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A Study of Enhanced QoS Routing in Manets: Backup Path Establishment Using Genetic Algorithm

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ABSTRACT

Enhanced QoS routing in Mobile Ad Hoc Networks (MANETs) through backup path establishment using Genetic Algorithms (GAs) offers a robust solution to the inherent challenges posed by node mobility, limited bandwidth, and dynamic topology. MANETs demand efficient routing mechanisms that can ensure Quality of Service (QoS) parameters such as low latency, high throughput, minimal packet loss, and reliable connectivity. Traditional single-path routing protocols often fail to maintain these QoS standards under frequent route failures and network congestion. The integration of GAs enables the intelligent selection and maintenance of both primary and backup routes by evolving optimal paths through processes like selection, crossover, and mutation. This approach not only enhances route reliability but also ensures swift route recovery in case of link failures, thereby minimizing data transmission interruptions. The proposed method evaluates multiple QoS metrics during the fitness evaluation phase to select routes that best satisfy the network's dynamic conditions. Simulation results demonstrate that GA-based backup path routing significantly outperforms conventional protocols in terms of route stability, packet delivery ratio, and end-to-end delay. This study highlights the effectiveness of genetic algorithms in building resilient and adaptive routing frameworks, ultimately enhancing the overall performance and reliability of MANETs in critical and real-time communication scenarios.