Research and evaluation of the effectiveness of the load-balanced multipath routing mechanism LCMR in wireless ad hoc networks

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Abstract: This study investigates and evaluates the Load-Controlled Multipath Routing (LCMR) mechanism for load balancing in wireless ad hoc networks. The LCMR protocol is designed to address the inherent limitations of single-path routing, such as network congestion, uneven energy consumption, and limited throughput. By establishing multiple disjoint or partially disjoint paths between source and destination nodes, LCMR dynamically distributes traffic based on real-time metrics including path delay, residual energy, and queue length. This research employs extensive simulations using the NS-2 simulator to compare LCMR against standard routing protocols like AODV and DSR under various network topologies and traffic loads. Performance metrics analyzed include packet delivery ratio, end-to-end delay, routing overhead, and network lifetime. Results demonstrate that LCMR significantly improves load distribution, reduces packet loss, and extends the operational lifespan of the network compared to conventional approaches. The findings confirm that the proposed mechanism effectively mitigates congestion hotspots and enhances overall network stability, making it a viable solution for resource-constrained wireless ad hoc environments.

Keywords: LCMR, multipath routing, load balancing, ad hoc wireless networks