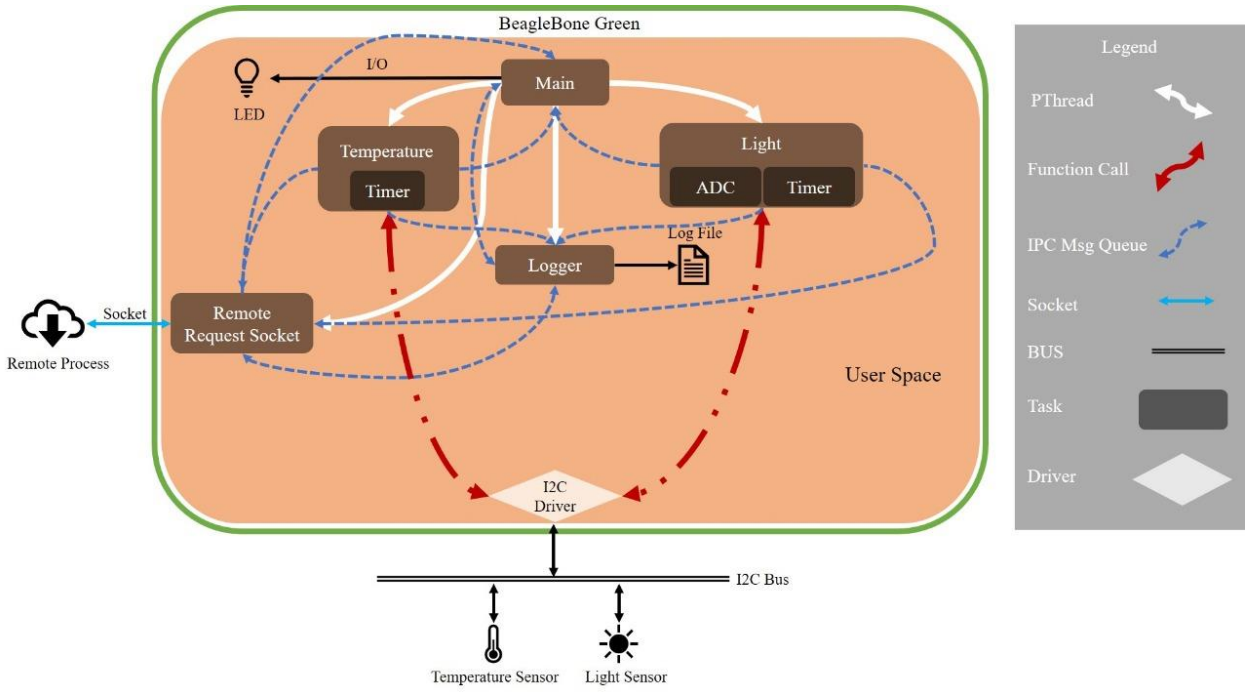
Project-1 Report

Git Hub Repository: https://github.com/devmittal/AESD-Project-1

Block Diagram



Functions in brief by header file:

i2c.h

init_i2c: This function initializes the I2C bus

write_i2c: This function writes 8-bit data to the I2C Bus

write_i2c16: This function writes 16-bit data to the I2C Bus

read_i2c16: This function reads 16-bit data from the I2C Bus

read_i2c8: This function reads 8-bit data from the I2C Bus

close_i2c: This function concludes the I2C Communication.

write_i2c16_config: This function writes 24-bit data to the I2C Bus to write to the configuration register of the temperature sensor.

led.h

led: This function switches the LED on and off

lightSensor.h

startup_test: This function checks the identification register as part of a startup test and confirms if the light sensor is working properly.

power_up: This function powers up the light sensor.

read_control_register: This function reads control register of the light sensor.

set_timing_register: This function is used to set the integration time and gain of light sensor.

read_timing_register: This function reads timing register of the light sensor.

enable_interrupt: This function enables interrupts in the interrupt control register of the light sensor.

disable_interrupt: This function disable interrupts of the light sensor.

set_interrupt_threshold: This function sets the high and low interrupt threshold of the light sensor.

