IoT Microcontroller Design Decision

Requirements:

- Last at least one year with a sampling rate of 1 sample every 10 minutes.
- Temperature range should be between 0 C to 60C with a resolution of 1C
- Must be small in size, accurate and low cost
- Must last at least 3 months without replacing the batteries.

Microcontroller Possibilities:

IoT Microcontroller	**NodeMCU Microcontroller**	**Arduino**	**Raspberry Pi 4**
Accuracy	High	High	High
Cost	Low	Medium	High
Size	Small	Medium	Large
Power	less	less	High

Based on the requirements of our project, we decided to go with the ESPMCU as it is highly accurate, has a low cost and size compared to the arduino and requires less power compared to the Raspberry Pi 4.

Sensor Possibilities:

DHT22

- Temperature range: -40°C - 80°C
- Sample rate: 2 seconds
- Communication protocol: one wire

TMP36

- Temperature range: -40°C to 150°C
- Output range: 0.1V (-40°C) to 2.0V (150°C)
- Communication protocol: analog output

Both of these sensors meet the requirements needed for sample rate and temperature range. We decided that the DHT22 and its analog output communication protocol would be a more practical and simple approach to this design. The DHT22 is also much more reliable than the TMP32 so we decided to use the DHT22 Temperature Sensor.

Power

DTIM: Delivery Traffic Indication Message

	Modem-Sleep	Light-Sleep	Deep-Sleep
Wi-Fi	OFF	OFF	OFF
System Clock	ON	OFF	OFF
RTC	ON	ON	ON
CPU	ON	Pending	OFF
Substrate Current	15 mA	0.4 mA	20 µA
Average current DTIM = 1	16.2 mA	1.8 mA	
Average current DTIM = 2	15.4 mA	0.9 mA	
Average current DTIM = 3	15.2 mA	0.55 mA	

In terms of the power consumption, nodemcu has the ability to enter deep-sleep mode which would enable us to consume less power. Furthermore, in light-sleep mode, the device will last the required amount of time necessary for 3 months. The NodeMCU Board has a socket which can be used to power the boards and to supply additional voltage if needed. A power supply adapter or the AA batteries provide from 7 to 12V of DC is required. This would allow the user to either use an adapter plugged into a wall socket or use 4 AA batteries which would allow the board to run for roughly 3 months at worst.