RTS ASSIGNMENT SUBMISSION

Group Members:

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Himanshu Kumar	2022H1400180P
Bharathi Shrinivasan T R	2022H1400182P
Chinthalapally Bhaskar	2022H1400181P

Title: Real-Time Health Monitoring System

Project:

Designed a Health Monitoring system with real-time data acquisition and diagnostics of physiological parameters, i.e., heart rate BPM, Cardiogram for heart rate, body temperature.

We are performing the project using a variety of types like some periodic tasks, some periodic tasks which require a critical section resource, and a sporadic job.
The resource used in the critical section is the Wi-Fi model of the esp32 which acts as a web server to publish the BPM and temperature of the patient to a remote mobile application or a doctor to monitor the well-being of the patient.

We have four periodic tasks,

- A low priority task for logging patient health data in the serial monitor
- Reading the sensors values.
- Publish patient BPM via Wi-Fi.
- Publish patient temperature via Wi-Fi.

And, a Sporadic job to alert doctor by the patient in case of any emergency.

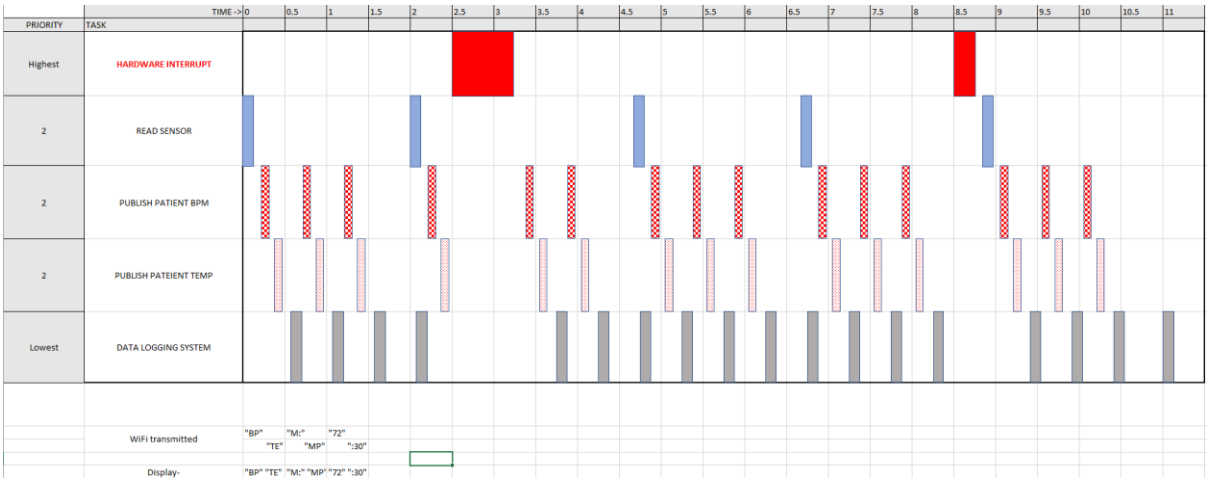
Prototyping:

1. Logging health system task- Used serial monitor application as part of this project.
2. Sensor modules – We used thermistor and IR pulse sensor to read the patient vitals.
3. Publishing module – ESP32's Wi-Fi module used. This is the critical resource which is accessed by two tasks (BPM publishing, Temperature publishing).
4. Sporadic job – As part of this project a hardware-based interrupt is used to service emergency. Emergency is indicated by an LED.

Scenario:

