Project Proposal Template

## Course: ELTC H3024 Project Part 2

## Supervisor: [Dave P Carroll]

## Project Title: [Health Monitoring System]

## Project Description

The project aims to oversee a health monitoring system utilizing a health gadget equipped with Pulse Oximeter and DS18B20 Temperature Sensor. This gadget enables remote monitoring of an individual's health by detecting pulse/heart rate and body temperature. The collected health information is transmitted to a dedicated website using HTTP, generating a comprehensive health report accessible to both the patient and their General Practitioner (GP) or doctor.

The main beneficiaries of this project are vulnerable individuals worldwide, especially those unable to travel. The system provides timely and accurate information regarding body temperature, pulse/heart rate, and oxygen levels. It also serves the patient by providing them with the access of the health data over periods of years or months, facilitating medical choices based on the health status of the patient.

The key functionalities and features of the health system:

**Remote Health monitoring:** Patients can regularly monitor their health status using the health gadget. In case of abnormal readings, such as fever due to high body temperature, a virtual meeting with the GP or doctor can be done, avoiding the need for physical visits in a clinic or hospital.

**Real time Report Updates:** The system ensures the medical reports are updated accordingly each time a patient measures their health parameters. This information will be displayed on a HTTP based medical report website, accessible to both patients and healthcare providers.

**Multi-sensor integration:** The system functions with multiple sensors such as Pulse Oximeter and DS18B20 Temperature Sensor, providing an overview of patient’s health status through a body temperature, pulse/heart rate and oxygen levels.

**Health Data Access:** The website stores the health reports, enabling patients and doctors to review the health data over various timeframes (e.g. months or years) which facilitates the understanding of the patient's health status.

**Secure Data transmission:** To ensure that the patient data is confidential and secured, the system utilizes secured HTTP protocols for transmitting health data from the gadget to the website. Additionally, username and password encryption are implemented to secure information during transmission.

**Virtual Appointments:** Through the system, the patients can engage a virtual appointment meeting with their GP or Doctor using platforms like zoom or Microsoft Teams. This will make the process faster and allows the health status of the patient without the need for physical assistance.

The technologies and platforms I used:

**Microcontrollers:**

**ESP32-S3** – The microcontroller enables the communication between the health system and patients, serving as an access point. Its capabilities ensure the collection of the patient information is accurate and guarantees of a precise health status update to the patients.

A computer chip with many colors

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**Technologies:**

**TCP/IP Protocol** – Transmission communication Protocol/Internet Protocol is a set of standards defining transmitted data over computer networks including the internet. It breaks the data into packets, transmitting them to their destination and enabling devices to communicate using a common language.

A blue and red table with text

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Application layer – The application layer is the responsible for networking communication. The primary protocol in this layer is the HTTP [Hypertext transfer protocol]. The main user applications include email services and messaging layers. In this project, an HTTP website will be created to display all medical reports accessible by doctors and patients.

Transport layer – The transport layer is the exchange between two devices with an error free packet. It involves the data packetization and acknowledgement, ensuring smooth communication between devices.

Networking layer – The networking layer involves data transmission of data across the entire network. The main protocol used is IP addresses, In this project, the connection to open tasmota is based on an IP address and access to medical reports on smartphones or laptops is also based on a IP address.

Data Link layer – also known as the physical layer or the network interface layer. It manages the data transmission of the physical aspects of the data produced. The main protocol of the data link layer is the Ethernet.

**MQTT** – A Customized protocol for device messaging in Internet of Things (IoT) design, the project adopts MQTT configuration through Tasmota to establish a connection with a virtual machine where tasmota facilitates the transmission of sensors data to the cloud data service. of the sensors allows the data to be sent in the cloud service. The MQTT parameters shows the connection of Azure to Tasmota then Node red, Influx Db and Grafana via the domain name muhammad03.westeurop.cloudapp.azure.com.

A diagram of a blue circle with orange arrows

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**I2C** – This technology utilizes two communication lines (SDA and SCL) for devices on the Bus. In the health system, I2C enables sensor connections to communicate with SDA and SCL pins, showing readings on Tasmota.

A diagram of a computer

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**Wireless Networking** - A wireless network is a network that is based on a computer using radio frequency (RF) connections between nodes and networks like telecommunication networks. It allows open-source platforms like tasmota or web servers like node red to operate using a wireless network such as Hotspot network connection or House network connection.

**SPI -** stands for Serial Peripheral interface which is a synchronous serial communication interface specification used for short distance communication, primarily embedded systems. It is used to transfer integrated circuits using a reduced number of data lines. SPI is a master slave type protocol that provides a simple and low-cost interface between microcontrollers. It is a clock and data lines, along with a select line.

