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Title:	**Component Based Networking and Design of Wireless Network Protocols**
Speaker:	**John S. Baras**
	Lockheed Martin Chair in Systems Engineering **University of Maryland College Park**
Time:	10:00-11:30 , 2011-3-23
Venue:	FIT 1-315

Abstract:

We present a new methodology to design wireless communication network protocols based on the decomposition of protocols into fundamental components. The new formal and model-based approach allows a systematic study of network performance and cross-layer analysis and design of routing, scheduling, MAC and PHY layer protocols. The routing protocol is divided into multiple components. We use the method to design new and improved neighbor discovery and topology dissemination components for mobile wireless networks. To analyze and optimize the topology dissemination component we introduce the stable path topology control problem for link-state routing in mobile multihop networks. We formulate the selective link-state broadcast as a graph pruning problem with restricted local neighborhood information and we develop general conditions for the distributed local policies to preserve the stable routing paths globally. We provide an efficient algorithm, to compute these local policies that yield a pruned graph. We demonstrate that this algorithm, when used with the popular ETX metric, outperforms topology control mechanisms commonly used for Mobile Ad Hoc Networks such as in the OLSR protocol. We illustrate, using examples, that composition operators used in many function computations in a networked system follow the semiring axioms. We present an abstract framework, using a special idempotent semiring algebraic path problem, to handle multiple metrics for composition. Under this framework, we identify a class of tractable composition rules that can be solved efficiently in different multi-criteria settings. We demonstrate, using an example from trusted routing, that logical security rules of admission control can be combined with delay performance metrics using this multi-criteria optimization framework.

Biography:

John S. Baras, Lockheed Martin Chair in Systems Engineering B.S. in Electrical Eng. from the Nat. Techn. Univ. of Athens, Greece, 1970; M.S. and Ph.D. in Applied Math. from Harvard Univ. 1971, 1973. Since 1973 with the Electrical and Computer Engineering Department, and the Applied Mathematics Faculty, at the University of Maryland College Park. Since 2000 faculty member in the Fischell Department of Bioengineering. Founding Director of the Institute for Systems Research (ISR) from 1985 to 1991. Since 1991, has been the Director of the Maryland Center for Hybrid Networks (HYNET). Fellow of the IEEE and a Foreign Member of the Royal Swedish Academy of Engineering Sciences. Received the 1980 George Axelby Prize from the IEEE Control Systems Society and the 2006 Leonard Abraham Prize from the IEEE Communications Society. Professor Baras' research interests include control, communication and computing systems. Email: baras@isr.umd.edu Web page: http://www.isr.umd.edu/~baras/