IoT for Viticulture

Degree programme: BSc in Electrical Engineering and Information Technology | Specialisation: Communication Technologies
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VinoT is a low-power, open source, modular platform for measuring environmental parameters such as temperature, wind speed and direction, humidity and rainfall. Its modularity allows the implementation of a wide range of sensors to measure additional parameters. The station uses LoRa technology to communicate with the gateway via LoRaWAN. The network stack „ChirpStack“ handles the data traffic, which is then displayed locally and can be sent further to the cloud.

Motivation

IoT is an ever-expanding field and increasingly so in agriculture. The ability to measure and monitor environmental parameters such as temperature, rainfall or wind strength can complement the manual labor of the farmer, especially when producing according to biodynamic standards.
The goal of this project is to build an open and modular platform that can be used to measure various environmental parameters and is as independent as possible from proprietary systems. VinoT was developed in collaboration with a biodynamic vineyard. The choice of sensors is adapted to their needs, but the modular approach makes VinoT flexible and adaptable to other situations.

Concept

The prototype was designed with the following key aspects:

Low Power and self-sufficient

- Solar panel powered with rechargeable backup battery
- LoRa transmission technology
- Energy management with sleep mode and optimised transmission times

Modularity

The measuring station has six sensor ports, all of which have the following functionalities:

- Digital (interrupt capable) in- or output
- Analogue or digital in- or output
- Differential I^2C
- Power

Open Source

- The Arduino MKR1310 is used as microcontroller platform
- The LoRaWAN network protocol is standardised by the non-profit association „LoRa Alliance®“
- The gateway is a Raspberry Pi running the LoRaWAN network stack „ChirpStack“

Results and Outlook

With VinoT, a flexible measurement platform has been developed. Sensors for temperature, humidity, wind strength and direction as well as rainfall are evaluated and implemented. The station has basic functionality and on the gateway side a simple interface displays the measured data.
In a first step, the measuring station will be extensively tested in the vineyard to acquire real world data. To measure other environmental parameters, new sensors can be evaluated and integrated into the system.

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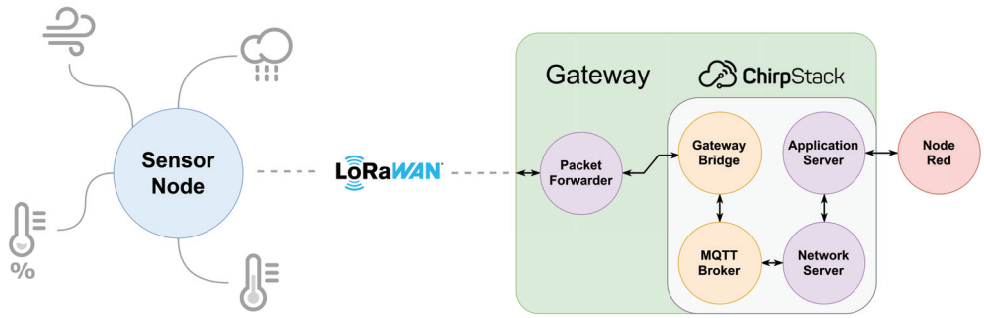

System Overview