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On Quality of Monitoring for Multichannel Wireless Infrastructure Networks

Abstract:

Passive monitoring utilizing distributed wireless sniffers is an effective technique to monitor activities in wireless infrastructure networks for fault diagnosis, resource management, and critical path analysis. In this paper, we introduce a quality of monitoring (QoM) metric defined by the expected number of active users monitored, and investigate the problem of maximizing QoM by judiciously assigning sniffers to channels based on the knowledge of user activities in a multichannel wireless network. Two types of capture models are considered. The user-centric model assumes the frame-level capturing capability of sniffers such that the activities of different users can be distinguished while the sniffer-centric model only utilizes the binary channel information (active or not) at a sniffer. For the user-centric model, we show that the implied optimization problem is NP-hard, but a constant approximation ratio can be attained via polynomial complexity algorithms. For the sniffer-centric model, we devise stochastic inference schemes to transform the problem into the user-centric domain, where we are able to apply our polynomial approximation algorithms. The effectiveness of our proposed schemes and algorithms is further evaluated using both synthetic data as well as real-world traces from an operational WLAN.