IoT for the Swiss Energy Strategy 2050

Degree programme: BSc in Electrical Engineering and Information Technology | Specialisation: Embedded Systems
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We have developed an energy monitoring system aiming at helping to achieve some of the goals of the Swiss Energy Strategy 2050. The system has three main features: It is modular, adapting to different energy monitoring situations; It enables to easily deploy a sensor network, measuring parameters that are not directly available; It interfaces to existing energy monitoring and home automation systems.

Initial situation and goals

Several existing monitoring systems can be hardly adapted to different monitoring situations. They do not measure all the needed parameters, and/or they do not interface with existing systems, and/or they are not connected with the external world. To solve these problems our goal was to develop a system that is highly modular and adapts easily to different installations. Our system also aims at having a low energy and cost footprint to allow the installation in every household.

Implementation

In a first step, we developed the sensor node, which will be used to collect environmental data like temperature, humidity, light intensity and so on. In addition to that, we can extend the node with sensors that have a serial, SPI or I^2C interface. Simultaneously we clarified which are the standard bus systems for energy monitoring and home automation. M-Bus devices can measure the consumption of electricity, water, heat and gas. ModBus is used as well to measure power consumption but also to measure the production of solar energy. KNX is the standard for building automation. KNX devices can control all kinds of consumers like heaters, lights, roller blinds, etc. The test environment consists of all needed interfaces to be able to gather data from all viable bus systems and the sensor node itself. The data will be presented on a webpage that can be accessed from every device with a web browser and an internet connection.

Results and outlook

We have recreated a typical monitoring scenario to develop and extensively test the system. It has provided a proof of concept as well as it has enabled the possibility to deeply study the potential of the system. Easiness of set up and use has been achieved, making the system a perfect candidate for both temporary measurement campaigns or as a permanent installation.
Our monitoring system is open for several further developments and adaptation. The sensor node currently uses the WiFi technology which can be replaced with low power transmission techniques. In turn, enabling low power will open the system to the use of energy harvesting.

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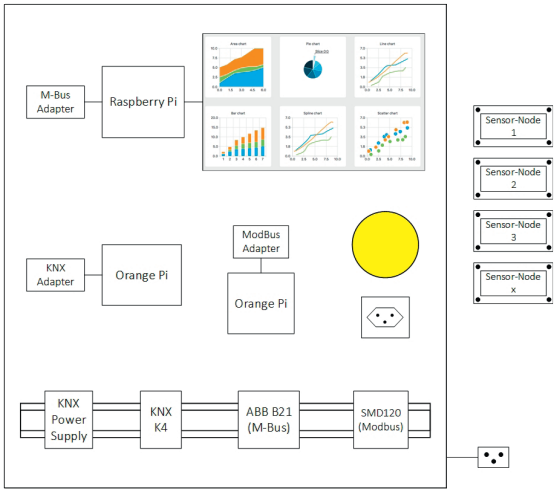
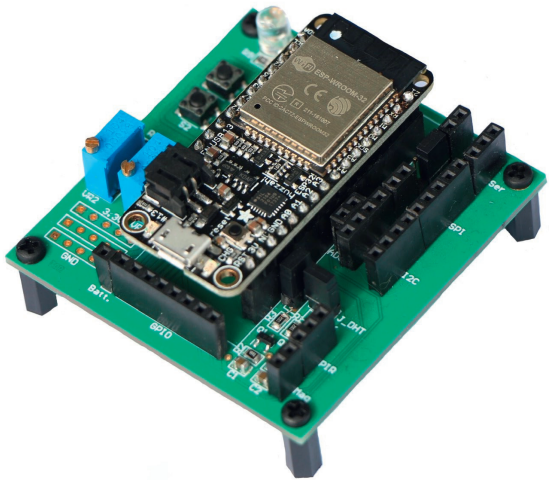


Test environment



Sensor-Node with ESP32