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Optimal Partition of QoS Requirements on Unicast Paths and Multicast Trees

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Abstract

We investigate the problem of optimal resource allocation for end-to-end QoS requirements on unicast paths and multicast trees. Specifically, we consider a framework in which resource allocation is based on local QoS requirements at each network link, and associated with each link is a cost function that increases with the severity of the QoS requirement. Accordingly, the problem that we address is how to partition an end-to-end QoS requirement into local requirements, such that the overall cost is minimized. We establish efficient (polynomial) solutions for both unicast and multicast connections. These results provide the required foundations for the corresponding QoS routing schemes, which identify either paths or trees that lead to minimal overall cost. In addition, we show that our framework provides better tools for coping with other fundamental multicast problems, such as dynamic tree maintenance.