Higher School of Communication of Tunis

Cloud of Things Scope Statement

Patient Monitoring System and Heart Attack Prediction

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1 Concept

1.1 Problematic

Timely detection of health issues, especially related to cardiovascular health, is critical for improving patient outcomes and reducing the incidence of heart attacks and other related conditions. This project addresses the growing need for remote health monitoring and early intervention. This project addresses the growing need for remote health monitoring and early intervention.

1.2 Context of the project

- Patient-Centered Healthcare: In an era of patient-centered healthcare, individuals are seeking ways to monitor their health proactively and take preventive measures.
- Advancements in IoT and Wearable Technology: The project leverages the advancements in IoT and wearable sensors, enabling patients to have real-time access to their health data.
- Integration of Machine Learning: Machine learning plays a pivotal role in the project by not only monitoring patient health but also predicting the risk of heart attacks, allowing for timely intervention and lifestyle adjustments.

1.3 Ambitions

1.3.1 Project Goal:

This project aims to develop a patient monitoring system that uses wearable sensors and machine learning to predict heart attack risk. The system will collect real-time data on blood pressure, heart rate, oxygen saturation, and body temperature from patients. This data will then be analyzed by a machine learning model to identify individuals who are at high risk of heart attack. Patients who are identified as high-risk will be alerted and encouraged to seek medical attention immediately.

1.3.2 Key Objectives:

- Development of a data processing and analysis system that can collect and analyze real-time data from the wearable device.
- Implement a secure data processing pipeline that includes data preprocessing, calibration, and noise reduction.
- Create a machine learning model that can classify heart attack risk based on sensor data and patient-specific health information.
- Design a user-friendly interface for patients to monitor real-time data and receive heart attack risk predictions.
- Establish secure communication channels for data transmission and storage in a MongoDB database.
- Ensure data privacy and security compliance with relevant healthcare regulations.

2 Functionalities

2.1 Sensor Data Acquisition:

- **Blood Pressure Sensor:** Measures blood pressure .
- **LM35 Temperature Sensor:** Measures the patient's body temperature.
- **MAX30100 Pulse Oximeter Sensor:** This sensor measures heart rate and oxygen saturation levels in the blood.

2.2 Mobile App Development:

Develop a user-friendly mobile app using PWA technology for cross-platform accessibility.

User Dashboard:

- Create a user-centric dashboard within the mobile app, allowing patients to view their vital sign data and heart attack risk prediction.
- Display real-time data for blood pressure, heart rate, body temperature, and oxygen saturation.

3 Technologies

In order to implement the different patient monitoring and heart rate prediction functionalities into the mobile application, different technologies will be used to develop this application:

- **Backend:**
  - MongoDB : is a NoSQL database that is known for its flexibility and scalability. It stores data in a document-oriented format (BSON) and is particularly well-suited for applications that require dynamic, rapidly changing schemas.
  - HiveMQ Broker : is a lightweight, MQTT-based messaging broker designed for IoT and M2M (machine-to-machine) communication. HiveMQ simplifies the implementation of MQTT and is used in IoT applications to enable real-time, efficient data exchange between devices and services.
  - Flogo : is an open-source, event-driven framework for building lightweight and efficient applications and microservices. It is designed for edge and IoT applications and can be used to create, deploy, and manage event-driven flows and functions.
- **Middleware:**
  - Jakarta : Jakarta EEis a set of software components, APIs, for developing specifically enterprise Java applications. These components are often referred to as specifications.
  - WildFly : Formerly known as JBoss Application Server or JBoss, is a Free Java EE application server written in Java, released under the GNU LGPL license. Being written in Java, WildFly can be used on any operating system providing a Java virtual machine.
- **Frontend:**
  - Progressive Web App (PWA): Progressive Web Applications are web applications that leverage service workers, manifests, and other web-platform characteristics along with progressive enhancement to provide users with a native app-like experience.

