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Final Project 7-2: Thermostat Lab

As SysTec develops a smart thermostat prototype which will integrate with its analytics software, they require the thermostat to support specific peripherals, connect to the cloud via Wi-Fi, and have the processing power to run efficiently. This paper will discuss three potential hardware architectures for the prototype. These are Raspberry Pi, Microchip controllers, and Freescale/NXP microcontrollers. A recommendation will be made on the one that satisfies the business needs best.

**Peripheral Support**

For this prototype, the hardware must support temperature sensors, buttons, and LCD display, and Wi-Fi connectivity. With Raspberry Pi, all can be supported through built-in I2C, SPI, UART, and GPIO (*Raspberry Pi Documentation - Microcontrollers*, n.d.). The Microchip microcontrollers, for example WFI32 (*EV36W50A*, 2024), include built-in Wi-Fi, but can also be configured to support the necessary peripherals. Though, some models will require additional components for LCD (*Microcontrollers and Microprocessors | Microchip Technology*, n.d.). Freescale/NXP microcontrollers are able to support the peripherals, however, they require an external Wi-Fi module.

**Cloud Connection**

SysTec requires the thermostat to have connection to the cloud for transmitting data. Both the Raspberry Pi and Microchip microcontrollers that have built-in Wi-Fi can connect to the cloud without external modules. Unfortunately, Freescale/NXP and Microchip microcontrollers without built-in Wi-Fi will require an external module (*Processors and Microcontrollers*, n.d.). All three architectures are able to support cloud connectivity once set up however necessary.

**Device Capabilities**

The final requirement is for the architecture to have enough Flash and RAM to support the software. Raspberry Pi has better memory available, though it consumes a lot of power. Microchip microcontrollers have a good amount of memory for Flash and RAM in embedded applications, without using too much power. Freescale/NXP has higher processing power and plenty of memory, however there is additional setup usually required for both peripheral integration and cloud connectivity.

**Recommendation**

In reviewing the abilities and limitations for the three architectures, the best choice for the prototype would be the Raspberry Pi. It is the most compatible with the variety of peripherals needed, including the built-in Wi-Fi. When the time approaches for production, a Microchip microcontroller would be a better option, as they do not draw as much power.

Sources:

*EV36W50A*. (2024). Microchip.com. https://www.microchip.com/en-us/development-tool/ev36w50a

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*Raspberry Pi Documentation - Microcontrollers*. (n.d.). Www.raspberrypi.com. Retrieved April 20, 2025, from https://www.raspberrypi.com/documentation/microcontrollers/