Real-Time Wireless Networking

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Abstract

We present an account of an approach to solve the problem of delivering required throughputs of packets that meet hard deadlines over heterogeneous unreliable channels. These recent results provide a contract for flows with throughput as well as delay constraints. This contract has two desirable properties: the contracts can be supported by the wireless network, and, further, the contracts are appropriate enough that applications can define their requirements through them.

The theory provides admission control algorithms for deciding when flows with throughput-cum-deadlines can be satisfied, as well as simple scheduling algorithms for doing so. The theory also extends well to various arrival patterns for packets, fading models, and rate adaptation schemes, as well as broadcast. It can also be generalized to optimize the service of elastic flows that have utilities based on the throughput provided. Further, it can be used in an incentive compatible way for strategic auctions. The results of the above theoretical framework are surprising, elegant and simple for inelastic as well as elastic flows, in terms of admission control for the form and scheduling for both.

Biography

P. R. Kumar obtained his B. Tech. degree in Electrical Engineering (Electronics) from I.I.T. Madras in 1973, and the M.S. and D.Sc**.** degrees in Systems Science and Mathematics from Washington University, St. Louis, in 1975 and 1977, respectively. Since 1985 he has been at the University of Illinois, Urbana-Champaign, where he is currently Franklin W.Woeltge Professor of Electrical and Computer Engineering, Research Professor in the Coordinated Science Laboratory, Research professor in the Information Trust Institute, and Affiliate Professor of the Department of Computer Science. His current research interests are in wireless networks, sensor networks, and networked embedded control systems.

He has received the Donald P. Eckman Award of the American Automatic Control Council, the IEEE Field Award in Control Systems, and the Fred W. Ellersick Prize of the IEEE Communications Society. He is a Fellow of the IEEE, and a member of the US National Academy of Engineering.

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