

Hybrid Modeling for Mobile Ad-Hoc Networks

Speaker: Dr. Yi Qian, ECE Dept, University of Puerto Rico at Mayaguez

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Time: 10 am - 12 noon

Venue: WH 413 (CReWMaN Lab)

Abstract:

There has been a great deal of work on ad-hoc network communications and protocol issues, and research is ongoing to expand the scope and quality of service of these networks. The performance of ad-hoc networks is normally studied via simulation over a fixed time horizon using a steady-state type of statistical analysis procedure. However, due to the dynamic nature of the network topology, such an approach may be inappropriate in many cases as the network may spend most of the time in a transient or non-stationary state.

This talk will discuss how to develop a performance modeling framework and detailed techniques for analyzing the time varying performance of mobile ad-hoc networks. Our approach is a hybrid of discrete event simulation and numerical analysis techniques. Network queues are modeled using fluid-flow based differential equation models which are solved using numerical methods, while node mobility is modeled using either discrete event simulation techniques or stochastic modeling of adjacency matrix elements. Extensions to the basic model will include incorporating energy consumption, interference and propagation effects into the hybrid modeling framework to improve its fidelity. The proposed techniques lead to insights into basic ad-hoc network behavior, for example, how mobility affects the stability of the network topology from a performance standpoint and what types of mobility patterns are particularly advantageous or detrimental to network performance. Additionally the models can serve as the basis for the application of control theory techniques to develop dynamic network control algorithms.

Biography:

Dr. Yi Qian is an assistant professor in the Department of Electrical and Computer Engineering, University of Puerto Rico at Mayaguez (UPRM). Prior to joining UPRM in July 2003, he worked for several start-up companies and Nortel Networks in the areas of voice over IP, fiber optical switching, Internet packet video, network optimizations and network planning for wireless and satellite networks. Dr. Qian received Ph.D. degree in Electrical Engineering from Clemson University. His current research interests include design, modeling, simulation, performance analysis, and security for next generation wireless networks, sensor networks, optical and high-speed networks and the Internet. He has publications and patents in all these areas. He has been on numerous conference technical committees including serving as the General Chair of the International Symposium on Wireless Pervasive Computing (ISWPC 2007), Technical Program Co-Chair of IEEE GLOBECOM 2006 - Symposium on Wireless Communications and Networking, and Technical Program Co-Chair of the Workshop on Information Assurance 2006 and 2007. He is currently serving on the editorial board for Wireless Communications and Mobile Computing Journal. He is also the guest editor for IEEE Communications Magazine, special issue on Advances in Mobile Multimedia Broadcasting. Dr. Yi Qian is a member of Sigma Xi, ACM, IEICE, IEEE Communications Society, Computer Society, and Vehicular Technology Society.