The presented final career project deals with wireless communication systems. To be more precise, it investigates ad-hoc WLAN systems based on IEEE 802.11 standard.

The aim of this work is to propose, to study and to analyze, by means of computer simulations, different Cross-Layer techniques in order to improve the WLAN systems’ efficiency. As a consequence, the use of the available radio resources is optimised and the energy consumption of the mobile terminals is reduced.

Cross-Layer techniques consist of exchange of certain information between the traditional OSI layers in mobile communication systems. With the proposed techniques the MAC layer adapts the transmissions to the wireless channel state according to some information of the physical layer. In particular, the back-off algorithm defined in the 802.11 standard is modified in order to prioritize the non-successful transmissions based on the measured signal strength.

In order to study the proposed techniques a platform in C++ has been designed. The aforementioned platform simulates an ad-hoc wireless system where the Cross-Layer techniques have been applied in different scenarios under realistic channel conditions.

The obtained results indicate that the proposed Cross-Layer techniques improve the reference system’s efficiency in terms of throughput, average delay, reduction in collisions, energy saving and available resources utilization. Therefore, they can be useful in the realization of future wireless communication systems.