SEMINAR NOTICE:

An Introduction of Mingsheng Gao's Work

TIME & LOCATION:

Illinois:
Tuesday, January 10 at 7:30 p.m.
Coordinated Science Lab - Room 238
ADSC Videoconference Room

Singapore:
Wednesday, January 11 at 9:30 a.m.
@ ADSC - Level 8, Fusionopolis, Connexis North

Mingsheng Gao

Research Fellow with the School of Computer Engineering at Nanyang Technological University in Singapore

Abstract:

This talk consists of three parts: (1) a scheduling and dispatch for smart grid; (2) a transmission scheme for underwater acoustic communications; and (3) a rate adaptation algorithm for wireless mesh networks.

In (1), a stochastic programming based scheduling and dispatch for smart grid with intermittent wind power is investigated. From the viewpoint of electricity supply, a power provider's electricity energy is assumed to comprise two parts: one is procured from the wholesale market/national power grid; the other is produced by its own wind generation with the power being a function of wind speed that follows the Weibull distribution; while from the viewpoint of electricity demand, it serves two categories of energy users, namely traditional energy users and opportunistic energy users. Taking a unit time into account, finding the profit of the power provider can then be modeled as a stochastic programming problem with three system parameters that need to be determined, i.e., the electricity procurement from wholesale market/national power grid, the day-ahead price corresponding to traditional energy users and the real-time price corresponding to opportunistic energy users. Our objective is to maximize the profit of the power provider while preserving the balance between the electricity supply and demand.

In (2), a transmission scheme for underwater acoustic communications is proposed. Due to the half-duplex property of the underwater acoustic channels, the classic stop-and-wait ARQ (SW-ARQ) and its variants are generally thought to be the only class of ARQ protocols that can be applied in underwater. When combined with the large propagation delay property of the underwater acoustic channels, the use of SW-ARQ and its variants makes the throughput performance of underwater acoustic communication systems very inefficient. In this work, we propose a transmission scheme that takes advantage of the long propagation delay in underwater to enable the use of continuous ARQ protocols over underwater acoustic channels. Simulation results show that our proposed transmission scheme allows much higher throughput to be achieved than both the classic SW-ARQ and its variants.

In (3), a rate adaptation algorithm for wireless mesh networks will be presented. In IEEE 802.11-based multihop wireless mesh networks (WMNs), nodes that are a number of hops away from the gateway (GW) face two-fold contentions: namely channel access contention between itself and other nodes, and traffic contention between its own and relayed traffic. As a result, they suffer from low throughput and even starvation, which results in unfairness in transmissions. In this work, we develop a rate control mechanism that can flexibly coordinate the tradeoff between throughput and fairness to adapt to different application scenarios by combining a rate adaptation algorithm, an adaptive capacity estimation algorithm and a queue management scheme. More specifically, with the adaptation algorithm, nodes can dynamically change their rates according to the number of flows observed or to the updated rate overheard; with the adaptive capacity estimation algorithm, nodes can adjust their rates by varying the fairness index provided that a certain fairness index threshold is satisfied; while the queue management scheme enables nodes to transmit their data packets originated from different flows (including their local flows) in a proportional manner. To evaluate the effectiveness of the proposed scheme, we demonstrate its performance via ns-2 simulations in terms of throughput, fairness as well as convergence property.

Biosketch:

Mingsheng Gao received his PhD degree in Electrical Engineering from Southeast University, Nanjing, China, in 2005. Before that, he worked as a software engineer and senior software engineer at Zhongxing Telecommunication Equipment (ZTE) Corporation for several years. From Dec. 2005 to July 2008, he was with the Department of Electronic Engineering at Shanghai Maritime University as a lecturer and an associate professor. From Aug. 2008 to July 2009, Dr. Gao was a research fellow with the Department of Electrical and Computer Engineering, National University of Singapore (NUS). After that, he has been a research fellow with the School of Computer Engineering, Nanyang Technological University (NTU). His research interests include smart grid, wireless sensor networks and multimedia communications.