

Abstract

This thesis dissertation addresses the problem of providing video streaming services over mobile wireless ad hoc networks. This sort of network represents a hostile environment for this kind of real-time data transmission to the extent that obtaining a good quality of viewer experience is challenging and still under study. Besides the research point of view, providing high-quality multimedia services is decisive for the practical usability and feasibility of wireless ad hoc networks so that service providers can broaden the range of services offered. So far, mobile wireless ad hoc networks have been used to provide network connection among users who could not have connectivity otherwise. However, quality expectations and requirements have been increased notably, fostered by the advent of real-time multimedia applications over mobile devices. Due to the considerable processing and bandwidth constraints underlying these types of devices, coupled with their ability to move freely, it becomes a difficult task to achieve an acceptable quality of service throughout the entire video transmission.

Thus, the contribution of this thesis work is twofold. On the one hand, the main problems and limitations that may be encountered and should be faced when deploying real-time services over mobile wireless ad hoc networks are analyzed and discussed. Bandwidth constraints and node mobility are portrayed as the major causes that prevent good quality of service and smooth video playback. On the other hand, following then the aim of improving video streaming quality, this thesis proposes practical solutions that involve diverse routing and cross-layer techniques.

One of the proposed approaches focuses on hierarchical routing. Hierarchical arrangement of network nodes may reduce packet interference as well as offer a structured architecture that reduces control traffic overhead. Particularly, the proposed hierarchical routing protocol aims at providing scalability when the number of nodes grows, while maintaining complexity as low as possible. The resulting reduction in packet losses and video playback interruptions finally enhances the quality of received video streams.

Furthermore, on the basis that the nodes in an ad hoc network are willing to perform routing tasks, every node could become essential for the proper network operation and routing performance. In tune with this philosophy, a new cross-layer mechanism for recovering lost packets is proposed. By overhearing packets over the wireless shared medium, any node in the surrounding area of the destination endpoint can altruistically retransmit those video packets that have not been correctly received at destination. Moreover, due to the video awareness and frame prioritization algorithm considered in this proposal, it becomes very convenient for real-time video streaming services. The results show that the presented mechanism succeeds in improving video quality and user experience, especially when packet losses are caused due to the mobility of the destination node.