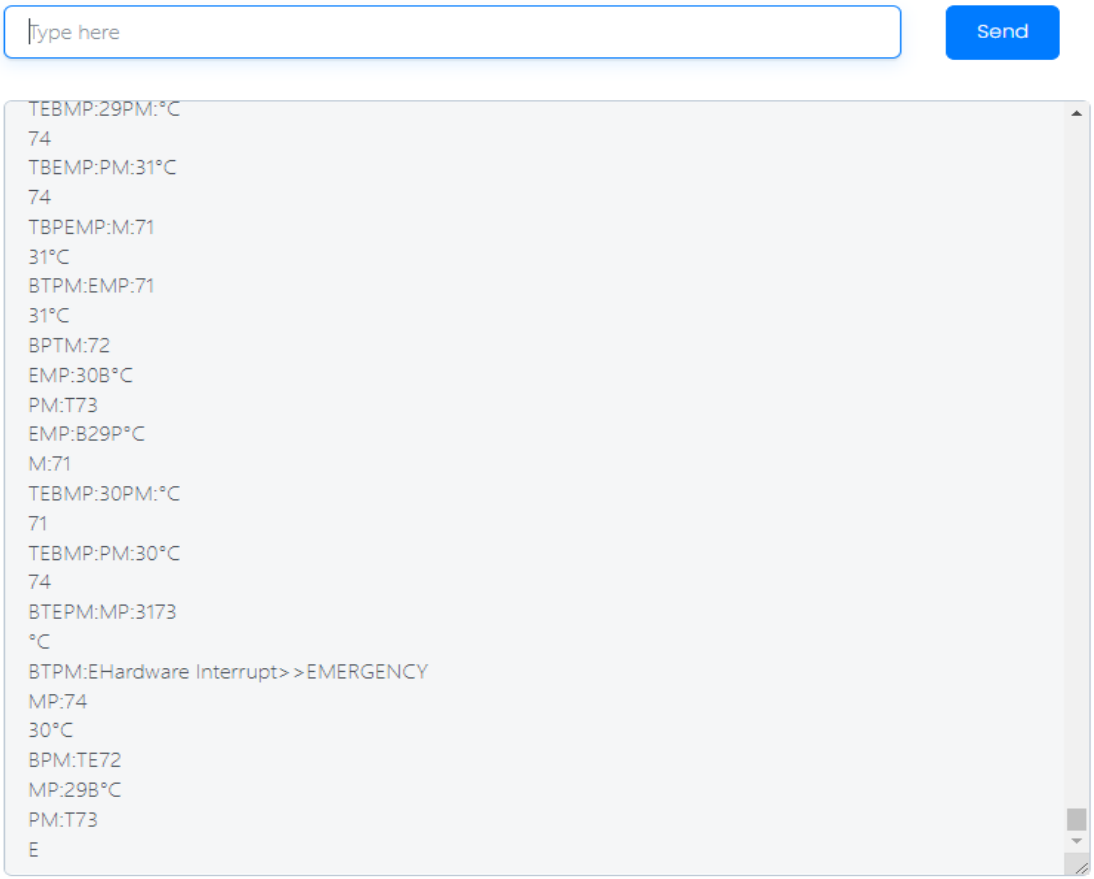
As there are two tasks using a critical resource, resource management is taken care by defining Mutex. So, the tasks become mutually exclusive. The same is demonstrated.

Scheduling of tasks without Mutex:

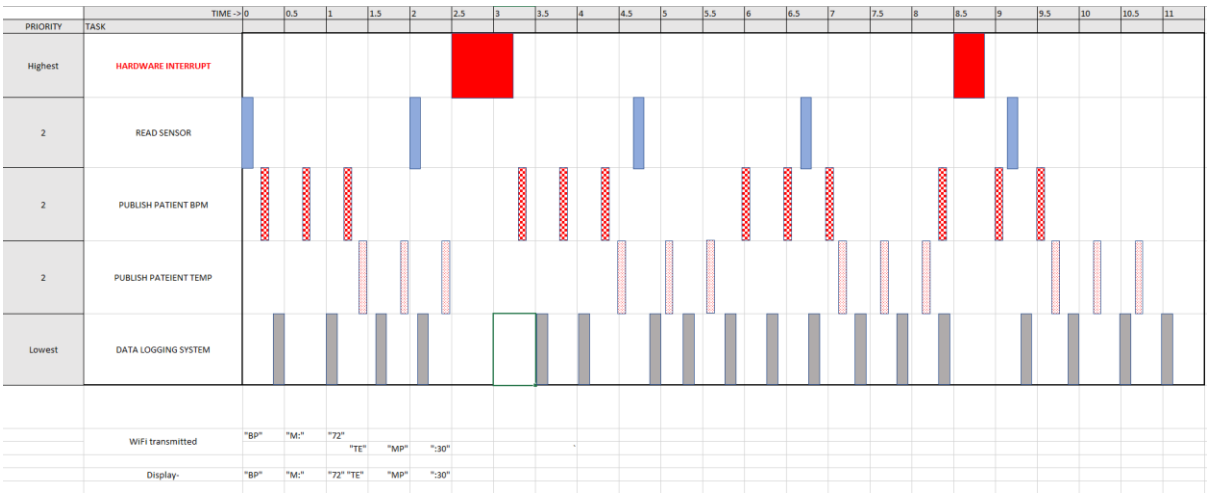


In the above scheduling the vTaskdelay present between different parts of publishing patient's BPM can be utilised by other tasks which will result in erroneous output.

