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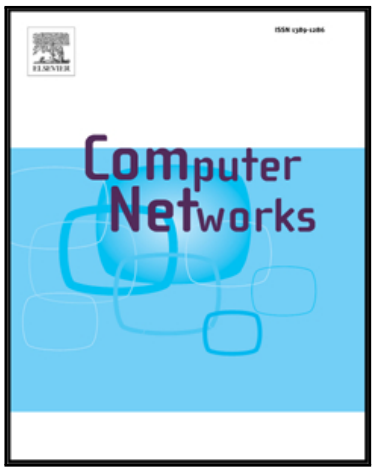

Enabling Robust and Reliable Transmission in Internet of Things with Multiple Gateways

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Enabling Robust and Reliable Transmission in Internet of Things with Multiple Gateways

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Abstract

This paper investigates the robust and reliable transmission problem in Internet of Things (*IoT*) applications, where multiple gateways are deployed. We discover that the reliable routing path with the best link qualities may not always gain the reliable transmission. The main reason is that the majority of existing routing metrics generally do not consider the working state of gateways. And the gateways may significantly reduce the reliability of data transmission at the last hop when they operate at the variable duty cycles (e.g., due to insufficient energy harvesting from ambiance). Last-hop data loss will lead to the inefficient transmission in all previous hops. To address this issue, we propose a novel routing metric *ETD* (Expected Transmission Direction, *ETD*), which efficiently selects a proper set of gateways with improved reliability in variable duty-cycled *IoT* through estimating the working state of gateways. Based on *ETD*, we design an efficient opportunistic routing protocol *PoR* to ensure reliable data transmission. Our simulations demonstrate the superior performance of *PoR*. It is shown that *PoR* achieves over 98% packet delivery ratio even in the worst network setting, with effective load balancing among selected gateways.

Keywords: Internet of Things, multiple gateways, variable duty cycle, routing metric.

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