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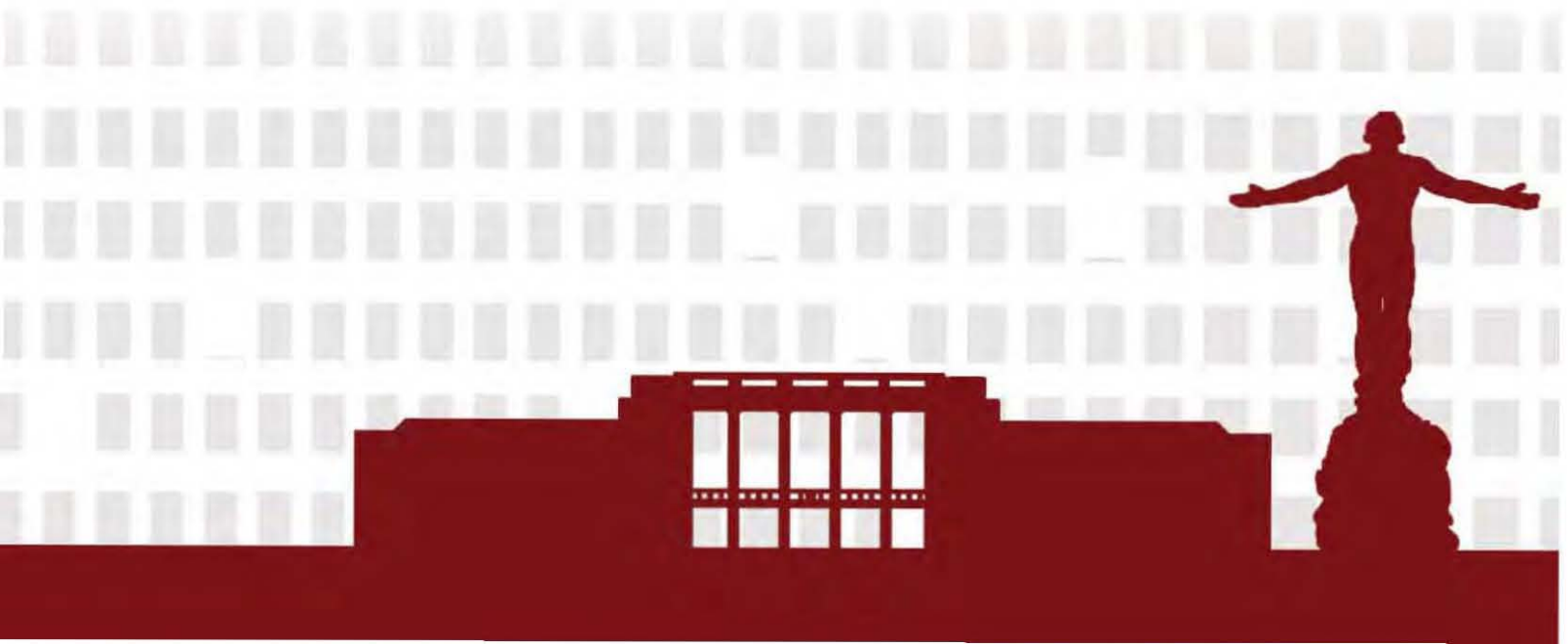

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CC-CAT: CONGESTION CONTROL FOR CACHE-AWARE TRANSPORT PROTOCOL IN WIRELESS SENSOR NETWORKS

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ABSTRACT

Congestion control mechanism is vital component of an effective and efficient transport protocol both for wired and wireless networks. It is one of the primary functions of the transport layer together with a reliable data delivery. Wireless sensor networks (WSNs) are distinctive group of wireless ad hoc networks with unique characteristics and imperative restraints. It was proven that caching in the intermediate nodes reduces end-to-end retransmission that makes it a better option for an energy efficient transport protocol. However, none of the congestion control protocols developed for wireless sensor networks have considered the use of intermediate caching. Thus, is it not yet known which congestion control technique is appropriate for caching-aware data transport. This paper presents a new congestion control mechanism called Congestion Control for Cache-Aware Transport (CC-CAT). It was implemented in a cache-based transport protocol such as in an enhanced Distributed Transport Sensor Networks (DTSN+). The main idea of the congestion control algorithm is to adjust the transmission window AW of the sender based on the cache size in the intermediate nodes and congestion state. The movement of the window is based on two instances: the optimum energy efficiency and optimum goodput, which are both function of cache size. The simulation results indicate that the Congestion Control for Caching-Aware Transport was able to improve the DTSN+ protocol in terms of end-to-end packet delay and throughput on the average. The CC-CAT achieved remarkable packet end-to-end delay gain of 2.31%, 19.43% and 18.90% at condition where high congestions and packet error rate are being manifested in the network at cache sizes of 10, 20 and 30 packets, respectively. Although the CC-CAT obtained slightly notable throughput gain, the mechanism delivered better response in avoiding further occurrence of congestion as seen in the behavior of the transmission window AW shown in Figure 1. With this novel approach, CC-CAT is more compatible with WSN applications where strictly minimal end-to-end packet delay is required but may compromise the amount of data to be transmitted. Such applications can be in Wireless Multimedia Sensor Networks (WMSN) that implements interactive voice and video.

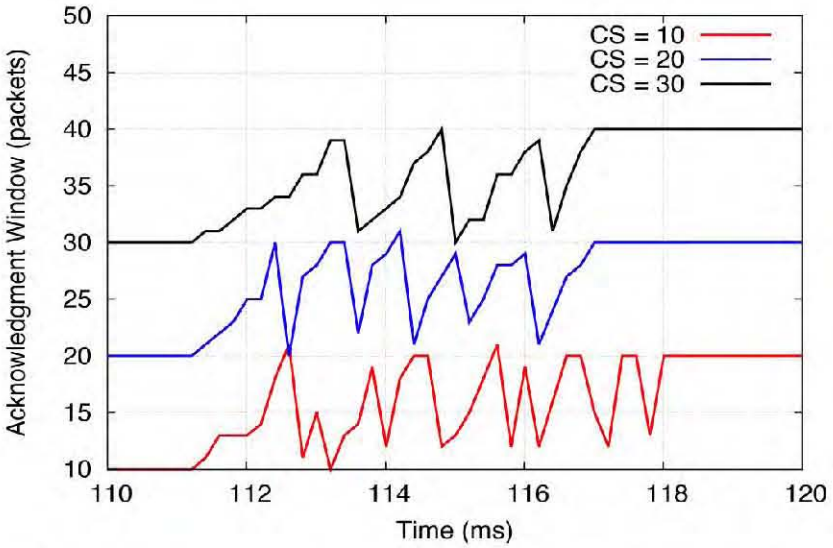

Figure 1. The behavior of transmission window (AW) of CC-CAT

Keywords: wireless sensor networks; congestion control; distributed transport sensor networks; cache size; transmission window

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