Final Project Report

The three peripherals that were involved in this thermostat prototype were a temperature sensor that was interfaced with via I2C, an LED that was controlled via GPIO, and information that was exchanged with a server via UART. The thermostat prototype reads the ambient temperature of the air via the sensor located on it. The temperature is then conveyed to the server by way of the UART, sending data that includes the current set point, temperature, heating element status, and time the thermostat has been running. The GPIO peripheral uses the information gained from the UART to signal when to turn the heating element on, denoted by the red LED on the thermostat turning on.

To determine which board architecture would be best for the thermostat, I have provided three from different manufacturers. The TI 3220S XL Launchpad that this program was prototyped with, the PIC32MZ-W1 and WFI32 2.0 Curiosity Board from Microchip that offers similar performance, and the 88MW32X AWS IoT Starter Kit from NXP (formerly Freescale). Links to all of the boards can be found at the end of this report. The TI board would need to be configured to communicate with a custom server for storing and relaying information, this is made possible by the wireless chip located on the board. The board from Microchip is compatible with both Azure and AWS, cloud services that could make setup of the wireless environment easier to implement. The Microchip board also has a PCB antenna, allowing for greater transmission distances with Wi-Fi. The board from NXP is specifically designed to interact with AWS IoT cloud infrastructure, making it a consideration if the development plans of this thermostat coincide with Amazon IoT products. The NXP board features a single-chip SoC with 1x1 802.11n Wi-Fi for its transmission capabilities. The storage hardware specifications of the boards are as follows: the TI board with 1MB Flash and 256KB of RAM, the Microchip board with 2MB Flash and 640KB of RAM, and the NXP board with 512KB SRAM and a Flash controller meant to interact with external Flash. As far as prices go, the TI board is the cheapest coming in at $50, the Microchip board is next at $85, and the NXP board comes in at $235. My recommendation is the Microchip board, as it has been proven that the memory on the TI board is sufficient for the current thermostat program, and the Microchip board has over double the memory for roughly $30 more. This allows for more headroom as new features and updates are introduced into the software. The NXP board is far too expensive, and its strict AWS structure could limit its interactivity with non-AWS devices. The Microchip board also allows for Azure and AWS cloud integration right out of the box, if that is preferred.

Sources

* *CC3220SF-LAUNCHXL*. CC3220SF-LAUNCHXL Development kit | TI.com. (n.d.). <https://www.ti.com/tool/CC3220SF-LAUNCHXL>
* PIC32MZ W1 family of Microcontrollers | Microchip Technology. (n.d.-a). https://www.microchip.com/en-us/products/microcontrollers-and-microprocessors/32-bit-mcus/pic32-32-bit-mcus/pic32mz-w1
* 88MW32X AWS IOT Starter kit. NXP Semiconductors. (n.d.). https://www.nxp.com/products/wireless-connectivity/wi-fi-plus-bluetooth-plus-802-15-4/88mw32x-aws-iot-starter-kit:88MW32X-AWS-IOT-STARTER-KIT