ABSTRACT

Future high speed network must be able to support a various mix of heterogeneous network traffic, while at the same time satisfy the high bandwidth requirements of applications. Asynchronous Transfer Mode (ATM) is viewed as the most promising technology that can satisfy the above requirements. ATM is potentially able to support all classes of traffic including voice, video and data in a single transmission and switching technology. The ATM network promises greater efficiency in handling different kind of traffic types without compromising the desired quality of service requested. Traffic flows which have completely different characteristics are statistically multiplexed to share transmission and switching resources, and to maximize utilization of resources.

However, due to the unpredictable statistical behavior of the traffic and various traffic characteristics, it has become a great challenge for ATM networks to effectively control the traffic and congestion while at the same time provide the desired quality of service.

The ATM traffic management framework has defined a set of traffic and congestion control functions to overcome the above problem. These functions have been extensively studied in the literature. On the other hand, the success of fuzzy logic control in controlling ill-defined and non-linear systems is seen as a possible solution to the problem. The ability to incorporate expert's knowledge and use of linguistic rules provides fuzzy systems with incredible flexibility and adaptability. Fuzzy logic control provides an alternative to the conventional method of implementing ATM traffic and congestion control functions.

The proposed fuzzy logic based traffic controller utilizes a set of linguistics rules (based on expert's knowledge) manipulated by means of fuzzy set theory and fuzzy logic in making control decisions. It consists of a Fuzzy Policer and a Fuzzy Congestion Controller. The Fuzzy Policer's main task is to monitor and restrict the behavior of traffic source to its

negotiated parameters. This is accomplished by discarding cells that violates the negotiated values. The Fuzzy Congestion Controller aims to prevent or relieve network congestion. It will notify the sources to adjust their transmission rates depending on the congestion state of the network, thus minimizing the occurrence of congestion. Simulation is carried out to evaluate the performance of the proposed fuzzy traffic controllers. Favorable results have been produced that shows the feasibility and effectiveness of utilizing fuzzy logic control in ATM networks.