4 Architecture

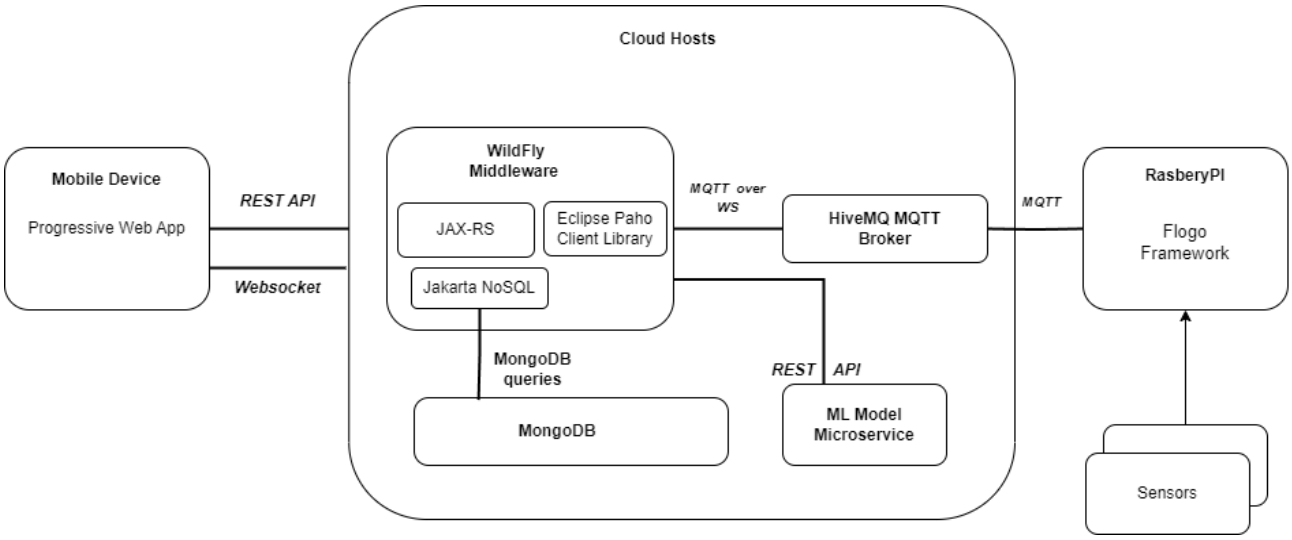

Figure 1: Application Architecture

The diagram above describes the main architecture of the application which is mainly composed by Backend, Middleware and Frontend

5 Deliverables

At the end of the project, the following items will be delivered:

- Health Monitoring And Heart Attack Prediction Web-App.
- Source code for different project components on GitHub.
- Health Monitoring prototype/simulation.
- Detailed report about the solution

6 Timeline & Tasks

The project development will undergo different steps:

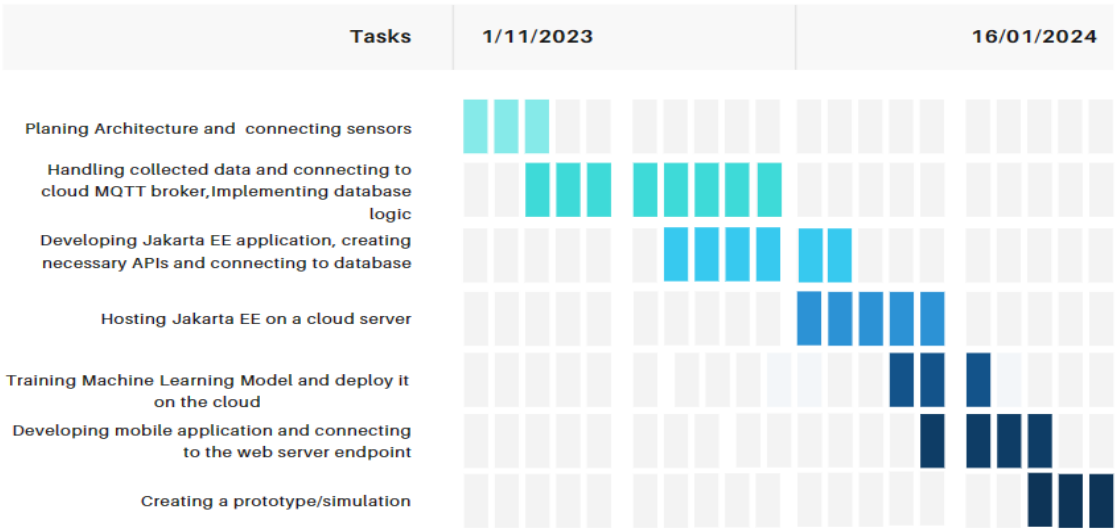

Figure 2: Project Timeline

7 Market Study

7.1 SWOT Analysis

This SWOT analysis provides an overview of the internal strengths and weaknesses of the project, as well as the external opportunities and threats in the healthcare and technology landscape. It can be a valuable tool for strategic planning and risk management in the development and deployment of our patient monitoring and heart attack prediction app.

