Autonomous Cloud Solution for Pressure Sensors

The company KELLER AG für Druckmesstechnik (KELLER) produces pressure sensors in Winterthur. For a few years now, the Long-Range Wide Area Network (LoRaWAN) network protocol has been used for the transmission of measurement data. KELLER offers its customers the KOLIBRI Cloud (www.kolibricloud.ch) for operating the pressure sensors with remote transmission functionalities. It acts as a LoRaWAN application server. In the KOLIBRI Cloud, devices are configured and measurement data is received, saved, and provided for further use. KELLER sales staff reported the customer's need to have the same functionality without having to transfer the measurement data to external servers via the Internet.

The objective of the thesis was to analyse the customer's needs, to define the requirements of the system, to develop a concept and to implement and validate the system as a proof of concept.

In the first step, possible local LoRaWAN solutions were analysed with the aim of covering customer needs which we knew from KELLER development staff. We created an initial broad set of specification and use cases. In the next steps, key requirements were determined together with the KELLER sales staff using a survey. Knowing the requirements and the prioritisation amongst them, we defined which subset of the specification and which use cases are implemented in the proof of concept together with KELLER.

In the proof of concept, hardware and software technologies were evaluated. The complete LoRaWAN stack was operated on a LORIX One device, an inexpensive outdoor LoRaWAN gateway with a Yocto-based Linux system. The freely usable open-source solution ChirpStack was used as LoRaWAN network and application server including data storage in PostgreSQL. For the data retrieval, we created an application called "KIWI Server" which provides an API using Go as programming language. For the visualisation of the data, we implemented the Windows program "KIWI Desktop" (.NET, WPF) to fetch the data from the LORIX One via the API in a local network.

The provided solution enables users to connect multiple low-energy LoRa devices with one cost-efficient server system. It makes it possible to use the benefits of the LoRa sensors without the need of an Internet connection and with the full control and ownership over all data. All produced software is well documented, will become open-source and therefore adaptable to third-party LoRa sensors.

Diplomierende
Samuel Egger
Lukas Raschle

Dozierende
Kurt Bleisch
Andreas Rüst
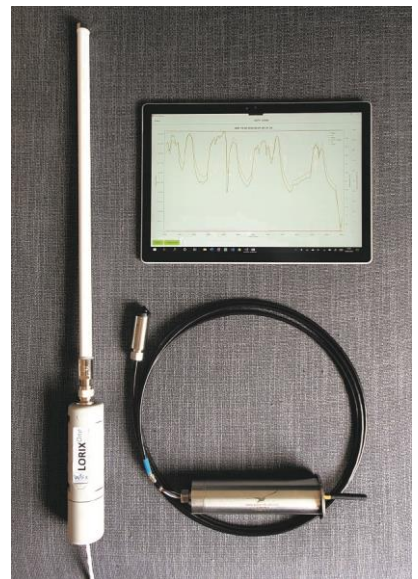
Setup of the proof of concept: LORIX One gateway running ChirpNest, KELLER ADT1 sensor and Windows computer visualizing the measurement data