

Graduation project: 'Radio resource management in multi-access networks'

Project duration: 6-9 months, starting in Q1 '06

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Location: TNO ICT, Delft

Introduction

The concept of multi-radio (heterogeneous) access networks is currently considered as strong candidate for the next generation wireless networks. This concept incorporates conventional cellular networks such as GSM/GPRS ('GERAN') or UMTS ('UTRAN') for wide area coverage, while local-area networks such as IEEE 802.11 WLANs, HIPERLAN/2 and/or several personal area networks (PN), possibly interconnected in ad hoc fashion are covering local traffic hot spots. This concept is visualized in Figure 1.

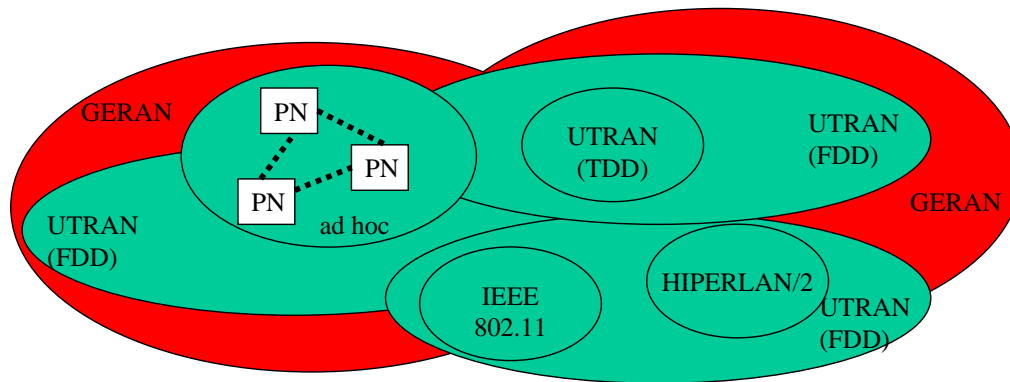


Figure 1: A multi-radio access network.

Radio resource management is a suite of mechanisms that aims at the efficient provisioning of adequate service quality in a radio access network. Examples of radio resource management mechanisms are call admission control, packet scheduling, bit rate adaptation and transmit power control. In a multi-access network such as envisaged for the near-to-medium-term future, an additional dimension of radio resource management optimization is related to the selection of the most adequate access network(s) to serve a given call, considering possible conflictive performance aspects such as resource efficiency, provided service quality and associated costs. In general, radio resource management in multi-access network is a very important and challenging issue.

Project description

The graduation project concentrates on the **development, simulation** and **evaluation** of radio resource management algorithms in a multi-access network, integrating both cellular and hot spot network technologies. These three stages will be loosely interleaved during the project, as e.g. new insights from the evaluation step may lead to adjustment of the developed algorithms.

In generic terms, these radio resource management algorithms are characterized by a *trigger*, i.e. an event that initiates the radio resource management procedure, e.g. the generation of a new call, a set of *input parameters*, e.g. the current loading of all access networks and/or the requested service quality of a newly generated call and a *decision rule*. In the **development stage**, all three components need to be

considered. In the **simulation stage** of the project both the considered *network technologies* and the developed *radio resource management algorithms* need to be implemented. In addition, relevant performance measures need to be determined and implemented. The **evaluation stage** then consists of the *formulation, execution, post-processing* and *discussion* of well-targeted simulation scenarios.

Finally, the developed models, algorithms and implementations, as well as the considered simulation scenarios and the obtained results and conclusions are to be documented in a *graduation report*.

The project is carried out as part of the European project 'Ambient Networks', (see www.ambient-networks.org). TNO ICT is one of about 40 international partners in this IST project, comprising e.g. network equipment vendors, mobile network operators, universities and research institutes.

Student profile

The ideal student has affinity with / interest in mobile communications, performance evaluation, programming and computer simulations. Programming experience in Matlab is much appreciated asset.

What does TNO ICT offer?

TNO ICT offers the opportunity to work with the latest developments in the field of mobile communication networking technology, and to interact with researchers both at TNO ICT and internationally, via the 'Ambient Networks' project.