AVAILABLE BIT RATE TRAFFIC CONTROL MECHANISM ON ATM NETWORK USING INTELLIGENT AGENT

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ABSTRACT
Asynchronous Transfer Mode (ATM) Network is a networking protocol with the potential to support applications with distinct tolerances for delay, jitter and cell loss and distinct requirement bandwidth or throughput. ATM defined four traffic services to support the two main classes of communication applications. Constant Bit Rate (CBR) and Variable Bit Rate (VBR) support guaranteed services applications, Unspecified Bit Rate (UBR) and Available Bit Rate (ABR) support best-effort applications. Recent works on ABR traffic control have generated efficient control schemes for ABR traffic on ATM network. This paper examines the improved performance envisaged if these control schemes adjust dynamically to the varying ABR bandwidth capacity in a stochastic manner instead of the conventional deterministic manner. The performance difference between setting explicit rate deterministically for transmitting ABR sources and doing the same stochastically using a learning automaton is of particular interest. The learning automation used is the Stochastic Estimator Learning Automaton (SELA). The performance difference is measured by comparing the congestion levels of the SELA-based control scheme with the reference deterministic control mechanisms. Simulation results show that the stochastic estimator gives better performance. The higher average congestion level experienced by the conventional deterministic approach is mainly due to the propagation time delay in the closed-loop feedback control schemes. The SELA, however, uses this period to learn the stochastic nature of the ABR bandwidth, hence, better performance.

KEY WORDS: RM – Resource Management; ER – Explicit Rate; SES – Source-to-End-System.

1.0 INTRODUCTION
The design and development of a single network that supports present and future communications services is inevitable. The most recent communications network that proves to achieve such goal is the Broadband Integrated Service Digital Network (B-ISDN). The need for fast, economic switching and multiplexing on B-ISDN led to the selection of ATM as the technology of choice on the network. ATM Forum has defined a family of service categories viz: CBR, VBR, UBR. Service category is typically used by connections that require a static amount of bandwidth that is continuously available during the connection life time. It is a deterministic service designed to support real-time applications requiring tightly-constrained delay variation, minimal cell loss and cell delay. Typical CBR-supported applications include circuit emulation, non-compressed voice traffic and constant bit rate video. VBR class is designed to support applications that generate traffic in bursts, rather than in a smooth stream. VBR applications are implicitly assumed to tolerate higher delays and higher variations than CBR sources. This class is further divided into two sub-classes, real-time VBR (rt-VBR) which supports applications that have variable bit rates combined with stringent real time requirement. A typical rt-VBR supported application is videoconferencing. The non real-time VBR (nrt-VBR) is quite similar to rt-VBR except that there is no delay bounds associated with this sub-class. A typical nrt-VBR-supported application is multimedia e-mail, which is typically spooled to the receiver's local disk before being displayed. UBR is intended for non-real time applications such as file transfer and e-mail where the service provides best effort delivery but offers no traffic-related guarantee. A UBR source neither specifies nor receives a bandwidth delay or loss guaranteed. It is assumed to be able to deal with fluctuations in these parameters by using techniques such as forward-error-correction or application-level flow control. File transfer, e-mail and USENET news are potential candidates for the UBR service because none of these applications have real time characteristics. The Available Bit Rate (ABR) service class currently being defined by ATM Forum (Sathaye, 1995) completes the suite of services available in class is designed to support highly-burst non-real time applications that are able