

A NOVEL ANALYSIS FOR STABILITY AND PERFORMANCE OF NETWORK RESOURCE ALLOCATION AND NUM PROBLEM IN LARGE SCALE NETWORKS

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ABSTRACT

Network resource allocation controls the number of different routes, where each connection is subject to congestion control. The fundamental problem in telecommunication network among the shared infrastructure is resource allocation with fairness and stability. The Network Utility Maximization (NUM) problem captures various fairness notions between end-to-end flows and takes care of congestion control. Flows or end-to-end connections in networks dynamically share resources according to various resource allocation schemes. These flows can be identified through their “classes,” which define the set of network resources they require for the transfer of the corresponding packets. An existing schemes of allocate resources to competing flows by distributive solving a network utility maximization problem.

In this paper we studied stability of network resource allocation against large scale networks. And we propose a decentralized admission control and primal dual congestion control based on user utilities and thus tailored to our proposed user-centric stability. We analyze the performance of this control under a traffic model of random connection arrival/departures through a fluid limit argument. Our result is shown to protect the network from users, imposing in situations of overload the desired notion of stability. The important problem analyzed here is the resource allocation provided by congestion control algorithms over a physical layer that allows multiple transmission rates, such as wired networks. We show that the typical algorithms in use lead to important inefficiencies from the connection-level perspective, and we propose mechanisms to overcome these inefficiencies and enhance the resource allocation provided by such networks.

KEYWORDS: Network Utility Maximization (NUM), Communication Networks, Optimization, Stochastic Process