

Evaluating the performance of the RPL routing protocol for mobile applications

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Abstract: This study evaluates the performance of the RPL routing protocol in mobile applications within the Internet of Things (IoT). While RPL is the standard routing protocol for static Low-Power and Lossy Networks (LLNs), its suitability for dynamic environments with mobile nodes remains a critical concern. Through systematic simulation, this research assesses RPL's effectiveness under varying mobility conditions, analyzing key performance metrics including packet delivery ratio, end-to-end delay, control overhead, and energy consumption. The results reveal that standard RPL experiences significant performance degradation as node mobility increases, particularly in terms of packet loss and network instability. The study identifies specific mobility thresholds where RPL's proactive topology maintenance fails to adapt efficiently, leading to increased routing overhead and reduced reliability. These findings underscore the necessity for mobility-aware enhancements to RPL for applications such as vehicular networks, wearable devices, and mobile healthcare monitoring. The research provides a quantitative foundation for developing optimized routing strategies that balance mobility support with the inherent resource constraints of LLNs.

Keywords: RPL, routing protocol, operational efficiency, mobile application