

IEEE 802.11e 無線網路下影像串流之 MAC-centric 跨層設計

摘要

近十年來，由於無線網路的普及與人們對於影像串流服務的需求愈高，導致人們迫切需要更好的服務品質。但在 IEEE 802.11 無線網路中，本身的設計並非針對影像串流來設計，為讓影像串流能在無線網路更有效率，我們必須重新設計適合影像串流的無線網路。本研究首先探討 IEEE 802.11 MAC 層 DCF (Distributed Coordination Function) 與 802.11e EDCA (Enhanced Distributed Channel Access) 機制的潛在問題。由於 DCF 與 EDCA 並未特別對影像串流做設計，會導致具有時延(delay time)限制的影像封包等待過久造成失效，卻仍繼續傳送。本研究提出幾個有效方法，改善原本 IEEE 802.11 無線網路對影像串流傳輸效能不彰的現象。我們將利用跨層設計使 MAC 層能取得影像串流封包資訊，並改善 DCF 與 EDCA 的重傳(retransmission)機制，使用 time limit 與 retry limit 混和設計節省不必要的等待時間，並使用 single-video multi-level queue 改善傳輸效能。最後本研究將利用網路模擬器 NS-2 (Network Simulator ver. 2) 與影像串流測試實驗架構 myEvalvid-NT 作不同效能的驗證比較並評估我們所提出方法的有效性。

MAC-centric Cross-Layer Design for Video Streaming in IEEE 802.11e Wireless Network

Abstract

Over the past decade, wireless network access and video streaming services have become more popular than ever. People are eager to have better quality of video streaming services over wireless network. However, IEEE 802.11 DCF and IEEE 802.11e EDCA are not specifically designed for video streaming. This leads to the problem of transmitting overdue video packets and thus degrades both the network performance and video quality. In this paper, we propose a hybrid design framework to improve the quality of video streaming. This framework consists of a MAC-centric cross-layer architecture to allow MAC-layer to retrieve video streaming packet information (slice type and transmission deadline), a retransmission mechanism of hybrid retransmission deadline and retry limit to save unnecessary packet waiting time, and a single-video multi-level queue to prioritize I/P/B slice delivery. Simulations show that the proposed methodology outperforms IEEE 802.11e, IEEE 802.11e Timebase and IEEE 802.11e MultiQ in packet loss rate, invalid packet ratio, lost and invalid packet ratio, delay time, jitter, and PSNR.