Convenient and Affordable Deployment of IoT Networks for Agricultural Monitoring with Mesh Networks

IoTempower ([http://github.com/iotempire/](http://github.com/iotempire/)) is an open IoT framework focused on teaching and easy bootstrapping of IoT solutions. It supports the extremely cheap WiFi ESP8266 and ESP32 chip for rapid deployment of edge nodes.

Currently IoTempower uses classic WiFi networks and needs a good WiFi infrastructure to deploy system nodes. We tried several times to employ IoTempower in agricultural monitoring settings (like a wineyard or vegetable field) to potentially create higher yield via monitoring environmental conditions. Using the ESP here is due to its price very attractive, though constantly powering the nodes and setting up several accesspoints in the area challenges the feasibility. Interestingly, the ESP offers a the low level ESP NOW protocol which has high reach with low power consumption. Based on this protocol exists an open project under a permissive license called "ESP NOW flooding mesh library" ([https://github.com/arttupii/](https://github.com/arttupii/)) that has the potential to solve the previously described challenges.

In this project you should integrate the "ESP NOW flooding mesh library" into IoTempower and prove its feasibility on a small agricultural example. You will get several ESP8266 or ES32 with simple environmental sensors (temperature, humidity, air pressure) for this project and are encouraged to try it out while covering the campus and the outdoors.

Expected challenges you will face:

- Designing the agricultural scenario in an agile way: that should be easy and fun
- Understanding IoTempower: this will be not so hard as the author of IoTempower, Prof. Ulrich Norbisrath, will be at your service
- Exploring the "ESP NOW flooding mesh library" and building a native project: as there is plenty of documentation and examples, this should be relatively easy
- Building a gateway/access point bridging your mesh network to a gateway computer (or a docker environment running IoTempower on your computer): this should be feasible when the first two points work
- Adding an over the air deloyment option to the "ESP NOW flooding mesh library" - there is related work available for this, but it will be a bit challenging
- Doing the actual integration and supporting IoTempower deployment options and testing this against the initial scenario - while mastering the previous points, this should mature more and more over the course of this project

Of course, you are free and encouraged to also consider a home automation scenario or only implement a sample of the points just mentioned based on problems that could arise.

This project is to be carried out as a Scrum project with a team size of 4-10 people - you have to select a project owner and a scrum master in your team. You will work on 7-8 sprints of about 2 weeks each.

Contact information: Ulrich Norbisrath ([http://ulno.net](http://ulno.net)), ulrich.norbisrath@ut.ee