A New Approach to Support Delay-Sensitive VBR Video in Packet-Switched Networks

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Abstract. Previous approaches to supporting video on packet-switched networks include deterministic service, statistical service, predicted service, and feedback-based schemes. These schemes represent different tradeoffs in quality of service (QOS), achievable network utilization, and method of dealing with overload. In this paper, we propose a new service that attempts to strike an efficient balance with the above tradeoffs. The approach is based on deterministic guarantees with client controlled renegotiation of QOS parameters and graceful adaptation during overload periods. We evaluate the scheme using two traces of MPEG-compressed video and show that, even with simple renegotiation polices and relatively low renegotiation frequencies, high network utilization in the range of 50% to 80% can be achieved. For traffic that is bursty over long intervals, this represents a 100% to 150% improvement in network utilization compared to deterministic service. Compared to statistical and predicted service, our approach allows more graceful and client-controlled QOS degradation during overload period.

1 Introduction and Motivation

Future integrated services networks will have to support applications with diverse traffic characteristics and performance requirements. There are three important types of traffic for future integrated services networks: constant bit rate CBR traffic, delay-sensitive variable bit rate or VBR traffic, and best-effort ABR or available bit rate traffic. Among these, delay-sensitive VBR traffic poses a unique challenge. While resource reservation schemes work best for CBR traffic, and there are many congestion control algorithms based on feedback and re-transmission for best-effort traffic, there is no consensus on which strategy should be used for VBR traffic, in particular, compressed video. This is due mainly to two conflicting design goals: good quality of service and high network utilization.

Achieving both goals with bursty traffic is fundamentally difficult. Since a bursty source may generate various amounts of data during different time periods, the aggregate amount of traffic generated by many sources sharing the same network resources also varies over time.