Web-based Wireless Sensor Network

Energy-Performance Control System

Carl Sagrado
Department of Electronic Engineering, TU Dublin Tallaght Campus, Tallaght, Dublin 24, Ireland
X00084403@mytudublin.ie

Abstract

The objective of this project is to develop a wireless sensor network (WSN) system for indoor monitoring and automation of a residential building. The system will autonomously collect environmental conditions from remote units and control these units in real-time via a web interface. The main purpose of the system is to monitor the environmental conditions of a building to aid in reducing energy consumption. The platform also provides an interface to control remote devices, i.e., relays, which will be controlled wirelessly using the same web interface.

Project Overview

Web Interface -

A system web page that displays all sensory data retrieved from the sensor networks and hosts an interface to control remote devices.

Technologies -

HTML - a markup language composed of elements, which contain attributes.

Cascading Style Sheets (CSS) - are used to control the formatting and layout of the document.

JavaScript (JS) - are used to control the formatting and layout of the document.

Web Server-

Serves as the backbone of the project. The server will both serve the communication between the web interface and the sensors, receives and publish the readings from the sensors dynamically and provide control capabilities to the remote devices.

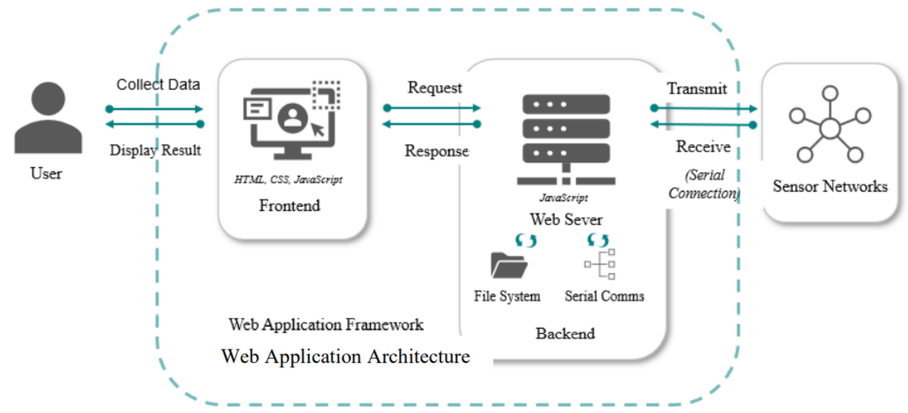
Runs on ***NodeJS*** platform using back end web app frameworks such as Express.js utilising available libraries such as **socket.io**, **serial port** to communicate between the client and the sensor networks.

Sensor Networks

Comprised of small powered intelligent devices with wireless infrastructure that collects and transfers sensory data to a web server for use and analysis. The same network device technology is used to adjust and control devices that are remotely executed by the user via the web interface.

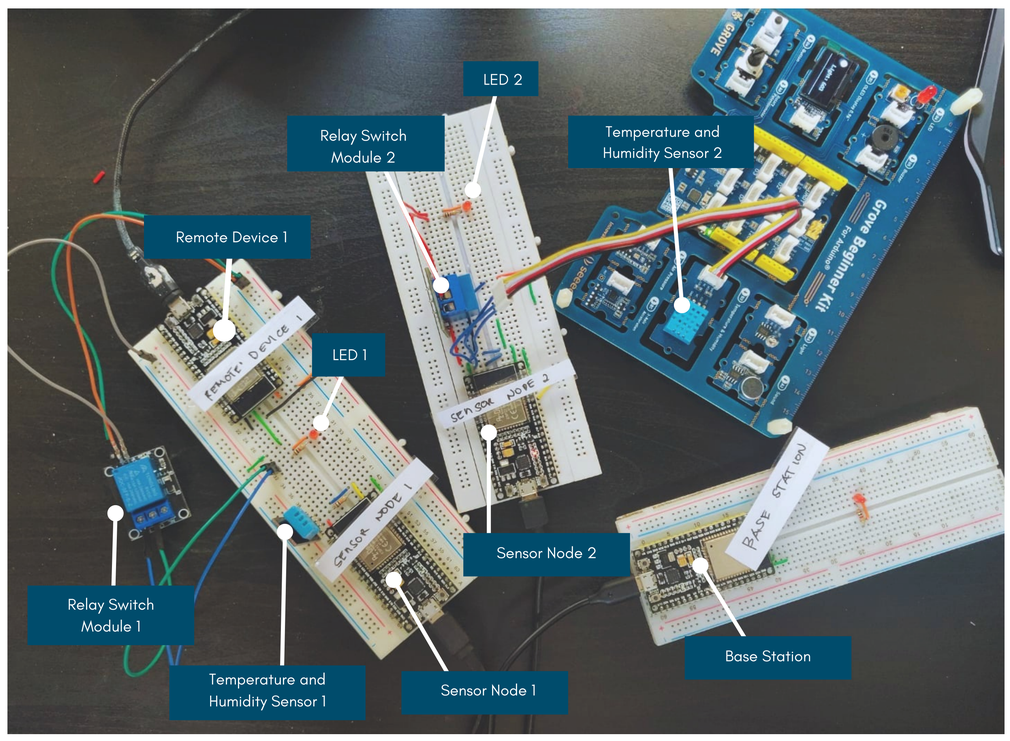
ESP32 - is a low-powered system on a chip microcontroller with 36 GPIO pins and a communication module in one. The module has a single 2.4GHz Wi-Fi and Bluetooth combo.