Output in web serial without Mutex:

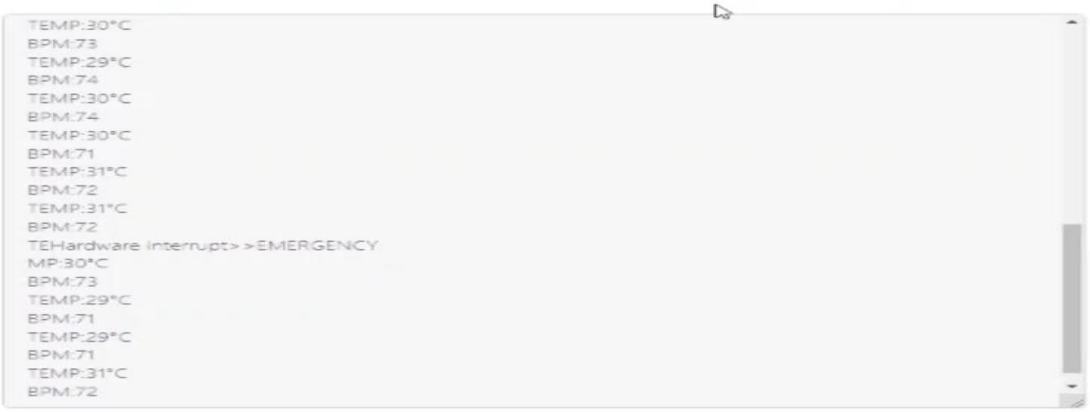


Scheduling of tasks with Mutex:

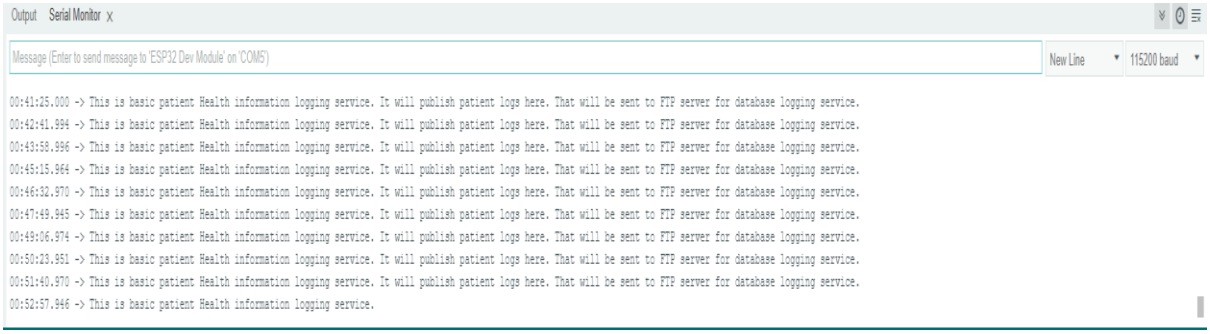


Whereas in this case the output is correct as Mutex doesn't allow execution of publishing patient's temperature until it is executed completely. However other tasks like data logging and reading sensor values can be executed during this delay.

Output in web serial with Mutex:



Output of the low priority logging task in the serial monitor:



Contribution of teammates:

Himanshu Kumar: Project ideation, Programming esp32, sensor selection,

Bharathi Shrinivasan T R : Programming esp32, verifying results, presentation

Chinthalapally Bhaskar : Programming esp32, Preparation of sensor modules, abstract prep

Complete Demonstration Link (15mins)-
https://drive.google.com/drive/folders/11PMoDrwyKtWS4ldWUoMKMlz9U8SJsEMS?usp=sharing