Illinois Center for Wireless Systems

ICWS Seminar Series

A System Theoretic Approach to Bandwidth Estimation

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Abstract: Much research has been dedicated to methods that estimate the available bandwidth in a network from traffic measurements, yet little progress has been made on achieving a foundational understanding of the bandwidth estimation problem. In this talk, we develop a min-plus system theoretic formulation of bandwidth estimation. We show that the problem as well as previously proposed solutions can be concisely described and derived using min-plus system theory, thus establishing the existence of a strong link between network calculus and network probing methods. We relate difficulties in network probing to potential non-linearities of the underlying systems, and provide a justification for the distinctive treatment of FIFO scheduling in network probing. Experiments on an Emulab testbed are used to evaluate the theoretical concepts in actual implementations of probing schemes. This talk presents joint work with Markus Fidler (TU Darmstadt) and Shahrokh Valaee (U. Toronto).

Bio: Jörg Liebeherr received the Ph.D. degree in Computer Science from the Georgia Institute of Technology in 1991. He is currently with the Department of Electrical and Computer Engineering of the University of Toronto as the Nortel Chair of Network Architecture and Services. He is a co-author of the textbook ``Mastering Networks: An Internet Lab Manual, published by Addison-Wesley in 2004. He was elected to the Board of Governors of the IEEE Communications Society for 2003-2005, and chair of the IEEE Communications Society Technical Committee on Computer Communications in 2004-2005. He was Editor-in-Chief of IEEE Network in 1999-2000, and an Associate Editor of IEEE/ACM Transactions on Networking and several other journals. He received an NSF Career award in 1996, a Virginia Engineering Foundation fellowship in 2002, a best paper award (as co-author) at ACM Sigmetrics 2005, and an Outstanding Service award from the IEEE ComSoc Technical Committee on Computer Communications in 2006. He is a Fellow of the IEEE. His current research interests are networks with service guarantees and self-organizing peer networks.

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