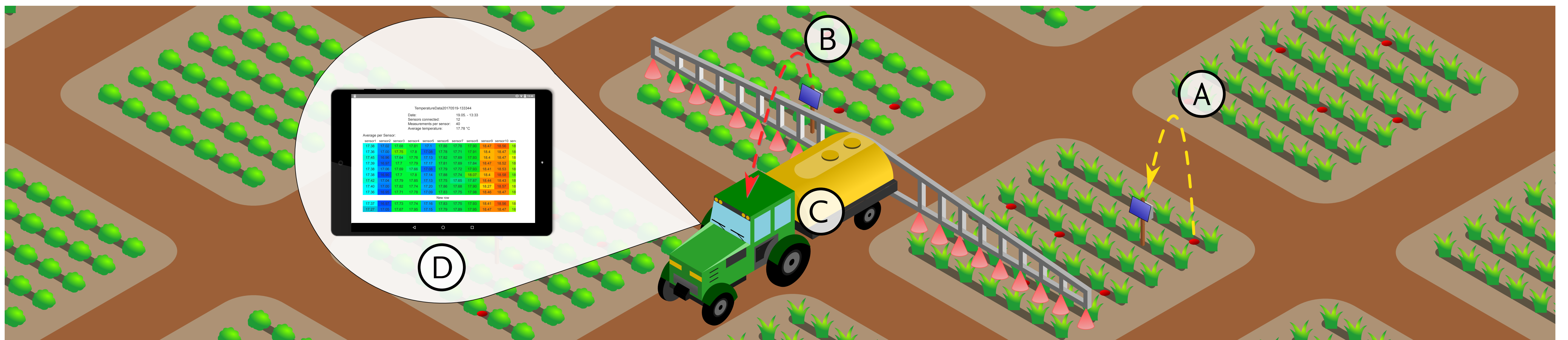# PotatoScanner - Using a Field Sprayer as Mobile DTWSN Node

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PotatoScanner

The goal of **PotatoScanner** is to work primary as a mobile **DTWSN node** and secondary to **measure the surface temperature of plants**. Our main focus lies on the communication and the setup of the DTN and WSN components.

We chose to use **IBR-DTN**, for the mobile node and **miniDTN** on the autonomous nodes. The surface temperature is measured, twice every second across eleven infrared temperature sensors, since our project partner, the "Versuchsstation Dethlingen" (VSD) is interested in this data. One measurement creates around 500kB of data which needs to be transmitted through our DTN.


Workflow

(A) A small wireless sensor node measures temperature at ground level and transmits data to an intermediate node

(B) The intermediate node stores the measurement data and transfers it to the mobile DTWSN node, once in range

(C) A field sprayer equipped with temperature sensors travels over the field, measures the surface temperature of the plants and transports the received data to the farm

(D) The field sprayer's sensors can be controlled via an Android tablet, which simultaneously evaluates and displays the received data in real time

After the tractor reached the farm, the tablet connects to the local WiFi and transmits the data via DTN to a cloud service. There, more detailed analyses can be performed to give the farmer further insights into the data.

Since the GPS coordinates have been recorded for each data point, not only local temperature differences can be assigned from the data, but also the transmission time and location of DTN packets can be precisely determined for further analysis of the DTN network.
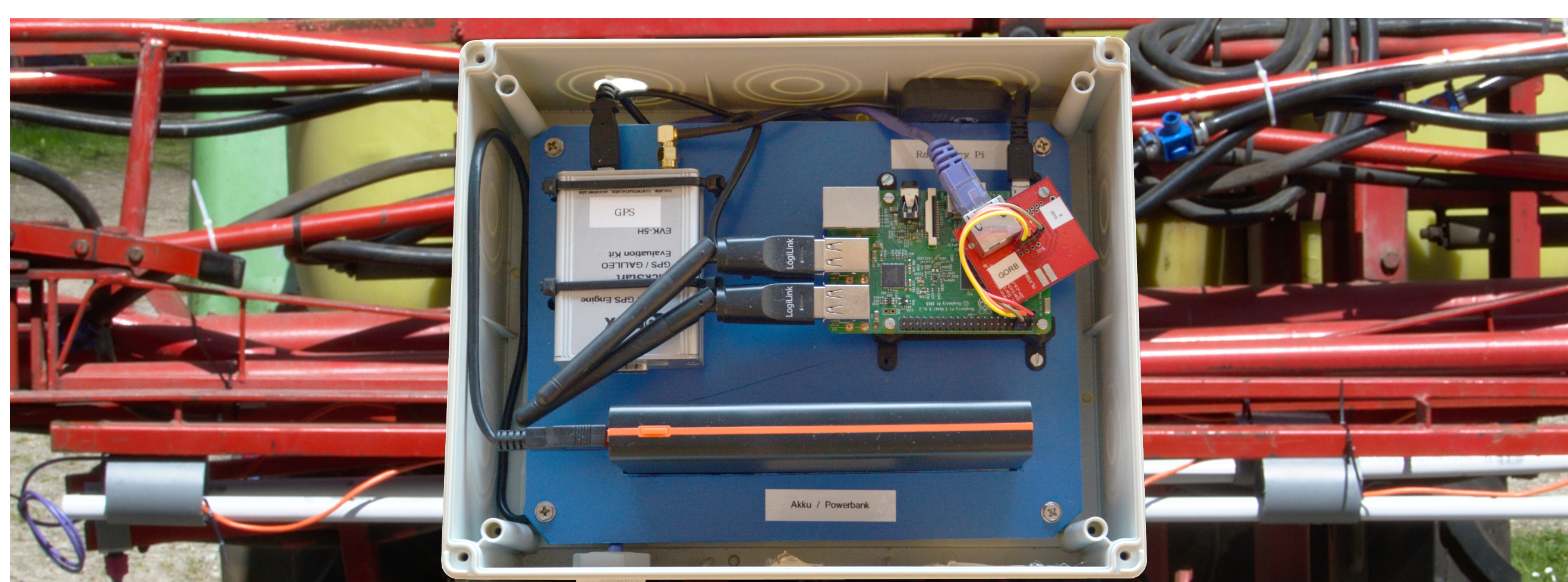
Mobile DTWSN Node

A sensor box was mountend on the tractor, which contains a **Raspberry Pi**, a **GPS module**, **two WiFi adapters** and a **battery**. The temperature sensors of the field sprayer are connected via the I²C bus to the Raspberry Pi. One WiFi adapter acts as an **access point for the Android tablet**. The second one creates a **mesh network**.

We log all occurring events of the DTN network along with the GPS position and time. This might be events like the creation and receiving of bundles, discovery of networks and timeout of bundles. In addition with the measured temperature and bundles from the intermediate nodes, this data gets transmitted to the Android tablet.

Results

- At least one measurement every week over 3 months (a whole season)
- All DTN data was transferred successfully (21 times)
- Due to growth of the plants, transmission times and locations changed over time
- The surface temperature measurements are interesting. Planted and unplanted areas can be identified and slight differences in plant temperatures can be detected
- DTWSNs are the right choice for Smart Farming scenarios in rural areas