Dynamics of Continuous, Discrete and Impulsive Systems
Series **B:** *Applications & Algorithms* **10 (2003)** 497-514

Tunable Leaky Bucket Flow Control In Broadband Satellite Communications For Multimedia Services[1]

Jun Huang[†] and Tho Le-Ngoc[‡]

[†]SpaceBridge Networks Corporation
Hull, Quebec, Canada
[‡]Department of Electrical & Computer Engineering
McGill University
Montreal, Quebec, Canada

Abstract. A dynamic resource allocation strategy based on a tunable leaky bucket flow control scheme for broadband satellite communications using an onboard packet switching to support multimedia services is suggested to achieve an efficient utilization of system capacity and an acceptable cell loss ratio in the onboard downlink queue. An analytic model based on matrix analytic techniques to evaluate the system performance is developed. Heterogeneous multimedia traffic sources are modelled as Markov Modulated Poisson Processes (MMPP) with diverse structures and parameters. Numerical results show that the dynamic resource allocation strategy in conjunction with the on board packet switch can provide a large statistical multiplexing gain. Effects of the token rates and bucket depths on the cell delay and cell loss probability in both on ground and on board buffers are presented. Simulation is also performed to verify the analytical results.
Keywords. On-board switching, Broadband satellite, Tunable leaky bucket, Traffic and queuing model.

1 Introduction

Satellite communications has inherent capabilities of providing multipoint and broadcast transmission, connectivity between any two distant nodes within a wide-area coverage, quick network configuration/reconfiguration, rapid allocation of space segment capability, and distance-insensitive cost. Satellite communications can serve a wide variety of consumer and business end-users to support multimedia services [1].

Among potential consumer applications, we encounter personal video and video telephony, high-speed personal computer access to on-line services, as well as interactive access to many Internet-based information and entertainment multimedia services currently under development. Such services are

[1]This work was supported by CITR under NCE program of Canadian Government