Performance of High Speed Uplink Packet Access in a multi-cell UMTS environment

Master Project

Background

WCDMA-based UMTS (3G) systems are currently being deployed. Most systems in the field are based on release 4 of the 3GPP specifications. These systems offer data services and an increased capacity compared to GSM. The latest deployments include release 5, introducing HSDPA (High-Speed Downlink Packet Access). This solution introduces the concepts of link adaptation and fast scheduling in the downlink, creating both a higher peak rate and a larger system capacity. This however is introduced at the cost of a 'best-effort' performance, where the end-user does not receive guarantees on the performance.

Starting in release 6, this downlink concept is copied to the uplink. HSUPA (High-Speed Uplink Packet Access) is in many ways similar to HSDPA, but also has it own specifics, as the uplink in WCMDA is very different from the downlink.

As the 3GPP specifications aim at interoperability while keeping the optimization to the individual manufacturers and operators, they provide a toolbox of options to the designer of the system. It is up to the designer to select the correct set of options and parameter setting, matching the purpose.

WMC has implemented EURANE as a tool to analyse the performance of end-user applications over WCDMA. EURANE includes a well developed model for HSDPA in a multi-cell environment. EURANE also includes an initial model for HSUPA in a near single-cell environment. A previous study indicated that the multi-cell behaviour is of major importance to the HSUPA performance.

Goal

Analysis of the performance of the WCDMA HSUPA in a multi-cell environment.

Description

The student must become familiar with the WCDMA release 6 air-interface. In addition, the student must make himself familiar with the model and implementation of EURANE.

The student will design the extension to the EURANE model, where the current HSDPA multi-cell model and the HSUPA single cell model both can serve as a starting point. The student must pay special attention to the radio propagation aspects of the uplink.

The student will define a number of scheduling algorithms for the uplink HSUPA scheduling, and analyze the performance of the algorithms through simulation. The aim of the algorithms is to create maximum capacity while maintaining a required quality for the end-user services.

The student will analyse the performance of the enhanced uplink in relation to the tuneable parameters and the environments in which the system is assumed to operate. The result will be documented and reported in a final report.

Practical issues

Duration: **39 weeks**

Location: **WMC**
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