

Abstract

This dissertation addresses the problem of multimedia delivery over multi-hop ad hoc wireless networks, and especially over wireless sensor networks. Due to their characteristics of low power consumption, low processing capacity and low memory capacity, they have major difficulties in achieving optimal quality levels demanded by end users in such communications.

In the first part of this work, it has been carried out a study to determine the behavior of a variety of multimedia streams and how they are affected by the network conditions when they are transmitted over topologies formed by devices of different technologies in multi hop wireless ad hoc mode. To achieve this goal, we have performed experimental tests using a test bench, which combine the main codecs used in audio and video streaming over IP networks with different sound and video captures representing the characteristic patterns of multimedia services such as phone calls, video communications, IPTV and video on demand (VOD). With the information gathered in the laboratory, we have been able to establish the correlation between the induced changes in the physical and logical topology and the network parameters that measure the quality of service (QoS) of a multimedia transmission, such as latency, jitter or packet loss. At this stage of the investigation, a study was performed to determine the state of the art of the proposed protocols, algorithms, and practical implementations that have been explicitly developed to optimize the multimedia transmission over wireless ad hoc networks, especially in ad hoc networks using clusters of nodes distributed over a geographic area and wireless sensor networks.

Next step of this research was the development of an algorithm focused on the logical organization of clusters formed by nodes capable of adapting to the circumstances of real-time traffic. The stated goal was to achieve the maximum utilization of the resources offered by the set of nodes that forms the network,

allowing simultaneously sending reliably and efficiently all types of content through them, and mixing conventional IP data traffic with multimedia traffic with stringent QoS and QoE requirements. Using the information gathered in the previous phase, we have developed a network architecture that improves overall network performance and multimedia streaming. In parallel, it has been designed and programmed a communication protocol that allows implementing the proposal and testing its operation on real network infrastructures.

In the last phase of this thesis we have focused our work on sending multimedia in wireless sensor networks (WSN). Based on the above results, we have adapted both the architecture and the communication protocol for this particular type of network, whose use has been growing hugely in recent years.