

## M.Sc.-Assignment

TNO ICT, Delft & University of Twente – DACS

# UMTS ENHANCED UPLINK PERFORMANCE

ASSESSING THE 'ENHANCED UPLINK' UPGRADE OF THE UMTS MOBILE NETWORKING TECHNOLOGY

GRADUATION PROJECT: UMTS Enhanced Uplink performance - assessing the 'Enhanced Uplink' upgrade of the UMTS mobile networking technology

DURATION: 6-9 months

MANAGER: Joost Warners<sup>1</sup>

ADVISORS: Hans van den Berg<sup>1</sup> (<mailto:J.L.vandenberg@telecom.tno.nl>) and Remco Litjens<sup>1</sup> (<mailto:R.Litjens@telecom.tno.nl>)

<sup>1</sup> Department of Planning, Performance & QoS, TNO Information and Communication Technology, Delft

## BACKGROUND

As a successor to the second-generation (2G) GSM/GPRS mobile networking technology, since 2003 third-generation (3G) UMTS networks are being rolled out. Potential benefits of the 3G over the 2G technology are the enhanced spectral efficiency, greater network capacity and improved service quality enabling the support of a much broader range of applications. It is expected that only with the UMTS upgrades of High Speed Downlink Packet Access (HSDPA), deployed in 2006, and Enhanced UpLink (EUL), deployed in 2007, the 3G networks will fully exploit the potential of the 3G technology.

HSDPA is targeted towards enhancement of network capacity and service quality, in terms of accessibility, throughput and latency, in the 3G downlink, i.e. the transfer direction from the base station to the mobile terminal. This direction of transfer is noted to be significant for services that have a strong downlink character, e.g. file downloads, WWW browsing. In recent years, HSDPA has received much R&D attention.

EUL concentrates on analogous improvements in the opposite direction, which of key interest to services as peer-to-peer networking, MMS as well as bi-directional services such as internet (video) telephony. Although EUL applies similar so-called radio resource management mechanisms to achieve the performance objectives, their operation differs significantly from that of HSDPA due to the inherently different characteristics of the uplink direction of transfer. The standardization of the EUL technology has been finished only recently and the R&D activity in this field is yet very limited, providing ample room for relevant contributions.

## OBJECTIVE

The objective of the proposed graduation study is three-fold.

- (i) Understand the workings of the EUL technology. To this end, the graduate student will first need to become familiar with the basics of the UMTS technology, and subsequently concentrate on the EUL technology itself, by studying e.g. overview papers and the specifications.

- (ii) Assess the EUL performance potential in terms of network capacity and service quality. This activity will comprise of both a study of the scarce literature in the field and the execution of system-level simulations and/or stochastic analyses.
- (iii) Develop and optimize effective radio resource management algorithms, e.g. call admission control and packet scheduling to maximize the EUL benefits. This activity closely interacts with the second activity, as the developed algorithms need to be implemented in the simulator or captured in an analytical model, which in turn is utilized in the evaluation and optimization step.

All insights, models, algorithms and results will be document in a graduation report.

#### STUDENT PROFILE

The ideal candidate is a conceptual thinker and has affinity with / interest in mobile communications, stochastic analysis, performance evaluation, programming and computer simulations.

#### CONTACT

For further information, please contact Geert Heijenk ([geert.heijenk@utwente.nl](mailto:geert.heijenk@utwente.nl), Zi 5005).