Efficient Firmware Update Transmission for LoRa Low Power Wide Area Technology

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Abstract

The growth over the past two decades of applications leveraging Wireless Sensor Networks on the Internet of Things, has lead to an exponential increase in the number of active IoT end nodes. With such a vast user base, it is reasonable to expect that best practice software engineering processes be used in the development of applications for the Internet of Things, just as they are expected to be used on software applications for any other platform. Such process include that of Continuous Development: the idea that software should be constantly updated to add functionality or address bugs. This process becomes difficult for nodes on the Internet of Things when the problem of transmitting firmware update packages to these nodes is considered.

The type of devices on the Internet of Things come with certain problems and constraints unique to this domain. Relying largely on battery power, often incurring size and weight limitations and requiring cost-effectiveness to be sustainable are just some of the properties of an IoT end node that lead to challenging problems for developers. This leads to devices being constrained particularly by low energy consumption requirements, to ensure long battery life, and limited computational resources, to ensure compact, lightweight construction and low cost devices. LoRaWAN is a spread-spectrum Low Power Wide Area Network communication technology that aims to allow the propagation of data over long distances, while still ensuring low computational and energy costs to devices using it.

This work aims to outline a more efficient means of transmitting firmware updates to end nodes on the Internet of Things by making use of LoRaWAN technology. It will build upon work done in previous dissertations with the same subject matter, and in particular attempt make use of the Class B mode of operation offered to LoRaWAN devices, by designing, testing and evaluating three different protocols for transmitting firmware update data over this device class.