

SEMINAR NOTICE:

Co-simulation and Emulation Platforms for the Smart Grid

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Abstract:

The power grid is the largest physical system the man has ever engineered. Due to its indispensable role in modern society, it must be dependable and reliable, efficient, fault tolerant, and secure. There have recently been special focus and enormous efforts to make the grid smart by equipping it with the ability to sense, to infer about itself, and to self-react and self-heal in face of faults. The future smart grid will not only include smart meters at the customer site and phasor measurement units in the transmission and distribution substations, but also it will include smart appliances that adjust their operations depending on instantaneous electricity prices, and myriad of communicating devices that engage in feedback networked control. The future smart grid's realization and further progress will undoubtedly necessitate the availability of simulation and emulation platforms that can be used to validate and evaluate different algorithms and protocols prior to real-life deployments.

In this talk, I will focus primarily on two platforms that I have built for the smart grid simulation. First, I have implemented a co-simulation platform for cyber-physical systems by integrating a physical systems simulator and a networks simulator. To achieve the integration, I proposed and validated several synchronization mechanisms between the simulated clocks/timings of both individual simulators. Second, I have designed and developed an integrated simulation and emulation platform for smart grid PMU-based applications. This platform integrates Simulink running in real time, a virtualized software-based PMU, and a network emulator. I will present demonstrative examples to illustrate the benefits of and to validate each platform.

Biosketch:

Ahmad T. Al-Hammouri is an Assistant Professor in the Department of Network Engineering and Security at Jordan University of Science and Technology. He received the B.S. degree with first-class honors in Electrical Engineering from Jordan University of Science and Technology, Irbid, Jordan, in 2000; and the M.S. and the Ph.D. degrees in Computer Engineering from Case Western Reserve University, Cleveland, Ohio, in 2004 and 2008, respectively. He has held research positions at Case Western Reserve University's Netlab. During the Summer of 2011, he was a Visiting Research Associate at the Department of Industrial Information and Control Systems, KTH—Royal Institute of Technology, Stockholm, Sweden. In this Summer, he is a Visiting Research Associate at the Department of Distributed Systems, Institute for Parallel and Distributed Systems, University of Stuttgart, Stuttgart, Germany. His Research interests are in the areas of cyber-physical systems, smart power grid, Internet congestion control, and middleware for real-time sense-and-respond systems.

