Approximation Algorithms for Delay-Sensitive Multicast Routing

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Abstract

Emerging group applications require efficient multicast schemes that provide Quality of Service (QoS) guarantees. QoS can be achieved by provisioning multicast trees that satisfy QoS constraints. Since the efficient usage of network resources is an important requirement, the cost of the constructed multicast tree should be as small as possible. Accordingly, in this study we investigate the fundamental problem of finding a multicast tree that satisfies end-to-end QoS constraints at minimum cost. We focus on additive QoS constraints such as delay or jitter, which are more difficult to handle.

This problem has been extensively studied. However, existing solutions have either relied on heuristic approaches or considered special cases, such as the case where the delay and cost of each link are identical. Moreover, many of the heuristic approaches are based on restricting assumptions, such as symmetric link delays. In this study we propose a novel algorithmic scheme, with proven performance guarantees, for this fundamental multicast problem. Effectively, this scheme allows to obtain an approximate solution to this problem out of any given approximate scheme of its (simpler) unconstrained directed version, with about identical (ε-close) performance guarantees.

Keywords: Routing, Multicast, Quality of Service.