**Integrated Wi-Fi Cloud Thermostat**

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**TI**

The TI CC3220SF has 1 MB of Flash memory and 256 KB of RAM, making it perfect for hosting code and user settings for a smart thermostat. It has an integrated Wi-Fi chip and a rich set of features. It supports GPIO, UART, I2C, and has LEDs to indicate the state of the thermostat. It integrates two processors on a single chip, an ARM Cortex-M4 MCU and a network processor MCU. It has a TMP0006 temperature sensor built-in which makes it suitable for a smart thermostat out of the box, with no additional components needed (Texas Instruments Inc., 2024).

**Microchip**

The PIC32MZ-W1 and WFI32 2.0 Curiosity Board combination provides a robust platform for a smart thermostat IoT device. It has 2 MB of flash memory and 640 KB of RAM, making it more than capable of running code for a smart thermostat. It supports GPIO, I2C, UART through its mikroBUS™ socket and XPRO Header, and GPIO/UART through a GPIO Header. The TC1047A temperature sensor connected using an analog-to-digital converter makes it capable of reading the air temperature. It also has status LEDs to indicate the state of the heater (Microchip Technology Inc., 2024a). Its 2.4 GHz Wi-Fi module allows it to connect to the cloud, where it is Microsoft Azure certified with plug-and-play capabilities, AWS Free RTOS certified, and Amazon Frustration Free Setup certified (Microchip Technology Inc., 2024b).

**Freescale**

The RW612 is a wireless MCU supporting Wi-Fi and low energy Bluetooth designed for connected smart home devices. 1.2 MB SRAM and 16 kB AON RAM makes it adequate for a simple cloud-integrated smart thermostat, however it does not feature any non-volatile Flash memory to store code and user settings. It would require an external Flash device to integrate with it to meet the requirements (NXP Semiconductors, 2024).

**Recommendation**

For this project, I recommend the TI CC3220SF as it is perfectly suitable for a smart thermostat, and we already have a prototype built with the TI CC3220 Launchpad XL. The Freescale RW612 would need additional components containing Flash memory to support user settings and to hold the software, so it is not optimal for our project. Microchip’s PIC32MZ-W1 and WFI32 2.0 Curiosity Board combination is a very powerful package that would more than meet the needs for a smart thermostat. It might even be a bit overkill depending on the features we expect to implement, and the scalability desired for future development.

**References**

Microchip Technology Inc. (2024a). *PIC32 WFI32 2.0 Curiosity Board User's Guide.* [Online Resource].<https://onlinedocs.microchip.com/oxy/GUID-728D5792-3593-46CA-A4D5-F9A8D8D82974-en-US-1/index.html>

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NXP Semiconductors. (2024). *Wireless MCU with Integrated Tri-radio: 1x1 Wi-Fi® 6 + Bluetooth® Low Energy 5.4 / 802.15.4*. [Online Resource]. <https://www.nxp.com/products/wireless-connectivity/wi-fi-plus-bluetooth-plus-802-15-4/wireless-mcu-with-integrated-tri-radio-1x1-wi-fi-6-plus-bluetooth-low-energy-5-4-802-15-4:RW612>

Texas Instruments Incorporated. (2024). *SimpleLink™ 32-bit Arm Cortex-M4 Wi-Fi® wireless MCU with 1MB Flash and 256kB RAM*. [Online Resource].https://www.ti.com/product/CC3220SF