Module 7: Project 2

Shannon Musgrave

Computer Science Dept. of Southern New Hampshire University

CS-350 Emerging Systems Architecture

Professor Gregori

12/15/2024

The microprocessor selected for use in an application must be carefully considered. Not only must the board have the needed peripherals, but it must also have the memory and computational power needed to run the solution without error. In this scenario, the peripherals required are GPIO, I2C, UART, and Wi-Fi. Although UART was used in the demo to simulate information being sent to the cloud, in a finished model, it could be utilized to communicate with an LCD screen or some other means for local engagement. The three architectures of interest in this discussion are TI, Microchip, and Freescale.

The TI CC3220S has all the needed functionality. According to TI.com, peripherals included are up to 27 GPIO pins, UART, I2C, an onboard temperature sensor, and an NWP (network processor) capable of 802.11b/g internet protocol (CC3220S Data Sheet, Product Information and Support | TI.com, n.d.). This Wi-Fi can be used as an access point for a new network or a station for connecting to an existing network. An additional bonus is the built-in WPA3 networking security, which is the latest generation and has several benefits, such as encryption. The CC3220S also comes with 256 KB of RAM, which can be used to store and run the solution. The RAM comes in two sections, SRAM or static RAM and SRAM2, the latter is available in a smaller size but is non-volatile, allowing the application to save critical information such as the program itself. According to the CCS IDE, while testing the prototype, the memory allocation analysis tool showed that 67 KB was being utilized. Although this is only a static analysis, its estimate shows that the application is only using approximately 26 percent of the available resources.

Microchip also has a solution that can handle the requirements of this project. Their PIC32MZ-W1 microcontroller comes with up to 60 GPIO pins as well as UART, I2C, Wi-Fi 802.11 b/g/n capabilities, and the temperature sensor (PIC32MZ W1 Family of Microcontrollers, n.d.). Like the previously mentioned solution, the Wi-Fi controller can operate as an access point or a station and supports several security protocols, including WPA3. A benefit of this microcontroller is that it comes with up to 2 MB of embedded flash memory and 640 KB of RAM. Compared to the estimated 67 KB used by the prototype, the PIC32MZ-W1 has ample memory capacity and could easily power the solution and any number of expansions.

Freescale, now a part of NXP, also offers a microprocessor that meets the requirements of the application. According to the manufacturer’s website, the 88MW32X is a model in their family of wireless microprocessors and was the only wireless option without Bluetooth. It comes in two packages with either 35 or 50 GPIO pins. In addition, it has many peripherals, including I2C, UART, and an embedded temperature sensor (Wi-Fi® + Bluetooth®, n.d.). Its Wi-Fi capabilities include 802.11b/g/n protocols and a wide range of modes comparable to the previous two architectures. Memory requirements are easily met with 512 KB of static RAM with an integrated flash controller that holds 32 KB.

In conclusion, there are many differences in the microprocessors, such as the number of GPIO pins and the types and varying amounts of memory. But within these varying components, all three have the capability to support this project because they support the peripherals needed for the project. They can connect to the cloud through a Wi-Fi access point using the appropriate SSID and password. And finally, they have enough volatile and non-volatile memory available to not only perform the required work but to also save the program when powered down.

**References**

CC3220S data sheet, product information and support | TI.com. (n.d.). <https://www.ti.com/product/CC3220S>

PIC32MZ W1 family of microcontrollers. (n.d.). Microchip Technology. <https://www.microchip.com/en-us/products/microcontrollers-and-microprocessors/32-bit-mcus/pic32-32-bit-mcus/pic32mz-w1>

Wi-Fi® + Bluetooth®. (n.d.). <https://www.nxp.com/products/wireless-connectivity/wi-fi-plus-bluetooth-plus-802-15-4:WIFI-BLUETOOTH>