**CMPE 460 Laboratory Exercise 4**

**Lab 4 UART over Bluetooth**

Name: Gloria Mbaka

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Lab Section: 1

Instructor: Prof. Ketout

TA: Jack Sipley
Andrew Tevebaugh
Colin Vo

**Description:**

This lab involves implementing UART communication to facilitate data exchange between a PC, a microcontroller (MSP432), and a smartphone via Bluetooth, using the HM-10 module.

**High-level description of how code works:**

**Part 2:**

The code is a simple UART driver for the MSP432 microcontroller, intended for Bluetooth communication to control an RGB LED. The program initializes the RGB LED and UART2 for Bluetooth communication. It then enters an infinite loop, continuously checking for incoming data on UART2. When a character is received, the `SetLEDColorAndPrint` function is called, which sets the LED color based on the received character and sends a confirmation message back via UART2. The colors are controlled by setting or clearing bits in the P2 output register, corresponding to different LED colors (Red, Green, Blue), or turning off all LEDs. The function also handles invalid inputs by sending an "Invalid Input" message back.

**Part 3:**

The code sets up a simple chatroom-like interface between a PC and a phone using UART communication. It includes functionality to initialize hardware, handle input from both the PC and phone, manage message buffers, and provide visual feedback through an LED. Here's a breakdown of its main components and functionality:

1. LED Control Functions: `LED1_On` and `LED1_Off` functions control an LED, used as an indicator for data transmission or reception.
2. Initialization in `main` Function:
    - Initializes LED and UART modules for both PC (`UART0`) and phone (`UART2`).
    - Sends a startup message to both PC and phone, indicating the chatroom is ready.
3. Message Handling Loop: The core of the program is an infinite loop that continuously checks for incoming data from both the PC and the phone.
    - PC Input Handling: When data is available from the PC, it turns the LED on, reads characters one by one, and processes them. If a newline character is detected, it sends the accumulated message to the phone, resets the buffer, and prompts for new input. It handles backspaces by removing the last character from the buffer and updating the display. Other characters are added to the buffer and echoed back to the PC for display.

- Phone Input Handling: Similar to PC input handling, but for data coming from the phone. Accumulated messages are sent to the PC upon detecting a newline character, and the buffer is managed similarly.

5. Buffer Management: The code uses two buffers, `pcBuffer` and `phoneBuffer`, to accumulate messages from the PC and phone, respectively. These buffers are cleared after each message is sent.

6. Feedback with LED: The LED is turned on at the beginning of data processing from either source and turned off after processing, serving as a visual indication of activity.

**Screen captures of the output:**

The screenshots of the PC and phone screens displaying the chatroom interface, with messages being sent and received on both devices are shown in Figure 1 and 2 respectively.

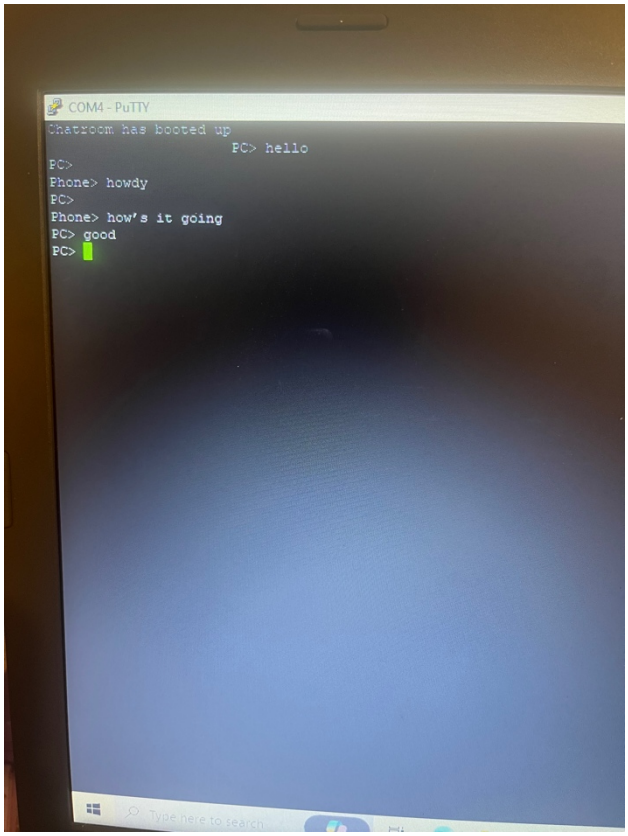


Figure 1: PC Screen Displaying the Chatroom Interface

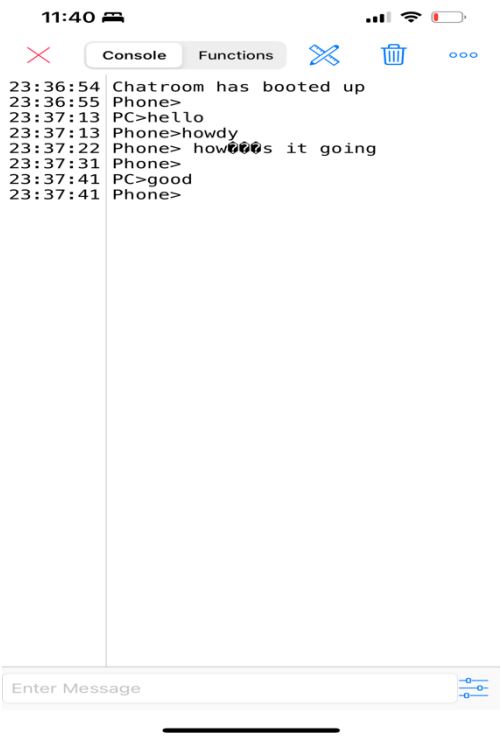


Figure 2: Phone Screen Displaying the Chatroom Interface

**Answer to the in-lab question:**

The control loop in the provided code allowed for handling input from both the phone and PC "simultaneously" by continuously checking for available data from each source within a single loop. When the program detects data from the PC (via UART0), it processes and potentially sends it to the phone (via UART2), and vice versa. The loop relies on non-blocking checks (`uart0_dataAvailable()` and `uart2_dataAvailable()`) to avoid halting the program while waiting for input. This approach enables the system to react to inputs from both sources in a responsive manner.

Exercise 4: UART over Bluetooth

Student's Name: Gloria Mbaka Section: 1

| Prelab | | Point Value | Points Earned | Comment s |
|---|---|---|---|---|
| Prelab | Renamed Board | 10 | 10 | CV 2/7 |
| | Register Configs | 5 | 5 | CV 2/7 |

| Demo | | Point Value | Points Earned | Date |
|---|---|---|---|---|
| Demo | BLE-controlled LEDs | 15 | 15 | AST 2/12 |
| | BLE Chatroom | 25 | 25 | CV 2/12 |

To receive any grading credit students must earn points for both the demonstration and the report.

Exercise 4: UART over Bluetooth

| Report | Point Value | Points Earned | Comments |
|---|---|---|---|
| Lab Description | 5 | | |
| Code Description | 10 | | |
| Question | 10 | | |