Average Matching Technique for MMPP Modeling of Homogeneous ON-OFF Sources and Efficient Implementation of Admission Control Function

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Abstract

Recent advances in high-speed switching, multiplexing, and optical transmission systems for telecommunication will provide an integrated access that will support a wide variety of telecommunication services with different characteristics. The basic goal of this future Broadband ISDN(B-ISDN) is to provide the ability to support a wide variety of traffic and diverse services and performance requirements. The most promising transfer mode for B-ISDN is Asynchronous Transfer Mode(ATM). To achieve high-speed multimedia transport, an ATM network adopts a simplified transport protocol based on a fixed size packet (cell) switching. Since the bursty information could be statistically multiplexed, ATM networks could use network resources more efficiently but may require new kinds of traffic and congestion control in order to guarantee a predefined quality of service(QOS) in all connections, which include connection admission control(CAC), usage parameter control(UPC), priority control(PC), etc.

CAC decides whether to accept a new connection request based on the predefined QOS. To evaluate QOS of ATM networks, accurate traffic source modeling is required. One of the simple but rather versatile traffic models for the characterization of the ATM sources is the on-off source model. In a short-term perspective, ATM will probably provide high-speed interconnection means for the transfer of LAN-generated data streams and these emission processes are known to be adequately represented by the on-off model. For the on-off

source model, the superposition of different ATM on-off sources can be modeled as the traffic stream resulting from the superposition of identical ATM on-off sources. The cell loss probability for this model can be calculated using some parameter matching techniques relevant to the adopted queueing models. The traffic parameters of the superposition of the identical on-off sources can be approximately by the asymptotic or the stationary-interval methods.

We develop a new parameter matching technique, called **average matching**, for the two-state MMPP model when the ATM source traffic is the superposition of homogeneous on-off sources. This average matching has good property that the parameters can be easily updated by recursive formulas. We also develop an admission control function which can be efficiently implemented for the ATM homogeneous on-off sources.

The performance of the average matching is evaluated and compared with a known method so called the asymptotic matching. The simulation results show that the average matching is very accurate for large buffer sizes. In the heterogeneous case, even though N heterogeneous on-off sources can be modeled by N' homogeneous on-off sources, the parameter updating is not simple and needs further research.