Implementation

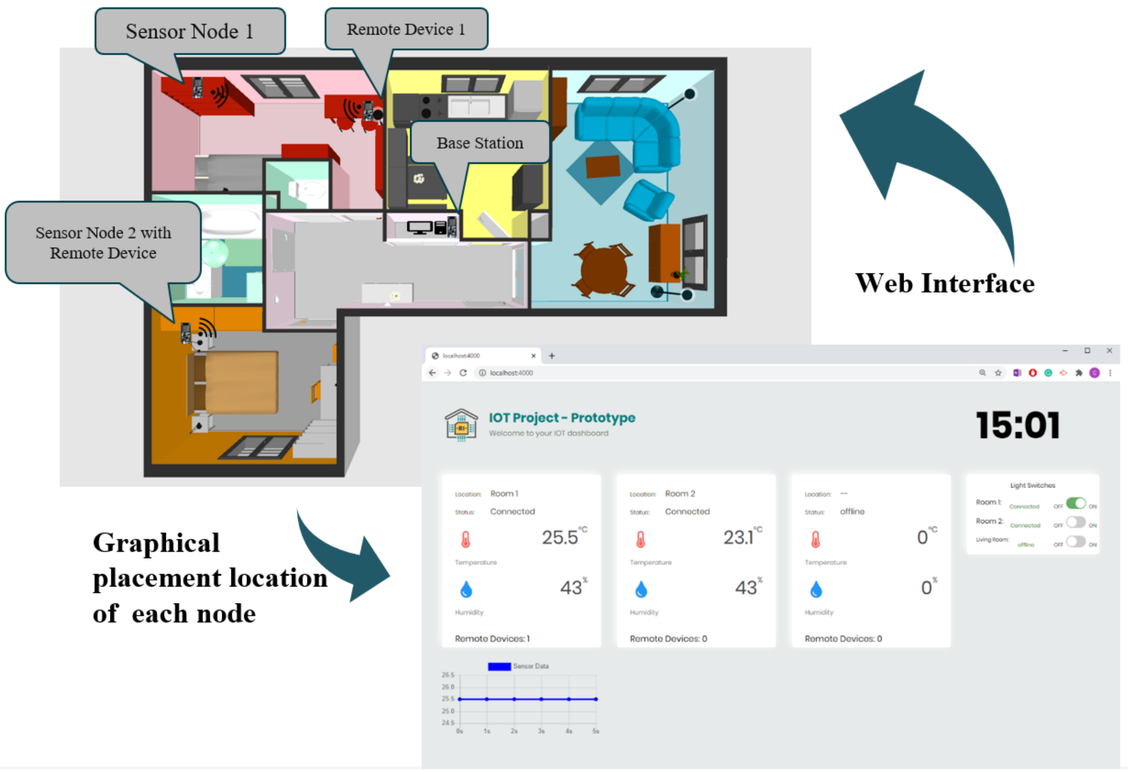


Web Application Achitecture

Hardware & Software Implementation



Result



Conclusion

- The system is working and collects environmental data (i.e. temperature and humidity) of a building and displays the data on a web interface.
- The remote device works accordingly and the web interface displays the correct status of any remote device connected to the wireless sensor network.

Future Work

- Implement a voice control feature to the system.
- Develop a mobile app for easier access.
- Implement an algorithm to enable the sensor network to self organise when new nodes are added to the network.

Reference

E. Systems, "ESP32 - Hardware Design Guidelines," 2021. [Online]. Available: https://www.espressif.com/sites/default/files/documentation/esp32_hardware_design_guidelines_en.pdf. [Accessed 20 May 2021]

Infinite Possibilities