦ Multiple antennas (MIMO) schemes and algorithms;

♦ Relaying schemes: cooperative relays, which can be seen as "virtual MIMO", and may compensate spectral efficiency unbalance within a cell;

- Cross-layer techniques for multi user MIMO and relays, assessed by system level simulations. One of the main rationales for these techniques is energy harvesting;

- Network and functional architecture supporting the efficient and transparent cooperation between heterogeneous wireless access networks;

- Framework to adapt services to underlying resources;

- Reconfigurability at the user terminal.

The project performed some show-cases; real platforms have been used as a proof-of-concept.

Approach

In order to accomplish the different goals which were identified, the project was organized into four technical and two management work packages, as enumerated below:

- WP1: Project Management

- WP2: Scenarios and Requirements

- WP3: Broadband air interfaces: advance algorithms and cooperative relaying

- WP4: Upper Level Solutions for BWA and 3G interworking

- WP5: Proof-of-Concept : Platform Validation and evaluation

- WP6: Dissemination and exploitation

WP3 and WP4 have developed algorithms that were assessed, evaluated and showcased in WP5, which has used existing platforms and off-the-shelf technology. Furthermore, WP4 proposed the MOBILIA architecture, a framework flexible enough so as to incorporate the various mechanisms which were tackled within both WP3 and WP4. The aforementioned platforms (WP5) have been used so as to demonstrate some of the concepts of the previous WPs. WP2 has steered the whole project, defining the corresponding scenarios, both for the algorithmic WPs, and the platform developments.

Achieved results

The MOBILIA project has proposed a number of advanced techniques and schemes to boost the performance of future wireless communication technologies within the lower layers of the protocol stack, including a reconfigurable power amplifier; an algorithm to adapt coding schemes over MIMO systems depending on link quality; cooperative ARQ to deal with hidden and exposed terminals; and a spatial division multiple access scheme, integrated within a dynamic resource allocation framework to be used over WiMAX. All those techniques can be instantiated from the upper layers, considering the requirements posed by the current services, thanks to the functionality provided by the MO-

BILIA architecture, which has the main goal of dealing with heterogeneous access environments, promoting the "Always Best Connected" paradigm. The functionalities which are brought about by such architecture have been exploited, and quantitative performance gains of various strategies have been obtained by means of proprietary system-level simulators. It is worth highlighting that the MOBILIA project has strengthened the implementation activities, and as a result, the MOBILIA demonstration has been shown in some international events. The quality of the produced results correspond to the high number of dissemination activities that had taken place, highlighting the two MOBILIA special sessions collocated with two international conferences.

Impact

WiMAX in particular, broadband wireless communications in general is the future market which is on the verge of an exponential growth. MOBILIA outcomes will have a positive business impact on the SME's involved in the project. Relevant outcomes for the business impact are the innovative architecture developed that could be applicable to real systems like wireless public announcement systems or network management solutions; the simulation tools consolidated like the full-3D Ray Tracing Simulator (3DTruEM) which aims to become a very powerful simulation tool in the hands of researchers, cellular operators, TV broadcasters etc.; and components developed like the power efficient reconfigurable WiMAX amplifier, with a broad application in the incoming wireless networks deployments.

Also MOBILIA achievements has strengthened the internal R&D capacities of the different partners and enhanced the competences on advance research that will be the basis for future cooperation and research initiatives, especially regarding future wireless communication systems.

EUREKA