Bryce Jensen
CS-350-R4870
7-1 Project 1
4/21/2024

Explain how the thermostat supports the **peripherals** used in the project. Make sure that you have included all the required details from the scenario in your report. You should discuss each of the three outlined hardware architectures, including TI, Microchip, and Freescale.

The peripherals in the TI CC3220S development kit include timers, buttons, temperature sensors, LEDs, and UARTs. All of these were used in the thermostat project. According to TI's specs page for this device, it has:

- Four general-purpose timers, each of which can be configured to operate as two 16-bit timers. Used to time the task scheduler's tasks.
- Two buttons that can be used for user input. These buttons can be configured to generate interrupts when pressed. Used to increase and decrease the set temperature.
- It obviously has a built-in temperature sensor, used with the I2C communication which can be used to interface with it, but I cannot find any stats on it. It was used to detect the ambient temperature of the room.
- The board has three LEDs that can be used for output indications. The red LED was used to indicate whether the "heater" was on or not.
- The CC3220S has a UART that can be used for serial communication. Used to display the statistics of the thermostat to a terminal (Texas Instruments, n.d.).

Microchip: For Wi-Fi connectivity, an external Wi-Fi module would be required as I cannot find anything about a board with a built in Wi-Fi module (Microchip, n.d.). Microchip offers the MRF24WG0MA/MB Wi-Fi modules which can be used with their microcontrollers for Wi-Fi connectivity (everythingRF, n.d.).

Freescale (now NXP): Freescale's Kinetis series of microcontrollers have extensive peripheral support. They also provide Processor Expert, a GUI tool to generate drivers for on-chip peripherals (squadmcu, 2012). For Wi-Fi connectivity, an external Wi-Fi module would be required. Freescale provides the WGM110 Wi-Fi module which can be used for Wi-Fi connectivity in their microcontroller-based systems (Silicon Labs).

Explain how the thermostat connects to the **cloud** via Wi-Fi. Discuss all three architectures in your work.

The thermostat connects to the cloud via Wi-Fi to send data to the server. This is typically achieved using a Wi-Fi module that communicates with the microcontroller. Not every controller uses the same process, some are built in, others require special hardware.

TI: The TI CC3220S LaunchPad has built-in Wi-Fi support. It uses the SimpleLink Wi-Fi CC3220 wireless MCU which can connect to the cloud via Wi-Fi to send data to the server.

Microchip: Microchip offers the MRF24WG0MA/MB Wi-Fi modules which can be used with their microcontrollers for Wi-Fi connectivity.

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Freescale: Freescale provides the WGM110 Wi-Fi module which can be used for Wi-Fi connectivity in their microcontroller-based systems.

Discuss the architecture's **Flash and RAM** that supports the code. Include all three architectures in your discussion.

The Flash and RAM in a microcontroller are critical for storing and executing code:

TI: The TI CC3220S LaunchPad has 1MB of flash memory and 256KB of RAM. The flash memory is used for storing the program code and the RAM is used for storing runtime data.

Microchip: Microchip's PIC microcontrollers also offer a variety of Flash and RAM sizes.

Freescale: Freescale's Kinetis series microcontrollers offer large amounts of Flash and RAM.