**Project Two Report**

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Project Two consisted of developing a prototype thermostat for SysTec using a TI development board. For the prototype, the TMP006 temperature sensor on the TI board is used to read the room temperature (via the I2C peripheral), an LED to indicate the output to the thermostat where LED on = heat on (via GPIO peripheral), two buttons to increase and decrease the set temperature (setpoint via GPIO interrupt), and the UART to simulate the data being sent to the server. While the development team is testing the code for the prototype, it has been asked that the second phase of the project begin, which is to connect the thermostat to the cloud. Although the prototype was developed using the TI development board, other manufacturers make integrated Wi-Fi solutions. It has been asked that three different architectures (TI, Microchip, and Freescale) be analyzed to recommend and justify the architecture decision based on the following criteria: the thermostat must support the peripherals used in the project, the thermostat must connect to the cloud via Wi-Fi, and the architecture chosen must have enough Flash and RAM to support the code.

TI (Texas Instruments) has a large portfolio of Arm-based processors, offering a range of efficient edge-computing performance for industrial, automotive, and IoT devices (Texas Instruments, 2024). One device specifically that would be a good fit for the next phase of this project is the SimpleLink Arm Cortex-M33 multiband wireless MCU with 1MB flash program memory, 296KB SRAM, integrated power amp. Texas Instruments (2024), It “consists of Wi-Fi, Bluetooth Low Energy, Thread, Zigbee, Sub-1 GHz MCUs, and host MCUs that all share a common, easy-to-use development environment with a single core software development kit (SDK) and rich tool set.” As required for the project, the SimpleLink Arm Cortex-M33 multiband wireless MCU has 4 UART, 2 I2C, and GPIO peripherals. Using its Thread feature, Thread enables a number of devices, such as smart locks, thermostats, and other sensor or actuator devices to integrate seamlessly with existing cloud-based infrastructures (Texas Instruments, 2024).

The MPC8569E PowerQUICC III Processor is designed to address increasing performance requirements for broadband access equipment. Produced by Freescale, this processor is built on Power Architecture technology and is designed to enable customers to handle multiple functions in a single-chip solution that normally would require multiple devices (Freescale Semiconductor, 2009). QUICC Engine technology supports multiple networking protocols which would allow for cloud integration. CPU speeds range from 800 Mhz up to 1.33 GHz and utilize 256 KB for instruction RAM and 128 KB of multi-user RAM (Freescale Semiconductor, 2009). As per the project requirements, it also supports UART, I2C, and GPIO interfaces.

The MIPS32 M-Class Microprocessor is a 200MHz, high-performance, 32-bit MCU that utilizes industry-leading Wi-Fi connectivity alongside rich peripheral options (Microchip Technology Inc., 2024). Microchip Technology Inc (2024) “It has 1 MB embedded flash and 256KB SRAM, empowering embedded designers to rapidly build complex IoT software covering WLAN, TCP/IP stack, RTOS, Cloud connectivity, and application.” UART, I2C, and GPIO are among the various types of peripherals supported, making the microprocessor an excellent choice to realize the most application features (Microchip Technology Inc., 2024).

The architecture recommended for use with this project is the TI SimpleLink Arm Cortex M33 multiband wireless MCU. This architecture is a great choice because it already incorporates a “rich” toolset along with an easy-to-use development environment. It meets the specifications required to have enough Flash and RAM to support the code alongside its use of Thread technology, which will allow the thermostat to integrate seamlessly with the cloud-based infrastructure that will be developed.

**References**

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