

## STANFORD PROBABILITY SEMINAR

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Monday, 3 October 2005

4:15pm (Refreshments at 4pm in the 1st Floor Lounge)

Sequoia Hall, Room 200

### Maximizing queueing network utility subject to stability

**Abstract.** We study a model which accommodates a wide range of seemingly very different resource allocation problems in communication networks. Some examples: utility based congestion control of complex time-varying (wireless) networks, minimizing average power consumption in wireless networks, scheduling in wireless systems subject to power consumption and/or traffic rate constraints.

The model is a controlled queueing network, where controls have dual effect. In addition to determining exogenous customer arrival rates, service rates at the nodes, and (possibly random) routing of customers among the nodes, each control decision produces a certain vector of "commodities." The set of available control choices depends on the underlying random network mode. Network "utility" is a concave function of the vector of long-term average rates at which commodities are produced. The goal is maximize utility while keeping network queues stable. We introduce a very parsimonious dynamic control policy, called Greedy Primal-Dual algorithm, and prove its asymptotic optimality. Although the model is formulated in terms of a queueing network, the algorithm can be viewed as a dynamic mechanism for solving rather general convex optimization problems.