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A cost-efficient method for streaming stored content in a guaranteed QoS Internet

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Abstract

Quality-of-service techniques allow network providers to differentiate the services they offer to their customers. This differentiation makes it possible to consider charging new quality transport services based on network resource usage. In a content streaming framework, consumers pay for content and network access. Similarly, content providers pay to reserve transport service resources to deliver high-quality content. Therefore, content providers need new cost-efficient methods that optimize network resource reservations. Our paper proposes a new method that ensures data availability on the client side while optimizing network resource reservation when servers deliver stored content with semi-elastic unicast flows. The method uses network resource reservation to guarantee the delivery rate when stored data is below a minimum threshold in the client memory. When occupancy reaches a maximum threshold, the transmission changes to the classic best-effort service, which is not charged based on usage but at a flat rate. The proper design of these thresholds optimizes transmission cost. We validate our analytical method using the ns-2 simulator. We also present a new approach for improving this method when the best-effort delivery rate from the server to the client presents higher variability. Finally, we analyse the case of several homogeneous clients that simultaneously require resource reservation from the server. To avoid resource reservation rejection in the server, bandwidth must be suitably allocated among the clients. To evaluate this more complex case, we also perform some simulations and implement the associated prototype to validate the simulations. The qualitative simulation results reveal optimum working areas in which usage-cost reduction efficiency of the method is significant and extra signalling is minimum.

Keywords: Quality of service; Network resource charging; Cost optimization; Stored content streaming

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