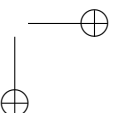
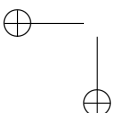


## Abstract

Performance requirements on mobile networks are tighter than ever as a result of the adoption of mobile devices such as smartphones or tablets, and the QoS levels that mobile applications demand for their correct operation. The data traffic volume carried in mobile networks for 2012 is the same as the total internet traffic in 2000, and this exponential growth tendency will continue in years to come. In order to fulfill users' expectations, it is imperative for mobile networks to make the best use of the available resources.

Heterogeneous networks (Hetnets) have the ability to integrate several technologies in a coherent and efficient manner in order to enhance users' experience. The first challenge of heterogeneous networks is to integrate several radio access technologies, which exist as a result of simultaneous technology developments and a paced replacement of legacy technology. A joint management of several RAT's enhances network's efficiency, and this influences user's experience. Another challenge of heterogeneous networks is the improvement of current macrocells through an efficient use of the electromagnetic spectrum. Some approaches aim to optimize the antennas or use higher-order modulation techniques, but a more disruptive approach is the use of dynamic spectrum techniques through a technology known as cognitive radio. Finally, heterogeneous networks should be able to integrate several layers. In addition to the well studied micro and pico cells, a new generation of cheaper and easily configurable small cell networks have been proposed. However, its success is attached to its ability to adapt to the current context of mobile networks.



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This thesis aims to analyze three different aspects of heterogeneous networks from a resource management and access control point of view. In the first part, a joint call admission control problem is studied for a network with two radio access technologies and two services. The impact of vertical handoff is studied and the main characteristics of the optimal solutions are described as function of the services and technologies' specifications. In the second part, an analysis over a dynamic spectrum access problem is done in order to establish the effect of fractional guard channels to perform spectrum handovers and to find an optimal value for this parameter. In the final part of this work a signaling load problem over a small cell network is analyzed, and two new schemes for location management are proposed based on a local anchor and the use of direct links among small cells.