Towards Context-Aware,
Self-Organizing Wireless Small Cell Networks
by
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Abstract
Delivering high-quality, bandwidth-intensive wireless services anytime and anywhere requires disruptive changes to the architecture and operation of today's wireless systems. Promising examples of such changes include: a) viral deployment of low-power, low-cost small cell base stations, b) direct device-to-device communications over the cellular and WiFi bands, and c) smart, proactive caching at different levels of the wireless system. Owing to this prospective evolution, the once-carefully planned networks will become an increasingly heterogeneous, unplanned mix of different types of devices, infrastructure nodes, technologies, and spectrum bands. Efficiently managing the scarce network resources in such a diverse and dynamic environment mandates a paradigm shift from centralized, user-agnostic approaches toward self-organizing, user-centric wireless networks. In this talk, we will introduce a novel framework for self-organizing resource management in next-generation wireless systems that will expedite this transformation. The proposed framework allows to reap the benefits of emerging wireless technologies by increasing the network's intelligence and by exploring a dimension that has often been overlooked – the user’s context. We will discuss the various components of this framework while highlighting its promising outlook for boosting the wireless network's performance. Then, we will study, in detail, the self-organizing perspective by exploring the use of matching theory – a Nobel prize-winning framework from economics – for the analysis of an illustrative social network-aware resource management and caching scenario in wireless small cell networks with device-to-device communication capabilities. We then shed light on future works and opportunities in this and other related research areas. We conclude the talk by discussing other ongoing research activities in our group.

Biography
Walid Saad is an Assistant Professor at the Bradley Department of Electrical and Computer Engineering at Virginia Tech, where he leads the Network Science, Wireless, and Security (NetSciWiS) laboratory part of the Wireless@VT research group. His research interests include wireless and small cell networks, game theory, cybersecurity, and cyber-physical systems. Dr. Saad is the recipient of the NSF CAREER award in 2013 and of the Young Investigator Award from the Office of Naval Research (ONR) in 2015. Dr. Saad received the 2015 Fred W. Ellersick Prize from the IEEE Communications Society. He was also the author/co-author of three conference best paper awards at WiOpt in 2009, ICIMP in 2010, and IEEE WCNC in 2012.

** ALL ARE WELCOME **