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TITLE OF THESIS: The Leaky Window: A Congestion Control Technique for High-Speed Wide Area Networks

DEGREE: Master of Science
YEAR THIS DEGREE GRANTED: 1992

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UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled **The Leaky Window: A Congestion Control Technique for High-Speed Wide Area Networks** submitted by **Charles Kiprotich arap Chirchir** in partial fulfillment of the requirements for the degree of Master of Science.

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Abstract

Congestion control in high-speed wide area networks (HS-WANs) is a very important issue since the presence of congestion may have catastrophic results. Reactive mechanisms applied to existing slow speed networks are not entirely suitable for HS-WANs due to the relatively long propagation delay. On the other hand, preventive mechanisms which have been proposed as possible solutions to this problem assume that traffic charateristics are known at the time of call setup. Window mechanisms do not make such an assumption, but modifications that have been proposed to adapt it to HS-WANs fall short of the fast response required in HS-WANs.

The Leaky Window (LW) mechanism is proposed in this thesis as an attempt to solve this problem. This mechanism is a modification of the sliding window that permits users to transmit traffic in excess of their window sizes based on an estimate of the network load. The estimate is based on acknowledgments received within a fixed time interval. Excess traffic is distinguished by "marking" cells. Marked cells are discarded at congested nodes. Conges-

tion control therefore, is a local decision executed by the congested node.

Through the use of a simulation model, it is shown that the LW has an average end-to-end delay and probability of loss that is lower than the sliding window mechanism. Comparison to the Virtual Leaky Bucket (VLB) mechanism shows that at lower load (0.7), the VLB has an end-to-end delay and a probability of loss that is lower than that of the LW under the same conditions. At higher loads where congestion is a real problem, the performance of the LW is significantly better than that of the VLB.