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The thermostat that has been created has the required functionality. The goal was to create a thermostat that would utilize a task scheduler in order to 1) check the button status every 200ms, 2) Check/update the temperature every 500ms, 3) update the LEDs accordingly and report to the server every second, and 4) Handle interrupts from a button being pressed. When the system checks the status of the two buttons, it will update its internal record of the set\_temp. Once the temperature has been updated, it can update the LEDs by comparing the temperature to the set\_temp. I will build upon this design description by exploring the implications of choosing between the following three architectures: TI, Microchip, and Freescale.

When choosing an architecture, it is important to consider whether or not the peripherals that you’ll need to use are supported. This thermostat uses GPIOs to control the heater, UART to report to the server, and I2C to check the temperature. All the aforementioned peripherals will need to be supported in order for the device to function. Fortunately, all three architectures have robust and quality support for all 3 peripherals, but TI's microcontrollers implement the support for these peripheral in such a power-efficient manner, it has given rise to a reputation for low power consumption. Needless to say, in regards to power efficiency, TI has the advantage.

Considering each architecture’s ability to facilitate internet access is another incredibly important aspect of choosing between TI, Microchip, and Freescale. The main goal of the thermometer is communication. It communicates in order to retrieve information about the temperature and it communicates in order to control the LED (the heater). Without proper Wi-Fi connection and network handling, this thermometer would be ineffective. With that being said, all three architectures offer microcontrollers with built-in Wi-Fi modules. This is helpful because using an architecture with a built-in Wi-Fi module rather than one that needs to use an external module will allow for a simpler design for the embedded system.

When it comes to Flash and RAM, Microchip and Freescale both offer options with much higher storage capabilities than TI does. All three offer cutting edge storage-capabilities in regards to Flash and RAM, however TI slightly falls short of the mark compared with the other two. With that being said, this particular project does not involve a large amount of source code. So, while the Flash and RAM capabilities of Microchip and Freescale are impressive, they do not constitute a real advantage in this case. In other words, their advantage in Flash/RAM does not outweigh TI's advantage in power consumption.

Security is another important aspect to consider in the architecture choice. In today’s word, the IoT is becoming so immersive and unavoidable. More and more of our personal lives are having some sort of interaction with the internet. If an IoT device is sloppy with user data security, people’s livelihoods are put at risk. With that in mind, it is a good thing that all three architectures in question offer features a standard lineup of security features such as secure boot, secure firmware updates, data encryption, and secure key storage.

When choosing an architecture for this project, one needs to consider peripheral support, Wi-Fi support, and Flash/RAM specs. From my analysis, I can conclude that the relevant architectures are all comparable to each other in the relevant aspects. TI becomes my final suggestion due to it’s advantageous power consumption efficiency.

Citations

Products | microchip technology. Microchip. https://www.microchip.com/en-us/products

Borgeson, J., Schauer, S., & Diewald, H. (2012). Benchmarking MCU power consumption for ultra-low-power applications. Texas Instruments.