

Research on energy efficiency optimization techniques for multipath routing protocols in mobile ad hoc networks using Fitness function

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Abstract: This study proposes an optimization technique to enhance energy efficiency in multipath routing protocols for Mobile Ad Hoc Networks (MANETs) using a fitness function. The inherent mobility and limited battery capacity of nodes in MANETs pose significant challenges to network longevity and stable data transmission. Existing multipath routing protocols often fail to balance energy consumption across nodes, leading to premature network partition. To address this, a novel fitness function is developed, integrating key parameters such as residual energy, node mobility, path length, and link quality. This function dynamically evaluates candidate routes, selecting the most energy-efficient and stable paths for data transmission while preserving backup routes. Simulation results demonstrate that the proposed technique significantly reduces average energy consumption per packet, extends overall network lifetime, and improves the packet delivery ratio compared to traditional protocols like AODV and DSR. By intelligently distributing traffic load based on real-time network conditions, the approach effectively mitigates energy depletion, offering a robust solution for sustainable communication in resource-constrained mobile environments.

Keywords: energy optimization, multipath routing protocol, mobile ad hoc network, Fitness function