

Optimal Sliding-Window Strategies in Networks with Long Round-Trip Delays

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ABSTRACT

A method commonly used for packet flow control over connections with long round-trip delays is "sliding windows". In general, for a given loss rate, a larger window size achieves a higher average throughput, but also a higher rate of spurious packet transmissions, rejected by the receiver merely for arriving out-of-order. This paper analyzes the problem of optimal flow control quantitatively, for a connection that has a cost per unit time and a cost for every transmitted packet (these costs can have generic interpretations, not necessarily in terms of money). The optimal strategy is defined as one that minimizes the expected cost/throughput ratio, and is allowed to transmit several copies of a packet within a window. We derive some bounds on the performance of the optimal strategy; in particular, we show that the optimal cost/throughput ratio increases merely logarithmically with the time price. We present a method for computing the optimal strategy; additionally, we demonstrate that a simple and efficient 'greedy' algorithm is sufficient to find a near-optimal solution.