**Smart Thermostat**

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This project utilizes the TI CC3220SF board to create a smart thermostat prototype that supports I2C, GPIO, and UART peripherals. The thermostat reads the room temperature using the TMP006 temperature sensor via the I2C interface, controls an LED to indicate the heating status using GPIO, and simulates data transmission to a server using UART. In this project’s code, the I2C peripheral reads data from the temperature sensor every 500 milliseconds, which the thermostat then uses to determine if the heat should be on or off. The thermostat uses GPIO peripherals to detect button presses and controls the LED. The GPIO pins connected to the buttons enable the user to raise or lower the temperature setpoint by triggering an interrupt when a button is pressed. An LED connected to another GPIO pin indicates if the heat is on by lighting up when the temperature is below the setpoint and turning off if the temperature is at or above the setpoint. The thermostat uses the UART peripheral to send the current temperature, setpoint, heat, and time since the system started (in seconds) to the console every one second. This simulates the data being sent to a server.

There are three hardware architectures that could be considered for a smart thermostat: TI, Microchip, and Freescale (now NXP). Microchip has a variety of 32-bit microcontrollers, including PIC and SAM. The SAM series, based on ARM Cortex-M cores, could be suited for smart thermostat applications. They have a variety of memory sizes for flash and Ram depending on the model which makes them flexible for the needs of different projects (*32-bit Microcontrollers (MCUs) | Microchip Technology*, n.d.). Microchip microcontrollers support many peripherals including I2C, GPIO, and UART. However, some microcontrollers might require an external Wi-Fi module to connect to a cloud. Depending on the model, Microchip’s SAM microcontrollers offer up to 384KB of SRAM and 2048KB (2MB) of flash memory. This memory capacity would be more than sufficient for a smart thermometer with the requirements in this project. Freescale has the Kinetis series based on Arm Cortex-M4 architecture similar to TI’s CC3220SF. The K6x has more than adequate memory for a smart thermostat with up to 2MB of flash and up to 256KB of SRAM (*K Series Cortex-M4*, n.d.). It can also support I2C, GPIO, and UART. However, it does not have Wi-Fi built into it and will need an external Wi-Fi module to connect to a cloud. TI’s CC3220SF has 1MB Flash and 256KB of RAM (*CC3220SF-LAUNCHXL Development Kit | TI.com*, n.d.). The TI architecture has integrated Wi-Fi capabilities that can connect to a Wi-Fi network and then communicate with a cloud server. The TI CC3220SF has sufficient memory capacity and integrated Wi-Fi capabilities that make it well-suited to developing a smart thermostat that can easily connect to the cloud.

**References**

*32-bit Microcontrollers (MCUs) | Microchip Technology*. (n.d.). https://www.microchip.com/en-us/products/microcontrollers-and-microprocessors/32-bit-mcus

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*K Series Cortex-M4*. (n.d.). https://www.nxp.com/products/processors-and-microcontrollers/arm-microcontrollers/general-purpose-mcus/k-series-arm-cortex-m4:KINETIS\_K\_SERIES