A diagram of a computer program

Description automatically generated with medium confidence

**Microsoft Azure Cloud service** – The cloud service platform is used to transmit data to the cloud, in terms of the project, it accesses the health-related information. Microsoft Azure ensures the secure and the data transfer process for improved overall system functionality.

A screenshot of a computer

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# System Architecture

Block Diagram:

A diagram of a computer

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***ESP32-S3:***

*Tasmota* is an open-source firmware which is build from a WIFI connection chip called ESP32-S3. In this project, the firmware will be used to showing the sensors readings on the main page of tasmota and also it will be used to use the LED on the ESP32-S3 by setting a pin (GPIO38) which is a Input and Output pin to be WS2112 which allowed it to be changed by changing the Multi colored RGB lights.

**Virtual Machine (VM):**

*Node Red* is a programming tool that writes together hardware devices ESP32-S3. To set up Node Red, A virtual machine was created on Microsoft Azure, and network port of 1880 was created which allows node red to operate. It is connected to a HTTP of muhammad03.westeurope.cloudapp.azure.com:1880. As part of this project, Node red will be used to read the sensor values from **tasmota or the database (confirm this)** to create a series of graph in Influx Db and Grafana

*Influx Db* is open-source time series database which is optimized for fast and high availability storage such as IOT sensor data E.g Pulse Oximeter and DS18B20 Temperature Sensor. To set up Influx db, In the same virtual machine in Microsoft Azure, and network port 8086 was created which allowed Influx db to operate. It is connected to a HTTP of muhammad03.westeurope.cloudapp.azure.com:8086. (Need to decide will I use the database on either influx dB or SQL where node red sends the data in SQL Database and makes a database then makes a graph).

*Grafana* is an open-source analytics and interactive web application which enables users to see data on charts or graphs on the data explorer on one or more dashboards. To set up Grafana, In the same virtual machine in Microsoft Azure, and network port 3000 was created which allowed Grafana to operate. It is connected to a HTTP of muhammad03.westeurope.cloudapp.azure.com:3000.

**Website:**

There will be 2 set of HTML websites where the “Health Monitoring System.html” shows an login/create an account page then once the user is logged in or created an account, the patients health status will be shown whereas the “Medical Reports.html” shows an login page where the user login’s and can access a list where it shows the list of medical reports for the patient to access there reports for the selected year.

* Describe the data flow between different components.

## **3.** Project Scope

The deliverables of the project are a report containing the information on the overall data analysis report like components used, block diagram of the system, description of each component used in this project, Technologies and communication used etc. A mobile app or a website based in HTML is also where the sensors of data will be tested for each patient tested and the website or the app will detect that information to update the health status for the patient. Both servers of accessing the patient’s health data can be accessed anywhere on mobile or laptop by the IP address of the website or downloading the app from app store/play store. **(Maybe)**Another deliverable for this project is a Gmail backup server where the health report of the patient will be sent to their email as a backup, if the patient cant access the IP addresses for “Medical Reports.html”.

* Define the boundaries of your project, outlining what is included and what is excluded.
* Clearly state any limitations or challenges anticipated in your project.

## **4.** Project Schedule

* Create a Gantt chart or timeline outlining the key milestones and tasks for your project, including development, testing, and deployment phases.
* Estimate the time required for each task and assign responsibilities to team members.
* Define key deadlines and deliverables for each project phase.

## **5.** Resources Required

|  |  |  |
| --- | --- | --- |
| **COMPONENT** | **PURPOSE** | **PRICE & WEBSITE** |
| Digital Temperature Sensor, Waterproof, DS18B20 | The purpose of the temperature sensor in the health system is that the probe is waterproof so the probe will be entered in the patient’s mouth so it can be updated in the health report. | **€6.25 –** [DFR0198 - Dfrobot - Digital Temperature Sensor, Waterproof, DS18B20 Farnell Ireland](https://ie.farnell.com/dfrobot/dfr0198/ds18b20-digital-temp-sensor-arduino/dp/3517904?st=digital%20temperature%20sensor,%20waterproof,%20ds18b20) |
| MAX30100 I2C - Pulse Oximeter Sensor | The purpose of the MAX30100 in the health system is that it measures the heart rate and oxygen level of the patient than it can be updated in the health report. | **€4.57 -** [DollaTek MAX30100 Heart-Rate Oximeter Pulse Sensor Pulsesensor Module for Arduino: Amazon.co.uk: Electronics & Photo](https://www.amazon.co.uk/DollaTek-MAX30100-Heart-Rate-Oximeter-Pulsesensor/dp/B07DK6PF2Y/ref=sr_1_6?creative=9325&creativeASIN=B078M67D5N&keywords=MAX30100+Heart+Rate+Oximeter+Sensor+Module%2C+Pulse+Oximeters+Development+Board+Sensor+Module+for+Wearable+Health+Fitness+Assistant+Devices+Medical+Monitoring&linkCode=gg3&linkId=cefe4ef9d267138454313fb2c87b31d8&qid=1706982913&sr=8-6) |

