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# Micro-controllers firmware architecture

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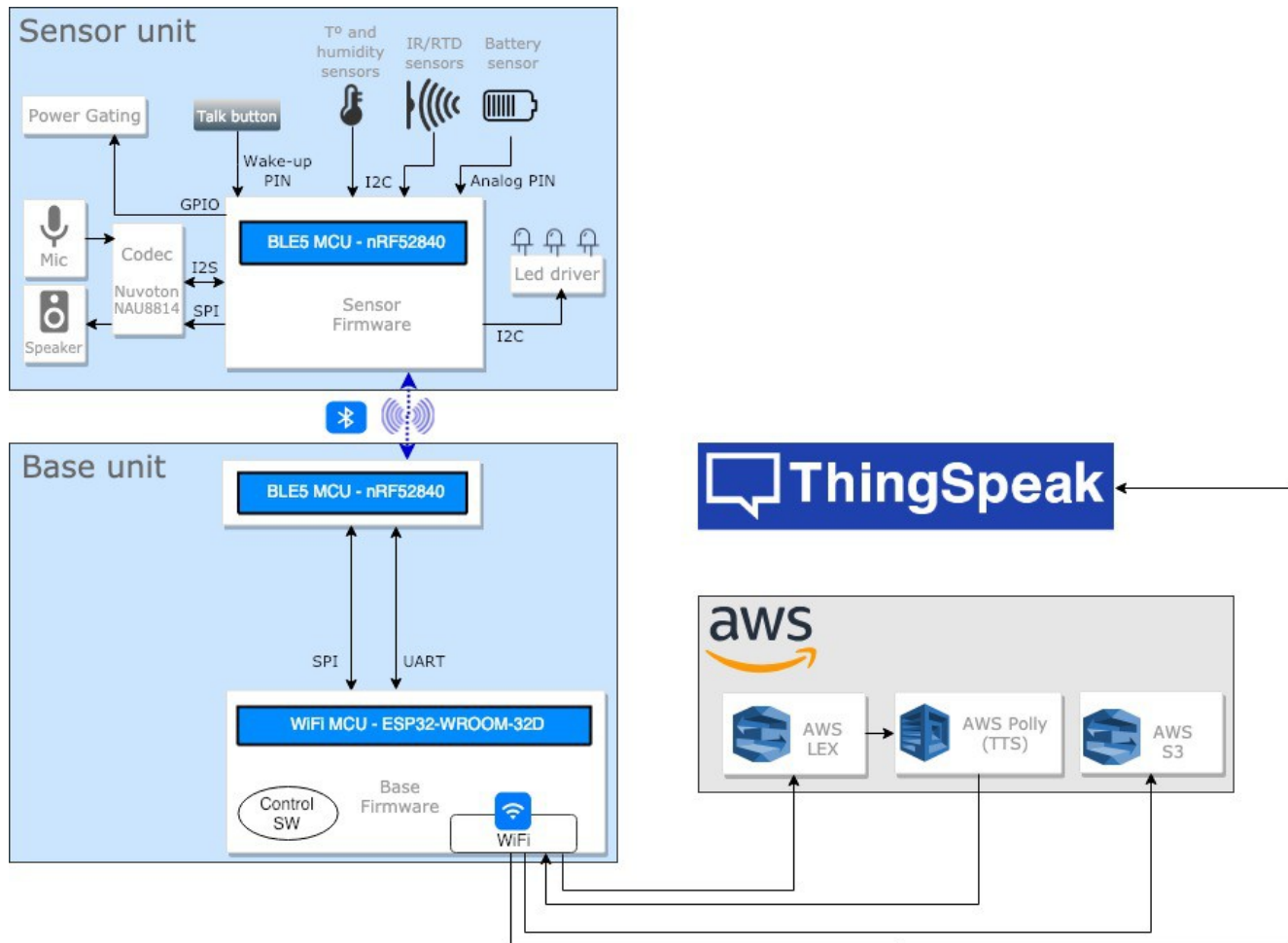
## Introduction

This document describes the overall architecture and the main components that are used by the firmware.

## Overall architecture

The solution consists of a sensor unit with a nRF52840 BLE5 MCU and a base unit with the same nRF52840 MCU and also a ESP32-WROOM-32D WiFi MCU. The sensor unit needs to read multiple sensors information and transmit them to the base unit over the wireless interface. It also has a microphone and speaker so it needs to transmit an audio stream received from the microphone via the I2S interface to the base unit over the Bluetooth interface and receive an audio playback from the Bluetooth interface and play it over the I2S interface using the speaker. The ESP32 is used to communicate with the cloud over WiFi. All sensor data are sent to ThingSpeak. AWS is used for voice recognition services. All three MCU will require firmware to be developed and tested.

The picture below depicts the overall architecture of our solution:



## Bill of material

The active components relevant to the firmware development are the following:

### Sensor unit

- Wireless BLE5 SoC : [BT840F Module](#) (using Nordic nRF52840 SoC)
- Temperature & Humidity sensors (x2) : [Sensirion SHT30](#)
- IR Sensors (x4 or x9) : [Excelitas TPI-S 1S 1385](#)
- RTD SMD Temperature sensor: [Sensirion STS31](#)
- Audio Codec (connected to mic & speaker): [Nuvoton NAU8814](#)
- Analog Mems (microphone): [TDK InvenSense ICS-40619](#)
- Led Driver: [Texas Instruments LP55231](#)
- Push button connected to wake up pin of sensor unit MCU

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**Base unit**

- Wireless 5 SoC : [BT840F Module](#) (using Nordic nRF52840 SoC)
- WiFi SoC: [Espressif ESP-WROOM-32D Module](#)
- Other circuitry used by the control function (out of scope)