IOT BASED WHEATHER REPORTING SYSTEM

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Abstract. *The IOT based Weather Reporting System is proposed to get Live reporting of weather conditions on agriculture used territories. It has to monitor temperature, humidity, wind, light and rain level on large ground fields. The Internet of Things (IoT) technology behind the system is aimed to offer an economically efficient solution to monitor weather conditions. The system is monitoring the environmental conditions and sends the information to the cloud and data is shown like graphical statistics on a web page, and are predicted the harmful weather conditions like storm, dryness.*

Keywords*: weather station, IoT, forecast prediction, temperature and humidity sensor, Arduino, cloud.*

Introduction

Current technology innovations are mainly aimed at monitoring various types of activities. They are increasingly appearing to meet human needs. Most of this technology is focused on the effective monitoring of various activities. An effective environmental monitoring system is essential for monitoring and evaluating conditions if the prescribed level of parameters is exceeded (e.g., temperature, light and humidity) [1].

The paper presents a weather system that is helpful for agriculture. This weather system is based on Internet of Things (IoT). It is equipped with environmental sensors used for measurements at any particular place and report them in real time on cloud. To accomplish this, it is used Arduino Uno and different environmental sensors like DS18B20.

Weather system will contain multiple weather stations that will collect data and send live data in the cloud through Wi-Fi connection. From the measurements will be calculated isobars, isochores, isotherms for land map and this will help for weather prediction.

System Architecture

System architecture is the conceptual model that defines the structure, behavior, and more views of a system.

The purpose of the system is to collect environmental data from weather stations located at different geographical coordinates. The system proposed is an advanced solution for weather monitoring that uses IoT to make its real time data easily accessible over a very wide range. The system deals with monitoring weather and climate changes and helps prevent/forecast agricultural risks.

The data will be stored on a server dedicated to the system, with the possibility to access the data through the Internet from a web page, hosted by the dedicated server. The system-level architecture is shown in Figure 1.

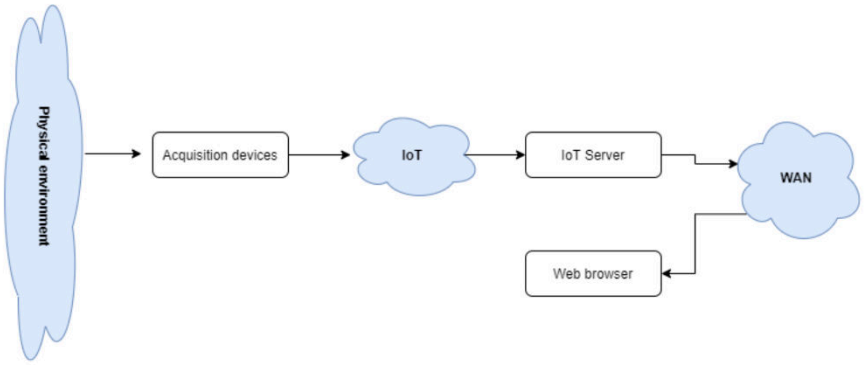


Figure 1. General architecture of the system

Acquisition devices

Each component of either sensor or communication will be realized as following the concept of the generic component. Every component has a stack divided by layers, which provides the application with many services through the RTE interface [2]. As a whole, the device will have the following structure shown in Figure 2.

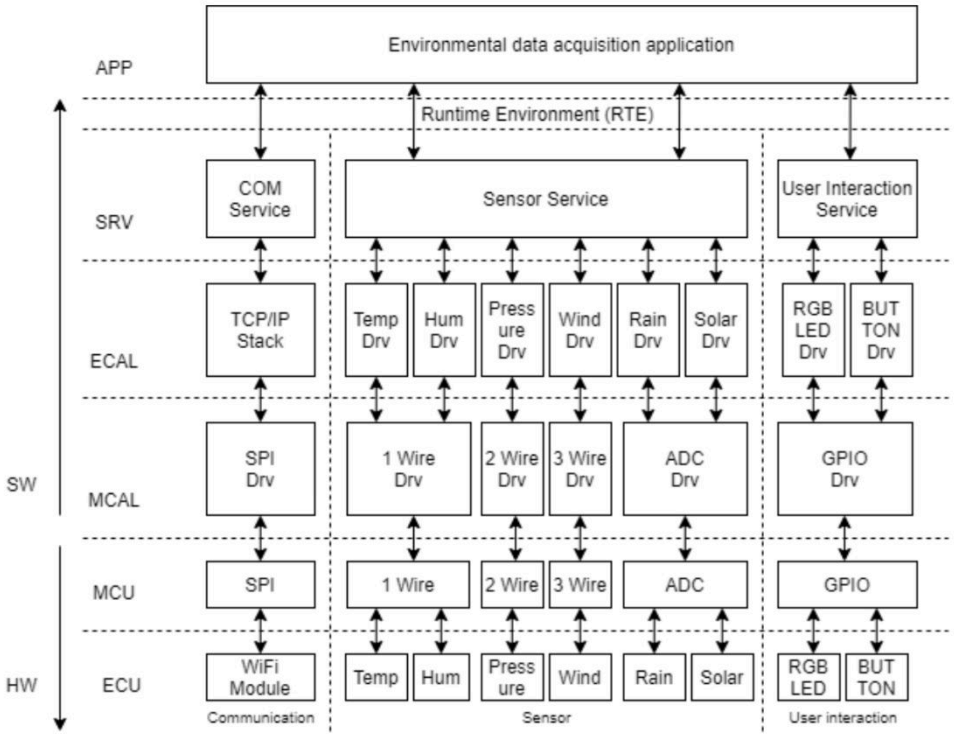


Figure 2. Layered architecture of the IoT device

Functionally, devices collect data about the environment and transmit it to the IoT network. List of sensors that are going to be used in the system are: temperature, humidity, air pressure, wind speed and direction (Anemometer), raindrop and light sensors.

