IoT for Water Management

Switzerland consumes around one billion cubic meters of drinking water per year, which corresponds to the entire volume of Lake Biel. During extended dry periods, this high level of consumption can even lead to drinking water shortages in this country. Making people aware of their water usage is a key step in promoting conscious and economical behavior. As part of this project, a system was developed to support this goal.

Concept

The system consists of four components: a sensor with a corresponding node, a gateway, a database, and a visualization unit. The node collects the sensor data and transmits it to the gateway via LoRaWAN. The gateway stores the data locally and forwards it to the database via WiFi or Ethernet. There, the data is visualized in charts and processed as part of a game, while a traffic light-style lamp indicates the water consumption of a user.

Hardware

Three circuit boards were developed for the system: sensor node, gateway, and awareness unit. Depending on their function, they can be installed at different locations within the household. The sensor node can also operate autonomously if needed. The enclosures were manufactured using the FDM process.

Firmware

The sensor nodes automatically detect the flow of water. Measurement data such as temperature, flow volume and battery level is then read periodically at predefined intervals via an analogue input or serial interface, and transmitted to the gateway. It is first stored locally and then uploaded in a database.

Frontend

The web application consists of two main parts. On one hand, a dashboard displays the water consumption and temperature curve using charts. On the other hand, a playful approach is used to raise awareness of personal behavior: A water mascot evolves when tasks, based on the previously measured data, have been completed.

Results

The system is capable of measuring water consumption and provides direct feedback, encouraging users to conserve water. Thanks to its flexible architecture, the system can be easily expanded to cover an entire household or to monitor in detail the use of water of specific appliances (e.g., dishwasher) or rooms (e.g., bathroom, kitchen, garden).
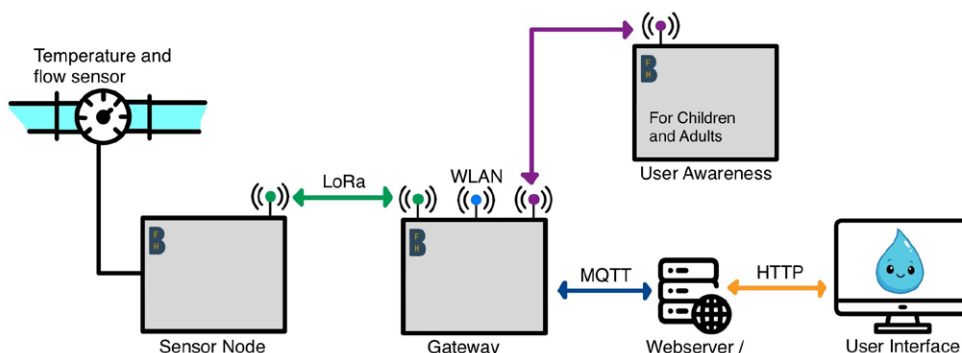

User awareness

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System overview