## **6.** Expected Outcomes

## Furthermore, the gadget provides a means to assess an individual's health status accurately. By regularly monitoring vital signs, individuals can identify any deviations from their baseline measurements, enabling early detection of health issues. This proactive approach to health monitoring can prevent complications and facilitate timely intervention.

health or unhealthy means to be have a bad health. It can be also be beneficial in a way that it can be tested and the doctor or GP can give a clarity of the health status of the individual by using the online meeting Zoom platform where the patient is testing their health status and the doctor or GP whoever is on the other side of the meeting can also see and view the results on the medical reports.html website which shows the previous reports for the patients and current medical report for the patient.

Moreover, the gadget facilitates remote consultation with healthcare professionals through platforms like Zoom. Patients can share their health data in real-time during online meetings with their doctor or GP, enabling informed decision-making and personalized healthcare advice. The accessibility of previous health reports through the dedicated website enhances continuity of care and enables healthcare providers to track longitudinal health data.

* **Describe the intended impact and benefits of your project.**

The intended impact of my project is the

The intended impact of my project is to revolutionize health monitoring by providing individuals worldwide with a convenient solution to assess their pulse rate, oxygen levels, and body temperature from the comfort of their own homes.

The benefits of the gadget are numerous. Firstly, it saves time and effort by eliminating the need for travel to a GP or hospital for routine health checks, Additionally, the gadget can be used repeadetely on various occasions and by different individuals (just to be careful clean it after each indiviual has used it), offering continous monitoring of health status. This is particulary for individuals who require frequnt health monitoring due to lifetime/chronic conditions or elderely indiviuals who may need regular check-ups.

* **How will your project solve the problem identified or address the target audience's needs?**

The project can address the problem that most indiviuals would or are facing are each patient or individual may think they know how to meausure their body temperature,heart rate and oxygen levels but which might be actually wrong which can lead to big problems in the future because the measurement is correct in the patients or individuals mind but eventully the mind is wrong and the heath is actually bad because the health wasent measured correctly, so this is where my project comes in place that my project will help those kind of individuals to prove their skills by the zoom platform online meeting process with their doctor or GP and they can be learned the right way of measuring their health using the health gadget and the doctor or GP can view the results of the patient or individuals within 5 seconds of the procedure and straight respose on their health be given for the patient.

* Outline any metrics or criteria you will use to evaluate the success of your project.

## **7.** Ethical/ Safety Considerations

* Discuss any potential safety issues related to the hardware you intend to deploy.
* Discuss any potential ethical issues related to data privacy, security, or environmental impact in your project.
* Describe how you plan to address these ethical concerns in your project design and implementation.

## **8.** Conclusion

* Summarize the key aspects of your project proposal.
* Briefly reiterate the value proposition and expected outcomes of your project.
* Express your team's commitment and enthusiasm for completing the project successfully.

## Appendix:

* Include any additional information, diagrams, or data relevant to your project proposal.

## Note:

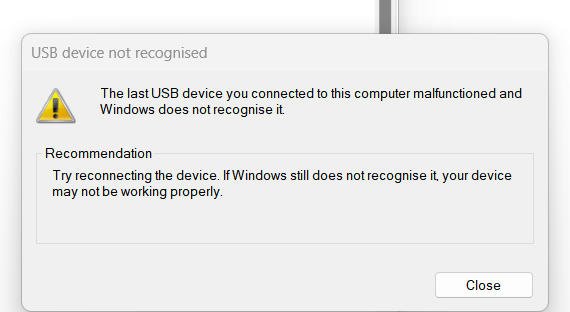
* This template is a guide and can be adapted to fit specific project requirements.
* Be sure to discuss your project proposal with your supervisor and get feedback before finalising it.

Need to do and links:

[Monitor Heart Rate using Pulse Sensor and ESP32 (microcontrollerslab.com)](https://microcontrollerslab.com/pulse-sensor-esp32-tutorial/)[Arduino MCU - Tasmota](https://tasmota.github.io/docs/TasmotaClient/)

[MLX90614 Non-contact Infrared Temperature Sensor with ESP32 (microcontrollerslab.com)](https://microcontrollerslab.com/mlx90614-non-contact-infrared-temperature-sensor-esp32/)

1. #define BLYNK\_TEMPLATE\_ID "TMPL4Z1bQMHXZ"
2. #define BLYNK\_TEMPLATE\_NAME "Health Monitoring System"
3. #define BLYNK\_AUTH\_TOKEN "CFVgmH-KhODf6eoa2nN2cOnnh0Wjlxq6"

A fingerprint identification number

Description automatically generated with medium confidence