SYSTEM DESIGN

Group name

First Airbenders

Project name

COMFORT HOME



|  |  |  |  |
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# Hardware

The indoor climate control system consists of several components which interact with each other. The hardware required is as follows:

1. STM32 Nucleo-64 development board with STM32F303RE MCU.
2. CM1106 CO2 sensor.
3. SHT20 temperature and humidity sensor.
4. IAQ-Core VOC sensor.
5. ESP8266 microcontroller.
6. Fan.

# Wiring diagram

A screenshot of a cell phone

Description automatically generated

# System design

## System context diagram

A screenshot of a cell phone

Description automatically generated

## 

## System architecture diagram

A picture containing clock

Description automatically generated

# Communication and protocols

The embedded board has a couple of sensors connected to it. Each one of them has to communicate with the board through a given communication protocol. They are as follows:

1. The temperature and humidity sensor uses I²C.
2. The VOC sensor uses I²C.
3. The CO2 sensor uses UART.
4. The ESP8266 uses TCP.

The C# application receives data (measured values) from the ESP8266 module. The format in which the data is being sent has thoroughly been discussed with several groups. Sending format of values:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| # | **TEMP** | ; | **CO2** | ; | **HUMID** | ; | **VOC** | ; | **IP** | $ |

The values temp (temperature), CO2 (carbon dioxide), humid (humidity), VOC (volatile organic compounds) and IP (internet protocol address) are formatted together with the start symbol (#), separators (;) and the end symbol ($).

Communication between the C# application and the ESP8266 module takes place every 5 minutes or when a spike is detected from the CO2 or VOC sensor. In that case the values are being sent including a percent symbol (%) in front of the CO2 or VOC value, depending on which sensor detected the spike.

# Control flow diagram



# State diagrams

## Embedded board states



## C# state