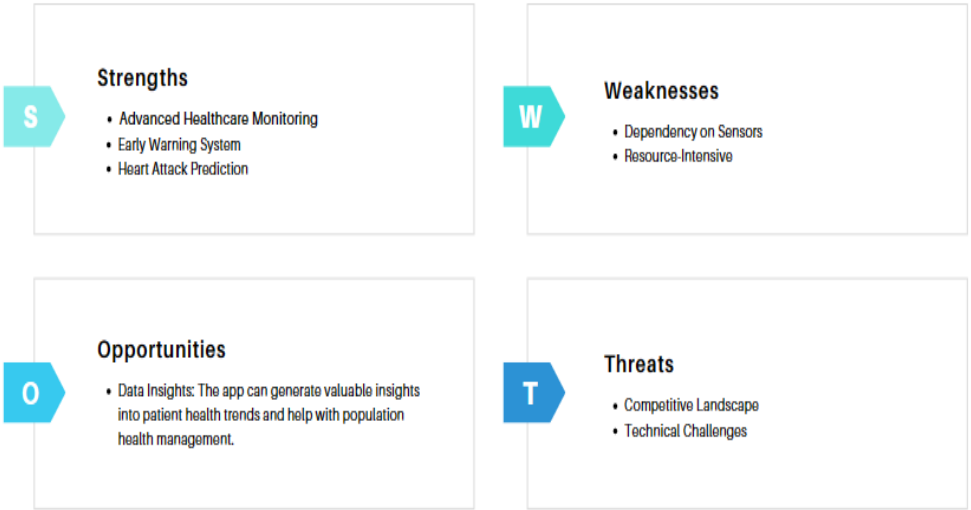

Figure 3: SWOT Analysis

7.2 4P Marketing Mix

- **Product:**
  - A wearable device that can accurately measure blood pressure, heart rate, oxygen saturation, and body temperature.
  - web-app dashboard displaying the patient vitals and a heart attack prediction feature
- Price:
  - Cost of manufacturing
  - Cost of developing and maintaining the data processing and analysis system
  - Cost of training and deploying the machine learning model
- Promotion:
  - online advertising
  - social media marketing
- Place:
  - Sell the device online
  - Sell the device directly to consumers
  - Sell the device through hospitals and clinics

8 Business Study

Overall summary of the business model that shows the main aspects such as value proposition, customer segmentation, channels, cost structure, revenue stream etc.

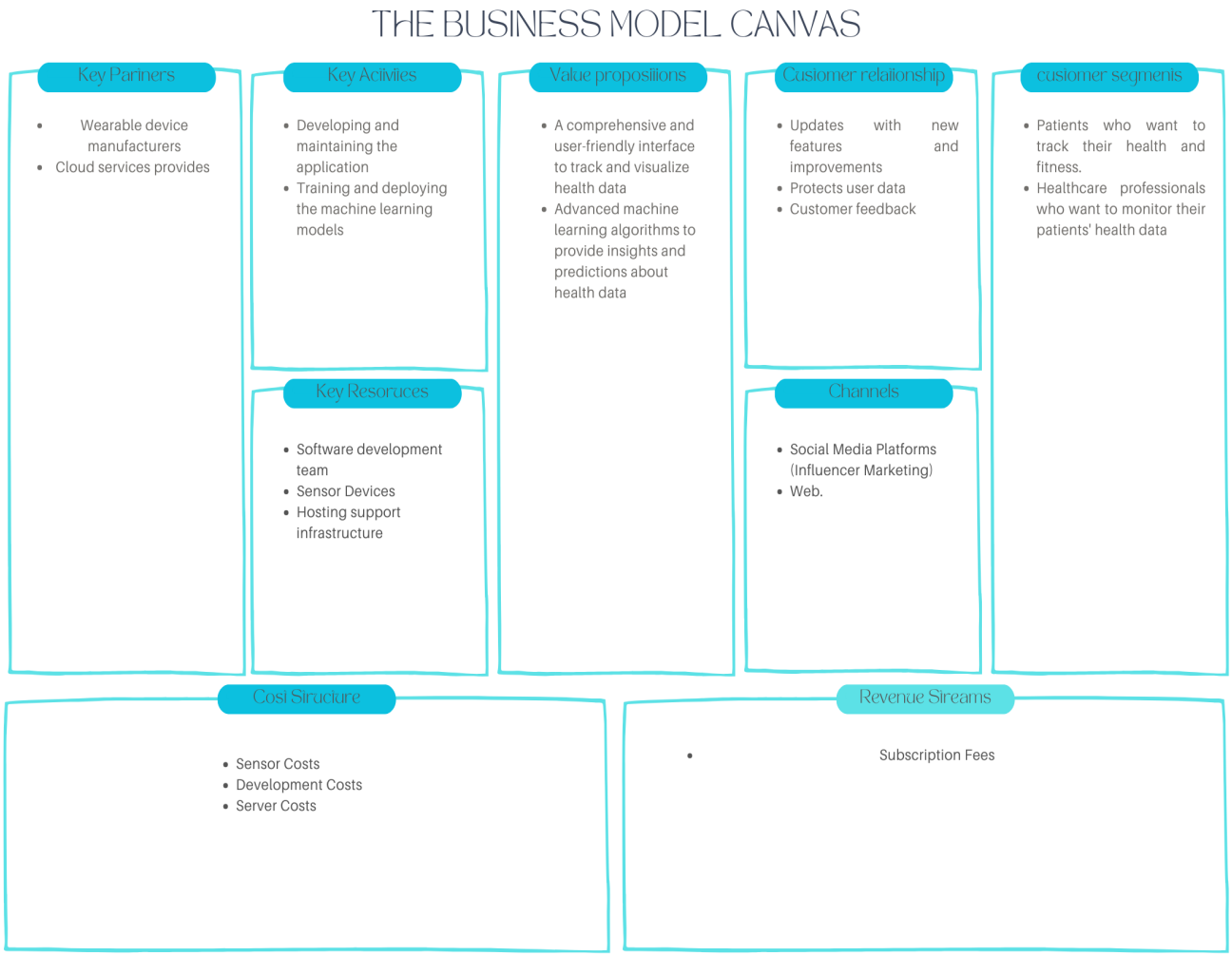

Figure 4: Business Model Canvas