ARROWS (Advanced Radio Resource Management for Wireless Services)

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Action line: IST 2000 - IV.5.2  
Clusters: Systems Beyond 3G

Main Objectives
This project aims at providing advanced Radio Resource Management (RRM) and Quality of Service (QoS) management solutions for the support of integrated voice and data services within the context of Universal Terrestrial Radio Access (UTRA). Both Time Division Duplex (TDD) and Frequency Division Duplex (FDD) modes are considered. The project includes packet access, asymmetrical traffic and high bitrate (2Mbit/s) services for multimedia IP based applications.

Therefore, the main objectives of the project are:

- To develop, simulate, evaluate and validate advanced Radio Resource Management algorithms and procedures for an optimal and efficient use of the radio resources provided by UTRA to enable high capacity for multiservice applications requiring high bitrate (up to 2Mbit/s). Both TDD and FDD modes will be considered; in case of UTRA-TDD, advantage can be taken of an asymmetrical allocation of the resources (timeslots).
- To achieve a specific QoS for packet switched services in the UTRA Network through the use and optimisation of QoS Management Functions.
- To demonstrate the benefits of the developed RRM algorithms by means of a multimedia IP based applications over a testbed.

Technical Approach
ARROWS project is embedded in one of the most challenging innovation activity for the Third Generation Mobile Communication Systems, that is, to provide ubiquitous and advanced data and multimedia services in a seamless way from the user point of view. To achieve this goal, advanced Radio Resource Management (RRM) mechanisms to assure the QoS for those services must be defined. This implies giving solutions to manage in a reliable way a conjunction of requirements and limitations: the scarce available bandwidth, the coexistence of services with very different needs in terms of QoS, bit rate, delay; asymmetrical connections, etc. In fact, the proposed algorithms will be tested in a realistic testbed environment, which aim is to provide useful insights of the algorithms capabilities.

The project stands on two parallel activities: algorithm development and simulation, and demonstration of the technology.

Quantitative results as well as subjective QoS perception will be feedback to the algorithm development activity to tune the algorithms to the requirements of target services.
The simulation activity aids to develop and test, in a first step, algorithms for RRM and QoS Management. For that, two sets of simulators will be developed one set for UTRA/TDD and another one for UTRA/FDD. Each set consists of two simulators (system simulator and multiservice simulator), each addressing different views of the systems. The system simulator aims to simulate the air interface in a multicell, multiuser environment for both TDD and FDD. As a result a statistical characterization of the air interface behaviour is obtained. Nevertheless, RRM and QoS Management algorithms are not analysed at this level. So, a new tool - multiservice simulator – is considered, in which a multiservice environment with different algorithms is studied in a flexible way. The combination of these two tools provides a complete platform for algorithm specification and test. In order to test the algorithms, their simulation is not enough and therefore the services must be validated in an environment as close as possible as will be in the real world. That is why a testbed, which includes mobile multimedia applications, will be used. The aim of the testbed architecture is to provide a software definable and flexible platform, able to be configured in different ways, to allow experimental evaluation of the QoS algorithms provided by the Radio Resource and QoS Management work-package. The generic structure of this testbed is shown in the figure.

Key Issues

- To develop algorithms and procedures for traffic control and dynamic bandwidth management, able to efficiently provide packet switched services guaranteeing QoS.
- To develop a flexible HW/SW platform including multimedia terminals, UMTS network elements and IP connectivity, able to support real-time multimedia calls.
- To integrate the RRM and QoS Management algorithms, the multimedia application and the HW/SW platform.
- To contribute actively to the standardisation, taken into account the new identified requirements and algorithms for UMTS RRM optimisation at relevant standardisation bodies including ETSI, IETF etc.
- To disseminate the results in workshops, conferences and relevant publications.

Expected Impact

The ARROWS project will define and evaluate new and efficient Radio Resource Management methodologies, including both call admission and allocation of the radio resources (scheduling), for the UMTS Radio Access Network. Simple mechanisms for deriving the Radio Bearer QoS parameters from the end-to-end QoS application requirements will also be studied, including the interactions between call control, application signalling and QoS negotiation procedures. Moreover, interfacing with external networks considering IETF policies will be supported at IP level. The results of the ARROWS project will be presented on international conferences, in journals and in a workshop organised by the project. Besides, it is expected that a significant part of the disseminations of results will be contributions of the ARROWS concepts and results to the international standardisation bodies.

List of participants

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<th>Institution</th>
<th>Country</th>
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<tbody>
<tr>
<td>Universitat Politecnica de Catalunya</td>
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<td>TILAB S.p.A</td>
<td>I</td>
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<td>INESC PORTO</td>
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<td>Telefónica I+D</td>
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<td>University of Limerick</td>
<td>IRL</td>
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Contact

Fernando Casadevall
Universitat Politecnica de Catalunya
Campus Nord UPC- Edifici D4
Jordi Girona 1-3
08034-Barcelona (Spain)
Tel: +34 93 401 6524
Fax: +34 93 401 7224
E-mail: ferranc@tsc.upc.es
Web page: www.arrows-ist.upc.es