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QoS Provision and Routing with Deterministic and Stochastic Guarantees

Erez Biton and Ariel Orda

ABSTRACT

We consider QoS provision and routing schemes for connections with end-to-end delay requirements in networks which employ rate-based schedulers. First, we consider the case of burstiness-constrained (BC) traffic with deterministic QoS requirements. Here, we extend the results of a previous study in order to obtain routing schemes of low computational complexity that identify feasible paths while optimizing some network utilization criteria. Next, we consider traffic with exponentially bounded burstiness (EBB) and stochastic QoS requirements. Here, we extend previous results and provide an end-to-end delay bound on the tail distribution for packetized traffic and links with non-negligible propagation delays. With this bound at hand, we formulated several routing schemes that identify feasible paths under various network optimization criteria. Then, we consider traffic with (general) stochastic bounded burstiness (SBB). Here too, we provide the corresponding end-to-end bound for packetized traffic and links with propagation delays. Then, focusing on the special case of a bounding function that is the sum of exponents, we design appropriate routing schemes. Finally, we investigate variable-rate links. Here, we consider two settings: a deterministic setting, of links with fluctuation constraints and BC traffic, and a stochastic setting, of links with exponentially bounded fluctuation and EBB traffic. In both settings, we extend previous results, obtained for a single-input FCFS server in isolation, and establish end-to-end bounds for a complete network, packetized traffic and non-negligible propagation delays. With these bounds at hand, we formulate appropriate routing schemes.