The goal of this project was to develop a prototype for a smart thermostat using the TI CC3220x LAUNCHXL board. The prototype's functions included reading room temperature, controlling a simulated heater (LED), adjusting the setpoint, and simulating data transmission to a server via UART.

The GPIO pins were configured to handle the LED and buttons for adjusting the setpoint. The LED represented the heater, turning on or off depending on whether the room temperature was below or above the setpoint. Button interrupts allowed users to increase or decrease the setpoint.

UART simulated data transmission to a server in the format <AA,BB,S,CCCC>, representing room temperature, setpoint, heater state, and elapsed time in seconds. The I2C protocol communicated with the TMP006 temperature sensor, providing temperature readings crucial for determining heater control.

A timer drove the task scheduler, ensuring button presses were checked every 200ms, temperature readings taken every 500ms, and data sent via UART every second. The task scheduler managed these operations efficiently, responding to user input and temperature changes in real-time.

The task scheduler loop checked if the TimerFlag was set, indicating the timer's expiration. It then incremented the timer counter, performed temperature readings, and controlled the heater based on the setpoint. Additionally, it sent data to the UART every second.

* Inputs: Button states (GPIO), temperature (I2C), and timer interrupts.
* Outputs: LED state (GPIO), data sent to UART.

The flowchart (provided separately) visualizes this process, starting with the initialization of GPIO, UART, I2C, and Timer, followed by the main loop's operations.

Hardware Architecture Analysis:

* TI CC3220x: Integrated Wi-Fi, necessary peripheral support, and sufficient Flash/RAM, making it ideal for IoT applications and future cloud connectivity.
* Microchip: Comparable performance with integrated Wi-Fi, though potentially requiring additional components, increasing complexity.
* Freescale (NXP): Robust solutions but may involve more complex design considerations and limited flexibility for future updates.

TI CC3220x is recommended for the next phase due to its integrated Wi-Fi, ease of use, and strong community support, making it the best choice for expanding the thermostat’s functionality to include cloud connectivity.

This report outlines the successful development of a smart thermostat prototype that meets the project requirements. For the next phase, TI’s architecture is recommended for its robust features and compatibility with the project’s needs.