DyLoRa: Towards Energy Efficient Dynamic LoRa Transmission Control

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Abstract. LoRa has been shown as a promising platform for connecting large scale of Internet of Things (IoT) devices, by providing low-power long-range communication with a low data rate. LoRa has different transmission parameters (e.g., transmission power and spreading factor) to tradeoff noise resilience, transmission range and energy consumption for different environments. Thus, adjusting those parameters is essential for LoRa performance. Existing approaches are mainly threshold based and fail to achieve optimal energy efficiency. We propose DyLoRa, a dynamic LoRa transmission control system to improve energy efficiency. The high level idea of DyLoRa is to adjust parameters to different environments. The main challenge is that LoRa has very limited data rate and sparse data, making it very time- and energy-consuming to obtain physical link properties. We show that symbol error rate is highly related to the SignalNoise Ratio (SNR) and derive the model to characterize this. We further derive energy efficiency model based on the symbol error model. DyLoRa can adjust parameters for optimal energy efficiency from sparse LoRa packets. We implement DyLoRa based on LoRaWAN 1.0.2 with SX1276 LoRa node and SX1301 LoRa gateway and evaluate its performance in real networks. The evaluation results show that DyLoRa improves the energy efficiency by 41.2% on average compared with the state-of-theart LoRaWAN ADR.

1 Content

This paper proposes an algorithm to dynamically select the **physical parameters** SF and TP in LoRa transmission. The caused **energy efficiency** is much higher than that of existing state-of-art algorithm ADR.