

Energy consumption and environmental conditions measuring system based on Arduino/Raspberry PI

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Measuring system

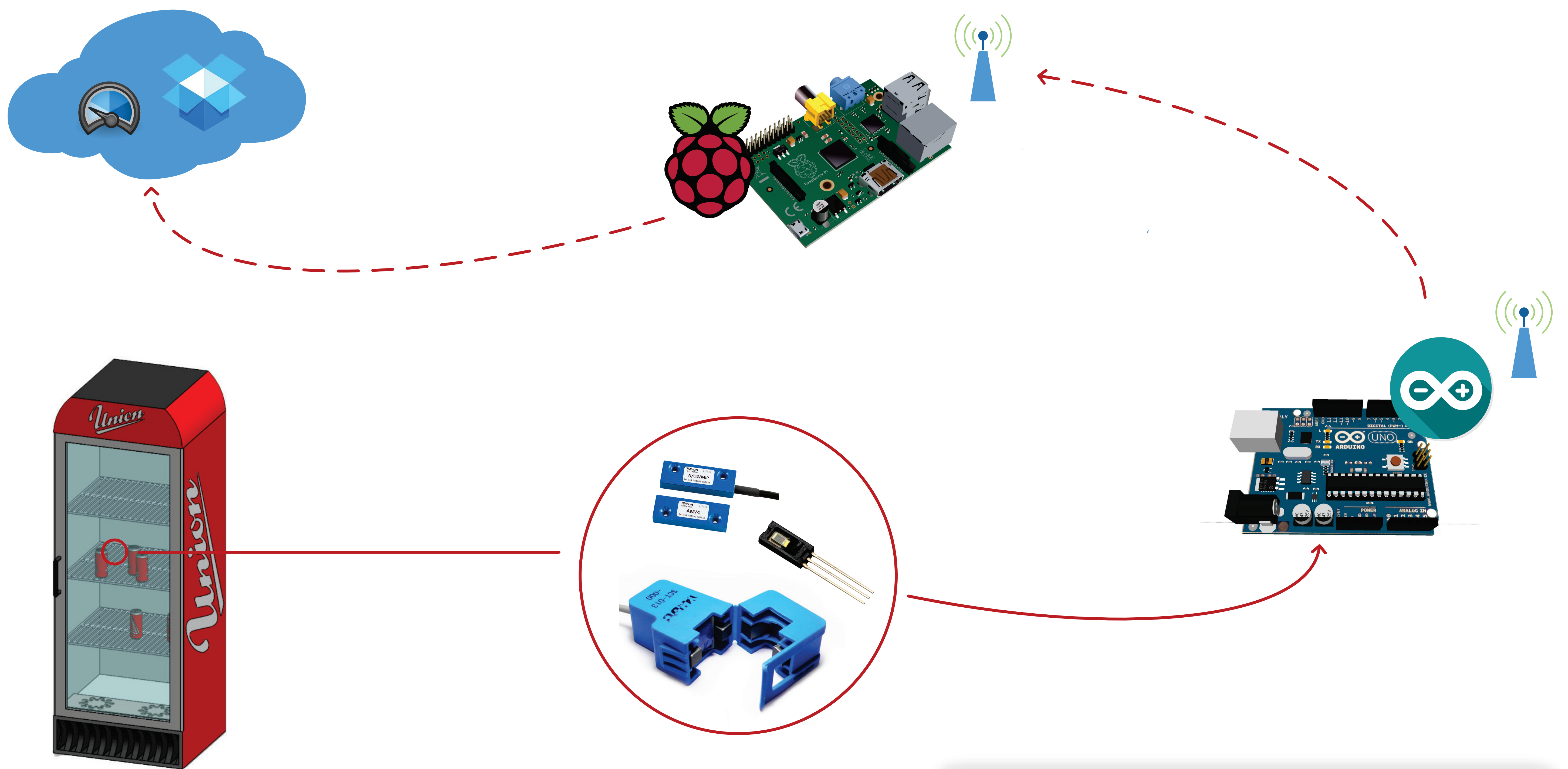
The goal was to design a measuring system which provides synchronous measurements of environmental and electrical parameters on a single platform. The measuring system is capable of measuring power and energy consumption, air temperature, humidity and door opening frequency. It also includes user-friendly web visualization for remote access and more convenient analysis of the gathered data.

Why design it?

In our other studies we have dedicated ourselves to minimizing energy consumption by altering the working regimes of appliances typically found in shopping centers depending on the surroundings and the load on the electrical grid, where the main focus is put on refrigeration. Hence a measuring system to collect data about the environmental and electrical conditions is needed.

Existing systems on the market, do not provide synchronous measurements of all the environmental and electrical parameters on a single platform and many of them are also hard to implement into existing installations without interfering and are therefore impractical for testing in realistic environments.

That is why we designed an independent system, which does not interfere with the existing installations and is capable of measuring multiple parameters simultaneously.



Components and measured quantities

The system consists of two open source platforms known as Arduino and Raspberry Pi (RPI). The Arduino is primarily used for measuring electrical loads with current clamps. The system is built to simultaneously measure up to six independent one phase loads or two three phase loads. It also keeps track of other relevant data, such as air temperatures on up to twenty-one positions at once by using 1-Wire temperature sensors, humidity, and door opening frequency using generic reed switches.

Remote access

All of the collected data is with the help of 2.4 GHz radio transceivers periodically transmitted to the Raspberry Pi, which serves as a local base and a gateway to the internet. Connected to the Raspberry is a 3G USB dongle, which maintains connection to two remote cloud storages. One is Dropbox, where we store raw data, and the other is Emoncms - an open source web application used for data visualization.