The data flow and the control signals are presented in the functional diagram of Figure 3.

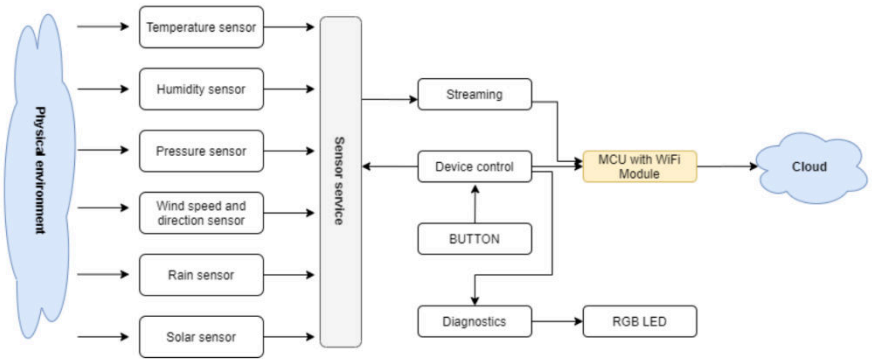


Figure 3. Functional and dataflow diagram for the IoT device

Acquisition server

The implementation of the acquisition server represents a complete individual system, especially on the part of sensors connectivity due to the architectural concept. The sensor services abstract the sensor components. In the case of the acquisition server, the data flow from the sensors is directed through the communication module, and respectively the data requests from the sensors are replaced with requests to the network. Acquisition server can also communicate with the regular Internet network through the Wi-Fi network.

Due to the sensor abstraction in the sensor service layer, the application uses the data from sensors as if it would be directly connected to the equipment on which it runs. The data is being accumulated in the Message Broker which then passes the data to its subscribers, which in the case of our system is the Data Processing layer, where all the data filtering, smoothing and analysis is done. The detailed dataflow diagram of the IoT server is presented in the Figure 4.

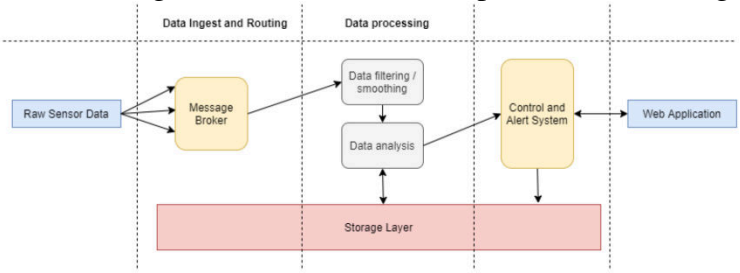
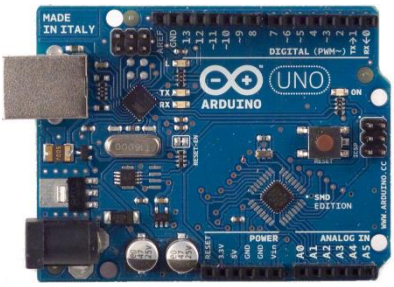


Figure 4. Functional and dataflow diagram for the IoT server

Arduino Uno



Arduino is an open source tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple micro-controller board, and a development environment for writing software for the board. In this system Arduino Uno is used like a development board, in order to get data from sensor and sent through Wi-Fi Module to the cloud.

Wi-Fi Module

The ESP8266 NodeMCU is a low-cost Wi-Fi microchip with a full TCP/IP stack and microcontroller capability. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. In this system Wi-Fi module is used to send data to the cloud in order to process data and output in a UI.

Temperature sensor

In this system is used DS18B20 waterproof sensor. It is useful when you need to measure something far away, or in wet conditions. Because they are digital, you don't get any signal degradation even over long distances. These 1-wire digital temperature sensors are fairly precise (±0.5°C over much of the range) and can give up to 12 bits of precision from the onboard digital-to-analog converter. They work great with any microcontroller using a single digital pin.

Security

The SMQ protocol that is going to be used in this IoT system behaves similarly to WebSocket, with the initial HTTP and HTTPS connection upgraded to a persistent SMQ connection, making the broker difficult to detect, essentially operating in stealth mode.

The SMQ clients can use salted password hashing, making it possible to securely authenticate clients using a non-secure (non-TLS) connection. Secure connections are initiated over HTTPS, enabling clients to connect out to the Internet and bypass any firewall/proxy.

For security reasons, the protocol does not allow wildcard subscriptions, thus an attacker that has gained access to the broker cannot easily subscribe to and detect the message flow.

Conclusion

The purpose of the system is to collect environmental data from devices located at different geographical coordinates. The system proposed is an advanced solution for weather monitoring that uses IoT to make its real time data easily accessible over a very wide range. In this paper is shown the architecture of the system, and some of the components of the system.

References

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