Devin Wheeler

7-2 Final Project: Thermostat Lab

SysTec is developing a smart thermostat prototype that integrates with its analytics software. The thermostat must support key peripherals, connect to the cloud, and have sufficient processing capabilities to run efficiently. This report goes over three potential hardware architectures, Raspberry Pi, Microchip microcontrollers, and NXP microcontrollers (Freestyle) , and recommends the best option for both prototyping and production.

**Peripherals Support**

The thermostat requires hardware that supports temperature sensors, buttons, an LCD display, and a Wi-Fi connection. Raspberry Pi supports all these peripherals with built-in I2C, SPI, UART, and GPIO. Microchip microcontrollers, like the WFI32, include built-in Wi-Fi and can be configured to support the needed peripherals. Some models may require additional components for LCD support or Wi-Fi. NXP microcontrollers can support these peripherals but can require an external Wi-Fi module.

**Cloud Connectivity**

The thermostat must connect to SysTec’s cloud for data transmission. The Raspberry Pi has built-in Wi-Fi, allowing for direct cloud integration with standard protocols like HTTP. Microchip with Wi-Fi modules can connect to the cloud just fine and support the needed protocols. NXP requires an external Wi-Fi module but can support cloud connection once added.

**Device Capabilities**

The chosen architecture must have enough Flash storage and RAM to support the thermostat’s software. Raspberry Pi has plenty of memory but consumes more power, making it less ideal for production. Microchips provide sufficient Flash and RAM for embedded applications while better controlling power consumption. NXP offer high processing power and enough memory but require additional setup for cloud connectivity and peripheral integration.

**Recommendation**

Since all three of the device architecture can support the needed peripherals (with help at some time) these are my recommendations. For prototyping, Raspberry Pi is the best option due to its ease of use and built-in Wi-Fi. For production, microcontrollers would most likely be better for their lower power consumption. NXP MCUs may be considered if more processing power is needed.

References

Raspberry Pi Foundation. (n.d.). Raspberry Pi Documentation. Retrieved from https://www.raspberrypi.com/documentation/

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NXP Semiconductors. (n.d.). Microcontrollers Overview. Retrieved from https://www.nxp.com/products/microcontrollers-and-processors