

Improving the sustainability of confirmed traffic in LoRaWANs through an adaptive congestion scheme

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Abstract

The scalability of long-range wide area networks (LoRaWANs) is known to be very sensitive to the presence of traffic from gateways (GWs) to end devices (downlink (DL) traffic). The protocol supports confirmed traffic, for which DL traffic is generated in the form of acknowledgments (ACKs). Research has shown that even a limited number of ACKs quickly cause network congestion, negatively impacting scalability. This article introduces a mechanism, the adaptive congestion scheme (ACS), which aims to monitor the congestion caused by DL traffic and take steps to reduce it. Currently, the ACS supports one counteraction in the form of a newly developed algorithm called groupedPackets (also introduced in this article). This algorithm reduces the number of sent confirmed packets by requesting that confirmed nodes (nodes that only send confirmed traffic) aggregate their application packets. Simulations showed that this algorithm improved the successful delivery of both unconfirmed traffic and confirmed traffic. When traffic volumes are low, the algorithm has a minimal impact, but at high network packet arrival rates (higher than 0.1 pkt/s), the successful delivery of especially confirmed traffic increased significantly.