

Traffic Management for the Available Bit Rate (ABR) Service
in Asynchronous Transfer Mode (ATM) Networks

DISSERTATION

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By

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ABSTRACT

With the merger of telecommunication, entertainment and computer industries, computer networking is adopting a new paradigm called *Asynchronous Transfer Mode (ATM)* networking. ATM networks have multiple service classes allow audio, video and data to share the same network. Of these, the *Available Bit Rate (ABR)* service class is designed to efficiently support data traffic.

Traffic management involves the design of a set of mechanisms which ensure that the network bandwidth, buffer and computational resources are efficiently utilized while meeting the various Quality of Service (QoS) guarantees given to sources as part of a traffic contract. The general problem of network traffic management involves all the available traffic classes. In this dissertation, we address the problem of designing traffic management mechanisms for one class - the ABR service class in ATM networks.

We consider five aspects of this problem in this dissertation. First, the ABR service requires a mechanism to carry rate feedback from the network switches to the sources. We design three switch algorithms (the OSU scheme, the ERICA and ERICA+ schemes) which calculate the rate allocations to satisfy different sets of goals. Second, we design a set of source end system mechanisms which respond to network feedback, and perform control in the case when feedback is disrupted or is stale. Third, we validate the performance of the service for various ABR and VBR demand

patterns. Specifically, we study the case of Internet traffic over ATM-ABR. Fourth, we consider the switch design issues for a specific ABR framework option called the “Virtual Source/Virtual Destination” option. Finally, we discuss cost/performance issues pertaining to the implementation of the service.

In summary, this dissertation work addresses fundamental issues in ATM ABR traffic management, and the techniques developed are applicable to a wider class of high-speed packet networks.

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To my family

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R. Jain, S. Kalyanaraman and R. Viswanathan, "Method and Apparatus for Congestion Management in Computer Networks using Explicit Rate Indication". *U.S. Patent Number 5,633,859*, granted May 27th, 1997

R. Jain, S. Kalyanaraman and R. Viswanathan, "The OSU Scheme for Congestion Avoidance in ATM Networks: Lessons Learnt and Extension". *Performance Evaluation Journal*, Vol. 31/1-2, December, 1997

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