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CS-350: Emerging Sys Arch & Tech

7-1 Project: Report

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For this project, three peripherals were used as a means of interacting with the thermostat via inputs and outputs: GPIO, I2C, and UART. The thermostat supports these peripherals in different ways that can be witnessed within the drivers and the code created for this thermostat to function. First, there is GPIO. The thermostat uses the GPIO’s LED light as an output to signal when the temperature is above or below the setpoint, and then uses the buttons on the microcontroller as an input method of increasing or decreasing the temperature. The I2C is the peripheral that allows us to introduce temperature checks to the board. Once the I2C peripheral is installed, the board can check the temperature and report back to us its value. Finally, there is the UART which allows data about the board to be sent to a terminal. Since the UART peripheral is able to transmit data from the thermostat to the simulated server being used, it can communicate with a wireless connection to connect the thermostat to the cloud. Information needed to access the cloud, such as any log in information, can be sent using the UART peripheral.

When it comes to the architecture for integrated for wi-fi to recommend, there are three options to compare: TI, Microchip, and Freescale. Since we want architecture that is able to handle that data being sent from the thermostat to the wi-fi and eventually the cloud, we want an option that has the flash and RAM capable of doing this. The first option, TI, has up to 256KB of RAM and a fully integrated module that includes 8Mbit of SPI Flash (Mouser Electronics, 2022). For our second option, Microchip, has wi-fi modules such as the “WFI32E01PC” that can have up to 1024 kb of Flash and 320 KB of RAM—though it can be more expensive (Microchip, n.d.). Finally, there is Freescale. Freescale (now acquired by NXP), like TI and Microchip, is capable of handling the data from the thermostat. The only obvious downside to Freescale is that finding that specific brand can take a bit of an effort since NXP offers a variety of brands.

Ultimately, when comparing different hardware architecture, their prices, and even finding some reviews where wi-fi integrated microcontrollers were being sold, I would recommend the TI model. When compared to Microchip and Freescale, finding wi-fi integrated architecture with TI is affordable with a strong reputation for reliability and a wide array of options to choose from. This means that if SysTec ever wanted to make updates to their thermostat then TI has options available such as more flash or RAM. It is also helpful that the thermostat and hardware architecture come from the same manufacturer. In the event that there are technical issues or upgrades need to be made, there is a common source that SysTec can work with.

**References**

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