Multiple Time Scales in Markovian ATM Models
I. Formal Calculations

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Abstract

Multiple time scale models are an attractive alternative to long-range dependence models via heavy tails. They are Markovian models, hence analyzable, and capture some of the key phenomena manifest in long-range dependence.

We analyze extensions of the AMS model of ATM traffic. The models include both open types (where connections arrive and leave), and closed, fixed-population types. Connections present either transmit "fluid" through a buffer to a finite capacity link, or are in one of several idle states. We analyze the most likely behavior of connections and buffer, as well as the probability and path to buffer overflow. We briefly indicate how our models and analyses might be applicable to the design of connection admission controls, and to the effect of pricing on user behavior. Our analysis is asymptotic in the buffer size and link capacity, and uses techniques from the theory of large deviations.