read_interrupt_threshold: This function reads the high and low interrupt threshold of the light sensor.

read_visible_light: This function reads channel 0 of light sensor.

read_IR_light: This function reads channel 1 of light sensor.

cal_lumen: This function calculates actual luminosity based on channel 0 and channel 1 lux values of light sensor.

change: This function checks if there is any change in light state from the previous state.

state: This function determines current light state based on threshold value.

read_LightSensor: This function calls functions to read channel 0 and 1, calculate lumen, determine current light state, and if there was a change from previous state and stores it in the allocated structure.

logger.h

write_log: This function logs events, errors, and heartbeat notifications generated by the program

message.h

init_MessageQueues: This function initializes all the message queues

dest_MessageQueues: This function destroys (closes and unlinks) all the message queues

open_MessageQueue: This function opens a message queue identified by its parameters

send_Message: This function is used to send messages through a queue identified by the first parameter

recv_Message: This function is used to receive messages through a queue identified by the first parameter

CloseUnlinkQueue: This function closes and unlinks a message queue identified by the first parameter

remoteTask.h

init_socket: This function initializes the socket at the server side

send_data: This function sends data through a socket from server to client

read_data: This function reads data sent from client to server via a socket

temperature.h

read_temperature: This function reads the temperature register of the temperature sensor

cal_temp: This function calculates actual temperature in celsius, fahrenheit, and kelvin based on digital temperature values read from the temperature register

read_Tlow: This function reads the lower temperature limit from the tlow register of the temperature sensor.

read_Thigh: This function reads the higher temperature limit from the thigh register of the temperature sensor

read_configuration_reg: This function reads the configuration register of the temperature sensor

set_shutdown: This function sets the shutdown mode in the configuration register of the temperature register

disable_shutdown: This function disables the shutdown mode in the configuration register of the temperature register

read_fault: This function reads the fault bits from the configuration register of the temperature register

read_em: This function reads the extended mode bit in the configuration register of the temperature register.

write_em: This function sets/disables the extended mode in the configuration register of the temperature register

read_conversion_rate: This function reads the conversion rate bits in the configuration register of the temperature register

set_conversion_rate: This function sets the conversion rate bits in the configuration register of the temperature register

write_fault: This function sets the fault bits in the configuration register of the temperature register

clientprocess.h

init_socket: This function initializes the socket at the client side

send_data: This function sends data through a socket from client to server

read_data: This function reads data sent from server to client via a socket

main.c

kill_signal_handler: Signal handler for signal SIGINT aka Ctrl-C

getSensorData: Common call back function for temperature and light timer

timer_init: This function initializes a unique timer on demand for every requesting thread

temperature: Temperature thread callback function

light: Light thread callback function

logger: Logger thread callback function

remote: Remote task thread callback function

check_heartbeat: This function registers heart beats from different threads and sends relevant data to the logger.

setup_signalhandler: This function initialize a signal handler to kill any particular thread or the process itself.

Unit Tests

Light Sensor Task

Start-up Test: Read ID register to verify light sensor is functional

Power-up Test: Read Control register to verify that light sensor has powered up

Timing Register Test: Set random integration and gain values and check if it is writing to the register by reading it.

Lumen Calculation Test: With random channel 0 and channel 1 lux values, the lumen calculation formula is tested to see if we are getting correct luminosity.

Temperature Sensor Task

Temperature Calculation Test: With random digital temperature values, it is tested whether the correct temperature values in Celsius, Fahrenheit and Kelvin are obtained.

T_{low} Register Test: The T_{low} register is read to test if the default value of 75 Celsius is obtained.

T_{high} Register Test: The T_{high} register is read to test if the default value of 80 Celsius is obtained.

Configuration Register Test: The configuration register is read to test if the default value of 0x60A0 is obtained.

Logger Task

File Creation Test: The function which creates the file is called to test if the file is created without any errors.

Start-up Tests

Light Sensor Task: The ID register is read and then checked if it correctly equals 0x50.

Temperature Sensor Task: The configuration register is read and checked if it correctly equals the default value of 0x60A0.

Logger Task: The start-up test constitutes the logger thread spawning and a file being created.