Master Thesis – project at Ericsson Research: Energy Efficient LTE Site Operations

Description
Mobile broadband for cellular networks are continuously being evolved to meet the future demands for higher data rates, improved coverage and capacity. The enormous success of Smart Phones boosts mobile broadband date requirements. 4G, or Long Term Evolution (LTE) is commercial since three years back, and is being evolved by Ericsson and others in 3GPP. LTE brings radio features such as advanced uplink and downlink multi antenna solutions (MIMO) and larger bandwidths from aggregating multiple carriers. These and other features will bring peak rates of 1 GB/s, but also improves other characteristics such as coverage, delay and flexibility.

The capacity in an LTE network needs to be dimensioned to handle the peak data requirements. But in most places and during most of the time the traffic is much lower and there is therefore a large potential for reducing the total energy consumption in the network by dynamically adapting the configuration of the cellular sites to match the instantaneous capacity requirements. When there is no data to transmit in a cell, there is no need to have MIMO activated and there is also no need to configure the site with more than one omni-directional cell. A normal site is typically deployed with at least two transmitters in three sectors, requiring in total six energy consuming power amplifiers (PA) to be active all the time. By quickly switching between sector coverage with MIMO activated and omni-coverage with a SISO configuration, whenever there is no need for high data rates, we can utilize only one single PA most of the time and provide area coverage and service to low rate users with very low energy consumption, and only activate the high capacity capabilities provided by MIMO and sectorization when we need them.

This thesis work will investigate the user and system performance impact of such dynamic site operation, as well as evaluate the energy saving gains. A detailed radio network simulator developed at Ericsson will be used to study what happens with the users that are active when the base station site switches back and forth between a capacity optimized mode and an energy optimized mode. The study involves configuration of the two modes in the simulator, implementing the algorithm that controls when to switch between the modes, and running simulations in order to evaluate the solution. Different deployment strategies will be investigated and evaluated considering the performance in throughput and energy consumption.

Qualifications
This project aims at Master of Science (civilingenjör) students in electrical engineering, computer science, or computer engineering. Matlab and/or Java is our primary tool for modeling and simulation work, and excellent Matlab and/or Java knowledge and programming skills is a must. Background in optimization theory and telecommunication is preferred. Applicants with less than B/4.0 in average grade will not be considered.
Contact person:
Gunnar Bark, Ericsson AB, Linköping
 Gunnar.Bark@ericsson.com
+46107114642 or
+46730435104