



**SOFE 4610 Fall 2021 - Design & Analysis of IoT**

**Project Title: Temperature-based Smart Fan**

**Architectural Design Decisions**

**Project Group No: 11**

**Group Members:**

Esam Uddin - 100711116

Ashwin Shanmugam - 100700236

Mihir Patel - 100702168

## **Design Objectives followed during the development of the IoT Application**

To create an open, service-oriented, safe, and secure horizontal system of real-world services. In order to achieve this, a set of Design Principles for an IoT Reference Architecture were developed.

The IoT application was designed to make sure the atomic services such as sensing and actuation are performed consistently by decoupling from the devices that provide services. This helps reuse deployed IoT resources across application domains. The application was designed based on a service-oriented architecture that will be used for application development and deployment. These services include accessing and publishing the sensor data and other resources on the platform for visualization and other purposes.

An important design decision that we made while building the IoT platform is ensuring they are secured. Upon creation of each component in the application, an authentication system was added to validate the user before accessing any resources. SSL certificate was established to enable encrypted connection and to authenticate the website's identity. The database was secured by creating user authentication within PhpMyadmin.

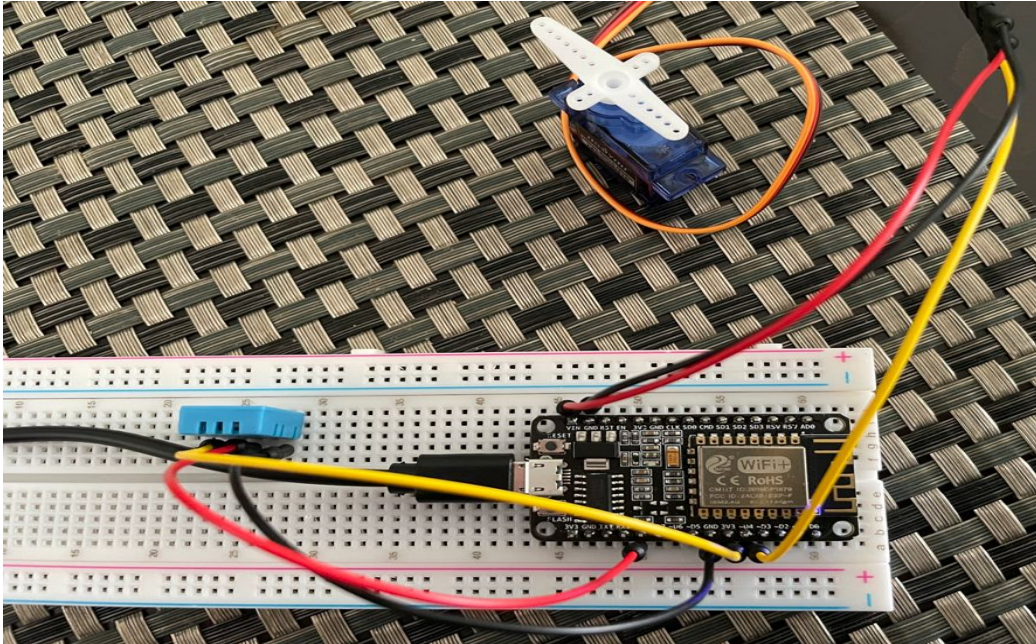
The application was designed by keeping in mind some of the quality attributes such as scalability, performance and effectiveness. These attributes are achieved by deploying the IoT platform using a cloud infrastructure which is established on a global scale. Sensor data which is received from the NodeMCU is delivered real time to the cloud instance with different characteristics. The cloud instance manages the incoming data and outputs it seamlessly to the user interface chart built on the application domain since the services were decoupled from the devices that provided it.

The IoT platform was initially built utilizing the Django REST framework and python programming language. In order to create a deployable application a cloud infrastructure had to be built. The cloud instance helps the embedded devices with sensors send and receive data through the Internet utilizing the MQTT protocol. In order to do this, it was important that we build the platform using the LAMP (Linux, Apache Server, MYSQL, PHP) stack. The network connectivity and flow was designed using node-red which is a flow based development tool used for visual programming.

During the initial design stages, we had a servo motor and DHT11 temperature sensors connected to the NodeMCU to allow the motor to spin if the temperature goes over a certain degree. The servo motor had issues with the output voltage in the NodeMCU and often failed to perform properly. We removed the servo motor and designed its functionality virtually using

node-red. A user interface was also created to virtually control the fan using the node-red dashboard.

Below is a screenshot that displays our initial circuit design.



A screenshot of the node-red dashboard is posted below to demonstrate the working of the circuit and to show that data is passed to the cloud.

