

Abstract

In the past few decades, wireless communications have been growing rapidly and the growth rate is accelerating at a very fast pace. In order to meet this growing demand, researchers are struggling to solve two fundamental problems: (1) providing the spectrum resources needed to support clusters of dense users with very high data rate and (2) supplying the required spectrum at reasonable power requirement level. This thesis first outlines the extent of this capacity-power problem now and in the near future and discusses possible approaches to meet these difficult challenges. We start by introducing a new metric, called Total Energy Per Bit (TEPB), to be used as a measure for greening of the network. Then, a proposed vision of replacing Macro-eNBs with a large number of Pico-eNBs to bring the network closer to the users is provided. This naturally leads to casting the problem as an optimization problem with an objective function of minimizing the overall power consumption while supporting user demand with acceptable quality of service. Based on the optimization problem, we propose two algorithms based on the concept of self organizing network (SON) to switch on/off base stations. Simulation results show that both proposed switch on/off algorithms can improve the power requirement of the network while maintaining the required UE throughput by reducing the TEPB significantly.