**CS 350 Project Report**

Alexis Indick

Computer Science Department, Southern New Hampshire University

CS 350: Emerging Sys. Arch. & Tech.

Dr. Roland Morales

April 16th, 2023

The peripherals in this project were UART, GPIO, and I2C. The UART is the universal asynchronous receiver/transmitter which defines a set of protocols for serial data exchange between devices (Rohde & Schwarz USA, n.d.). The GPIO are the general-purpose input/output pins that are used like switches for on/off input (Raspberry Pi Foundation, n.d.). The I2C is a protocol for using multiple peripherals for communication between devices (SparkFun, n.d.). The thermostat in this project was used to support each of these peripherals. For example, the GPIO is utilized by the thermostat through the buttons that need to be pressed to change the temperature. The UART is used to communicate through Wi-Fi with various systems. Lastly, the I2C is used to communicate with the other peripherals.

TI, Microchip, and Freescale are all different hardware architectures that can be utilized for this project. The TI, which is the SimpleLink CC3220S board from Texas Instruments, is used for Wi-Fi connectivity, has network security (WPA2), and 256KB of RAM (Texas Instruments, n.d.). The Microchip SAM-IOT WG Development board supports connections with Microsoft Azure, has 256KB memory and 32KB of SRAM, and Wi-Fi connectivity (Microchip, n.d.). Freescale (NXP) has many different boards which made it difficult for me to choose just one, but I found one that was very similar to the other two boards. The Freedom Development Platform FRDM-KW40Z 20KB SRAM and 160 KB memory and Wi-Fi connectivity (NXP, n.d.). Each board appears to have all the features necessary for the thermostat to function like LED lights and buttons but, I would have to say that SimpleLink from TI is the superior board. This is because SimpleLink is cheap to buy compared to Freescale’s since the Freedom platform was $224 but SAM-IOT is cheaper than SimpleLink where it was $45. But the SAM-IOT seems to only have specifically cloud capabilities for Azure. SimpleLink has cloud capabilities for any cloud platform. SimpleLink also has wider support for all peripherals that were needed for the thermostat to function.

**References**

Microchip. (n.d.). *Sam-IOT WG development board | microchip technology*. Retrieved April 13, 2023, from <https://www.microchip.com/en-us/development-tool/EV75S95A>

NXP. (n.d.). *FRDM-KW40Z: KW40Z/30Z/20Z: Wireless*. FRDM-KW40Z|Freedom Development Platform|Kinetis® MCU | NXP Semiconductors. Retrieved April 13, 2023, from <https://www.nxp.com/design/development-boards/freedom-development-boards/wireless-connectivy/freedom-development-platform-for-kinetis-kw40z-30z-20z-mcus:FRDM-KW40Z>

Raspberry Pi Foundation. (n.d.). *GPIO pins*. Projects.raspberrypi.org. Retrieved April 12, 2023, from <https://projects.raspberrypi.org/en/projects/physical-computing/1>

Rohde & Schwarz USA. (n.d.). *Understanding uart*. Rohde & Schwarz. Retrieved April 12, 2023, from <https://www.rohde-schwarz.com/us/products/test-and-measurement/essentials-test-equipment/digital-oscilloscopes/understanding-uart_254524.html#:~:text=UART%20stands%20for%20universal%20asynchronous,also%20have%20a%20ground%20connection>.

SparkFun. (n.d.). *I2C*. I2C - SparkFun Learn. Retrieved April 13, 2023, from <https://learn.sparkfun.com/tutorials/i2c/all>

Texas Instruments. (n.d.). *CC3200*. CC3200 data sheet, product information and support | TI.com. Retrieved April 13, 2023, from <https://www.ti.com/product/CC3200?utm_source=google&utm_medium=cpc&utm_campaign=epd-con-null-prodfolderdynamic-cpc-pf-google-wwe_int&utm_content=prodfolddynamic&ds_k=DYNAMIC%2BSEARCH%2BADS&DCM=yes&gclid=Cj0KCQjwlumhBhClARIsABO6p-xw6aL-C1WbQoSGxrR3MJSUFcLUNTvA2m_nS6R77CDhrscjnU7A3JQaAmJoEALw_wcB&gclsrc=aw.ds#design-development>