Providing sufficient QoS is a key element both for the network operators and the end users. In order to meet the diverse QoS requirements, performance evaluation plays a crucial role in the networks' efficient design process to ensure their successful deployment and exploitation in practice. However, the complexity associated with future cellular systems makes it a challenging task. The measurement and modeling are the two critical approaches for performance evaluation of the network. To fully realize the potential of cellular networks, queueing theory has proved to be a very powerful mathematical tool for appropriate analytical modeling and performance analysis of corresponding complex cellular systems. It serves to model a wide range of congestion scenarios to predict the stochastic (random) behavior of cellular mobile networks. With its latest methodologies, it continues to be one of the most extensive theories of stochastic models to analyze complex systems and to quantify their performance to high accuracy.

The work in this thesis presents new spectrum management schemes and the corresponding analytical models based on the Markov chain for future cellular networks. The queueing-theoretic approach is used to analyze the behavior of a particular cellular system under consideration. The study here is devoted to evaluate the performance of the proposed schemes with the aim of future networks' performance enhancement while addressing the issues that arise in current cellular networks. The important conclusions drawn from these studies allow network operators to make the right decisions about how they deploy capital and maintain network QoS.

1.2 Research Objectives

The whole study of this thesis corresponds to the following objectives.

- To design and analyze new spectrum management strategies with the aim to improve access flexibility in radio spectrum under different network scenarios.

- To integrate realistic features into Markov chain modeling which allows capturing all the network operations in order to develop more practical and accurate performance evaluation models.