Title: Delay Guarantees of a Realistic WiFi-based First Responder Ad-Hoc Network

Author: Orangel Contreras, Ana Aguiar

Abstract: Wirelessly connected sensors are increasingly used in critical applications, e.g. firefighters or drone rescuing team, raising the need to quantify performance guarantees. In this work, we characterize the end-to-end delay on a Mobile Wireless Sensor Network (MWSN) with an analytical method based on Stochastic Network Calculus (SNC) with Moment Generating Functions (MGFs). The particularity of the studied scenario is that the network is composed of two segments: one with multiple nodes connected by a contention-based channel using the Distributed Coordination Function (DCF), and another consisting of a link prone to disconnection due to the mobility pattern the first segment's node groups. The first was modelled through the expected per-packet service time in a non-saturated homogeneous channel, whereas the latter through a Discrete Time Markov Chain (DTMC). Especially the use of a non saturated channel model, more adequate for sensing scenarios, is novel in this analytical framework. Numerical performance bounds are provided for an example application in which the effects of pernode offered load, scheduling algorithms and connectivity on the link to the sink are quantified for different network sizes.