

Research on efficient routing methods based on load-balanced multipath routing for ad hoc networks

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Abstract: This study proposes an efficient routing method based on multipath routing with load balancing for ad hoc networks. Ad hoc networks are characterized by dynamic topology and limited resources, making traditional single-path routing protocols prone to congestion, packet loss, and energy depletion. To address these challenges, this research develops a novel multipath routing algorithm that simultaneously establishes multiple disjoint or partially disjoint paths between source and destination nodes. The proposed method incorporates a dynamic load balancing mechanism that distributes traffic across available paths based on real-time metrics such as queue length, link quality, and residual energy. This approach prevents node overload and enhances overall network throughput and lifetime. Simulation results demonstrate that the proposed protocol significantly outperforms conventional routing protocols like AODV and DSR in terms of packet delivery ratio, end-to-end delay, and energy efficiency. The findings provide a practical solution for improving the reliability and performance of ad hoc networks in dynamic environments.

Keywords: multipath routing, load balancing, ad hoc network, efficient routing