A Cooperative Retransmission Control Scheme for CoAP in Constrained IoT Networks

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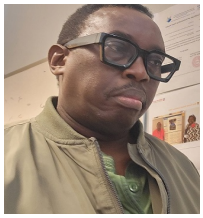
***Abstract*—These The Constrained Application Protocol (CoAP) enables RESTful communication for resource-constrained IoT devices over UDP. However, in Separate Response mode, delayed or lost Empty Acknowledgments (ACKs) can trigger unnecessary retransmissions, causing duplicate responses, energy waste, and higher latency. This paper proposes a cooperative retransmission control scheme that enhances CoAP reliability without modifying its standard. The client employs an adaptive retransmission timeout (RTO) using an exponentially weighted moving average (EWMA) of round-trip times, while the server applies a two threshold duplicate suppression mechanism that differentiates between transient delays and actual losses. Together, these components dynamically balance reliability and responsiveness. Simulation and analytical results in 6LoWPAN environments show reductions of up to 45% in redundant messages, 25% in latency, and 18% in energy consumption compared with baseline CoAP. The proposed scheme provides a lightweight, fully compliant improvement for scalable, low-power IoT networking.**

***Keyword*—About CoAP, Retransmission Control, Adaptive Timeout, Duplicate Suppression, IoT.**



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