**7-1 Project Submission**

Winnie Kwong

Southern New Hampshire University

CS-350 Emerging Sys Arch & Tech

Professor Prasad

April 21st, 2024

The project leveraged the highly efficient I2C, GPIO, and UART peripherals to ensure the thermostat had seamless access to control logic. The I2C, with its ability to read data from the temperature sensors, ensured reliable communication between sensors and the other peripherals. The GPIO, a versatile component, was used for multiple functions, such as controlling the LEDS, and also functioned as an interrupt when the temperature increased and decreased. Lastly, the UART provided robust communication from the thermostat's data into the specified server by connecting the USB to the computer, further enhancing the project's technical prowess.

The project opted for the cost-effective and highly functional TI Simplelink WI-FI CC3220S. With 256KB of RAM, 1 MB of flash memory, and security features, this single-chip solution proved more than sufficient to complete the project. The kit's Wi-Fi connectivity and direct connection to a computer using the provided USB, along with development tools such as Code Computer Studio Cloud IDE, further underscored its value for money and functionality, ensuring the project's financial viability.

Reviewing Microchip, the company offers many IoT boards with integrated peripherals similar to TI, and one series, notably the WFI32 MCU series, would also help complete the project. One in particular, the WFI32-IoT Development Board, has all the features to support the required peripherals, Wi-Fi, flash memory, RAM, and other functionalities to transmit data into a cloud server. (WFI32-IoT Development Board, n.d.) The model also has the necessary equipment to create a smart thermostat and can offer power efficiency, but it is three times as expensive in comparison to the TI Simplelink WI-FI CC3220S.

NXP Semiconductors, previously known as Freescale, offers a handful of MCUs with sufficient Flash and RAM but feels advanced or complex for development when supporting the peripherals. Under the general purpose MCU portfolio, the following are the i.MX and Kinetis K series are great for creating a smart temperature; however, their products do not enable the use of buttons to complete tasks. One example, i.MX RT1064, offers 2 MB of RAM and 4 MB on-chip flash. (NXP Semiconductors, 2024). The microcontroller provides wireless connectivity to send data into the cloud.

The thermostats rely on Flash and RAM for code execution. Flash can permanently store the program's code, defining the sensor readings and outputs. The RAM temporarily stores data such as the sensor's reading and user input. RAM can access data faster than Flash but cannot retain data once power is lost.

**References**

*CC3220S-LAUNCHXL*. (n.d.). Texas Instruments. <https://www.ti.com/tool/CC3220S-LAUNCHXL#description>

NXP Semiconductors. (2024, April 11). *I.MX RT1064*. <https://www.nxp.com/products/processors-and-microcontrollers/arm-microcontrollers/i-mx-rt-crossover-mcus/i-mx-rt1064-crossover-mcu-with-arm-cortex-m7:i.MX-RT1064>

*WFI32-IoT Development Board*. (n.d.). Microchip Technology. <https://www.microchip.com/en-us/development-tool/ev36w50a>