The radio and network planning and optimisation are continuous processes that do not end after the network has been launched. To achieve the best trade-offs, especially between quality and costs, operators make use of several coverage and capacity enhancement methods. The research from this thesis proposes methods such as the implementation of cell zooming and Relay Stations (RSs) with dynamic sleep modes and Carrier Aggregation (CA) for coverage and capacity enhancements.

Initially, a survey is presented on ubiquitous mesh networks implementation scenarios and an updated characterization of requirements for services and applications is proposed. The performance targets for the key parameters, delay, delay variation, information loss and throughput have been addressed for all types of services. Furthermore, with the increased competition, mobile operator’s success does not only depend on how good the offered Quality of Service (QoS) is, but also if it meets the end user’s expectations, i.e., Quality of Experience (QoE). In this context, a model for the mapping between QoS parameters and QoE has been proposed for multimedia traffic.

The planning and optimization of fixed Worldwide Interoperability for Microwave Access (WiMAX) networks with RSs in conjunction with cell zooming has been addressed. The challenging case of a propagation measurement-based scenario in the hilly region of Covilhã has been considered. A cost/revenue function has been developed by taking into account the cost of building and maintaining the infrastructure with the use of RSs. This part of the work also investigates the energy efficiency and economic implications of the use of power saving modes for RSs in conjunction with cell zooming. Assuming that the RSs can be switched-off or zoomed out to zero in periods when the traffic exchange is low, such as nights and weekends, it has been shown that energy consumption may be reduced whereas cellular coverage and capacity, as well as economic performance may be improved. An integrated Common Radio Resource Management (iCRRM) entity is proposed that implements inter-band CA by performing scheduling between two Long Term Evolution – Advanced (LTE-A) Component Carriers (CCs). Considering the bandwidths available in Portugal, the 800 MHz and 2.6 GHz CCs have been considered whilst mobile video traffic is addressed. Through extensive simulations it has been found that the proposed multi-band schedulers overcome the capacity of LTE systems without CA. Result shown a clear improvement of the QoS, QoE and economic trade-off with CA.
Before looking into more detail what actually will be new (and different) in WCDMA radio network planning and optimisation, it is useful to summarise some of the defining characteristics of 3G multi-service radio networks. One can characterise 3G radio access with the following attributes:

- Highly advanced radio interface, aiming at great flexibility in carrying and. Interference management for heterogeneous networks with spectral efficiency improvement.

