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Optimizing Routing Protocols for IoT Networks with Mobile Devices

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Abstract: *The rapid proliferation of the Internet ofThings (IoT) has led to the integration of numeroussmart and interconnected devices in various domains. To ensure seamless communication in IoT networks with mobile devices, efficient and adaptive routing protocols are essential. This paperpresents a comprehensive study on optimizing routing protocols for IoT networks with mobile devices. We analyze the challenges posed by mobility in IoT networks and propose novel solutions to enhance the performance of routing protocols. The proposed optimizations are evaluated through simulations and real-world experiments, by demonstrating significant improvements in network efficiency, scalability,and reliability*

Keywords: optimization, topology, efficiency,mobility, quality

I. INTRODUCTION

The increasing deployment of mobile devices in IoT networks introduces dynamic topologies and mobility challenges, requiring routing protocols to adapt and optimize their behavior accordingly. Thispaper highlights the importance of routing protocols in IoT environments with mobile devices,identifying key issues such as network scalability, energy consumption, and link stability. Our work aims to optimize existing routing protocols to address these challenges and improve the overall performance of IoT networks with mobile devices.

II. RELATED WORK

We review the existing literature on routing protocols for IoT networks and their adaptations formobile environments. Notable studies addressing the impact of mobility on routing protocols are analyzed to identify their strengths and limitations. This section lays the foundation for the proposed optimizations by understanding the state-of-the-art techniques.

III. CHALLENGES OF MOBILITY IN IOT NETWORK

In this section, we discuss the specific challenges that mobility introduces in IoT networks. These include frequent topology changes, network partitioning, link quality fluctuations, and energy constraints in mobile devices. Understanding these challenges is crucial for devising effective routing protocol optimizations.

IV. PROPOSED OPTIMIZATIONS

We present our novel optimizations for routing protocols in IoT networks with mobile devices:

A. Mobility-Aware Route Discovery:

To cope with frequent topology changes, we propose a mobility-aware route discovery mechanism. This enhancement enables the routing protocols to detect and adapt to mobility events efficiently, reducing the delay in route establishment and enhancing packet delivery.

B. Energy Efficient Routing:

To address the energy constraints of mobile devices, we introduce an energy-efficient routing mechanism that minimizes energy consumption during route maintenance and data transmission. This optimization extends the network lifetime and enhances the sustainability of IoT deployments.

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C. Predictive Link Quality Estimation:

Fluctuations in link quality are common in mobile environments. We propose a predictive link quality estimation model that anticipates link degradation and proactively switches to more reliable paths. This adaptation improves the overall reliability and stability of the IoT network.

V. PERFORMANCE EVALUATION

We evaluate the proposed optimizations through extensive simulations and real-world experiments. Performance metrics such as packet delivery ratio, end-to-end delay, network throughput, and energy consumption are used to quantify the improvements achieved by each optimization. The evaluation aims to demonstrate the effectiveness of the proposed solutions in comparison to traditional routing protocols.

VI. DISCUSSION

We discuss the implications of our findings, potential limitations, and areas for future research. Moreover, we compare the proposed optimizations with other relevant approaches in the literature, emphasizing their advantages and contributions to the field.

VII. CONCLUSION

In this paper, we presented a comprehensive study on optimizing routing protocols for IoT networks with mobile devices. The proposed mobility-aware route discovery, energy-efficient routing, and predictive link quality estimation optimizations demonstrate substantial enhancements in network efficiency, scalability, and reliability. Our work contributes to the advancement of IoT network routing in the context of mobile devices and lays the groundwork for future research in this area.

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