Real-time wireless networking

P. R. Kumar
UIUC

We present a framework to solve the problem of delivering required throughputs of packets that meet hard deadlines over heterogeneous unreliable channels. These 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 simple and sometimes surprising for inelastic as well as elastic flows, in terms of admission control for the former and scheduling for both. [Joint work with I-Hong Hou and Vivek Borkar].