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Performance of Wi-Fi coordination schemes for VoIP in the presence of FTP data.

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Abstract

Evolved 3GPP cellular core networks have made co-existence of heterogeneous Wireless Access networks (HetNets) possible. The evolved core network along with the development of multimode end user devices have led to the realisation of converged Access Networks. Wireless Local Area Networks (WLANs) are assuming a prominent role in the telecommunications ecosystem due to their cost effectiveness, ease of deployment and operation in the free spectrum. Although WLANs are only data centric, there will be greater demand for Voice over Internet Protocol (VoIP) over WLANs as multimode smart-phones become accessible and operators integrate WLANs into their business models. Therefore, it is imperative that WLAN's ability to support VoIP services is thoroughly understood. Currently, the design of call admission control mechanisms for WLANs that support heterogeneous (data and voice) traffic is a challenging issue. The challenge stems from the difficulty of modelling the behaviour heterogeneous traffic, mixed VoIP and data traffic.

IEEE 802.11 WLANs use two types of medium access schemes, the polling based schemes and the contention based schemes. Both types of WLAN coordination schemes have not been thoroughly investigated for their ability to support VoIP over WLANs in the presence of File Transfer Protocol (FTP) data sessions. File Transfer Protocol (FTP) is a Transport Control Protocol(TCP) based file exchange protocol. TCP was optimised for wired networks and as a result it is unsuitable for wireless network. Furthermore, it was not optimised to co-exist with VoIP and as a result of its burstiness it has severe impact on the jitter, packet-loss and delay of VoIP traffic.

The purpose of the work presented in this report is to evaluate the performance of Distributed Coordinated Function (DCF), Point Coordination Function (PCF) and Enhanced Distributed Coordinated Function (EDCF) techniques' ability to manage Voice Over Internet Protocol (VoIP) over WLAN in the presence of contending heavy FTP data. The key question this work seeks to answer is, are the Medium Access Control (MAC) coordination techniques in their present form capable of carrying VoIP data in the presence of other data. In other words, how realistic is the deployment of VoIP services with FTP services in the same network, using the current coordination schemes for WLAN? Can these coordination schemes be improved by using current MAC enhancements such as fragmentation and increasing the Access Point buffer?

The study is carried out for IEEE 802.11g as this is still the most widely deployed standard. The performance is evaluated by setting up a network of stations that generate both voice and FTP traffic in OPNET. The two network configurations are 30-Voice stations and 30-FTP stations; 15-Voice stations and 45-FTP stations. Moreover, two codecs G.711 and G.723 are compared to assess the effect of codec selection on performance.