Research on the coordination mechanism between channel access control techniques and TCP flow rate adjustment techniques in multi-hop Ad hoc networks

Hoang Thi Le Dung

Abstract: This study investigates the coordination mechanism between Medium Access Control (MAC) and TCP rate control in multi-hop ad hoc networks. The inherent characteristics of such networks, including node mobility, channel contention, and hidden terminal problems, often lead to severe performance degradation due to the mismatch between the MAC layer's channel access scheme and TCP's congestion control algorithm. This research proposes and analyzes a novel cross-layer framework that enables dynamic information exchange between the MAC and TCP layers. By allowing the MAC layer to signal real-time channel state and contention levels, the TCP sender can adapt its transmission rate more accurately, preventing unnecessary packet loss and retransmissions. Simulation results demonstrate that the proposed coordination mechanism significantly improves end-to-end throughput, reduces delay jitter, and enhances overall network stability compared to standard layered approaches. The findings provide a theoretical foundation for designing more efficient transport protocols tailored to the dynamic conditions of multi-hop ad hoc environments.

Keywords: MAC, TCP, Ad hoc, multi-hop