Notice and Invitation

Oral Defense of Doctoral Dissertation

The Volgenau School of Engineering, George Mason University

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Analytical Modeling and Algorithms for Coexistence of Opportunistic and Random Access Technologies

Thursday, April 12, 2018, 8:30 am-10:30 am

Engineering Building, Room 3507

All are invited to attend.

Committee

Dr. Bijan Jabbari

Dr. Brian Mark

Dr. Jill Nelson

Dr. Song Min Kim

Abstract

The behavior of traffic in wireless networks is becoming more and more complex due to the diversity of sources as well as the associated access protocols and transmission policies, resulting in high degrees of randomness in the aggregate traffic load. This gives rise to imminent need for more accurate and efficient models to capture the random, bursty, and time-variant characteristics of wireless networks. Especially, it is of high importance to take into account the randomness in the occupancy of wireless channels towards modeling a fair and efficient coexistence for dissimilar radio access technologies operating in a common spectrum.

Recognizing the inherent distinctions between a schedule-based and a random access contention-based wireless network, and the inevitable need for them to share the scarce resource of spectrum, this dissertation takes WiFi and LTE-U as examples to address two important problems: modeling temporal characteristics of a random-access network (WiFi), and exploiting the temporal opportunities therein by a schedule-based network (LTE-U).

Towards this end, we first develop an analytical framework based on Markov Modulated Batch Poisson Processes (MMBPP) that captures the underlying dynamics and random bursts of WiFi network traffic to statistically model the characteristics of white spaces in WiFi channel. Next, under the developed framework, we propose an opportunistic coexistence algorithm that enables dynamic exploitation of WiFi white spaces for LTE-U transmissions, such that the latency imposed on WiFi activity is minimized, while LTE-U maximally utilizes the available spectral resources. Finally, towards a simple, model-free, and robust implementation, we propose an alternative algorithm based on reinforcement learning for the opportunistic coexistence of LTE-U with WiFi.