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A Project Proposal

On

"Doctor Consultation System"

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1.Introduction

In healthcare, secure and efficient communication between patients and doctors is crucial for timely and accurate care. To facilitate this, our system employs an algorithm that integrates AES Encryption for secure data transmission and priority scheduling to ensure patients requiring urgent attention are prioritized. The communication process begins when a patient logs into the system and searches for a doctor based on their specific health condition or disease. After selecting the desired doctor, the patient has the option to initiate a chat by filling out a pre-consultation form. This form captures key details such as the patient's age, illness, symptoms, and the urgency of their condition. Once submitted, the chat function is activated, allowing direct communication between the patient and the doctor. The system uses a priority scheduling algorithm to manage patient consultations, giving higher priority to patients who indicate urgent health concerns or who belong to vulnerable groups such as senior citizens. This ensures that those with critical conditions receive faster responses and appropriate care. For security, all communication between the patient and doctor, including the form data, is encrypted using AES (Advances Encryption Standard). This ensures that sensitive health information is protected during transmission, providing a secure environment for patient-doctor interactions. Once the chat is initiated, the doctor can view the form filled out by the patient, allowing them to understand the patient's condition before beginning the consultation. This streamlined process, powered by priority scheduling and secured by AES encryption, ensures that patients receive timely, efficient, and secure healthcare support.

2.Problem Statement

In the healthcare sector, ensuring timely and secure communication between patients and doctors is critical for delivering quality care. However, existing communication platforms often face two significant challenges: security of sensitive patient data and inefficient consultation prioritization. Sensitive medical information exchanged between patients and doctors, such as symptoms, medical history, and personal details, is vulnerable to breaches when transmitted through unsecured channels. This lack of security can lead to unauthorized access, compromising patient

privacy and trust in the healthcare system. Additionally, not all patients require the same level of urgency in care. However, most communication platforms do not have an effective way of prioritizing consultations based on urgency or patient vulnerability. As a result, patients with urgent conditions or those who belong to at-risk groups, like senior citizens, may experience delays, leading to potentially harmful consequences. A system is needed that not only ensures secure data transmission but also provides a mechanism to prioritize patient consultations based on urgency and vulnerability. The solution must allow patients to easily access doctors, fill out critical information about their condition, and receive prioritized responses when necessary

3.Objectives

- To ensure secure communication between patients and doctors by implementing AES encryption to protect sensitive health data.
- To streamline the patient-doctor interaction process, allowing patients to easily search for doctors based on their medical conditions and initiate consultations via a secure chat system.
- To prioritize urgent care by utilizing a priority scheduling algorithm that gives precedence to patients with critical conditions and senior citizens.
- To capture essential patient information through a pre-consultation form that includes details such as age, symptoms, illness, and urgency, helping doctors assess the patient's condition effectively.
- To enhance patient experience by offering a secure, user-friendly platform that delivers personalized, timely medical attention based on the urgency of their health needs.

4.Methodology

The application that enables patients to chat with doctors in real-time. The system will categorize doctors based on their specialization in various diseases, allowing patients to consult the appropriate specialist. Patients can initiate consultations at any time, providing flexibility and convenience. To address urgent cases, the system will prioritize emergency patients, ensuring they

receive immediate attention. The development process will follow an Agile methodology, allowing for iterative improvements and feedback from stakeholders. We plan to use React for the frontend, Node.js for the backend, and MongoDB for securely storing chat data. Rigorous testing and prototyping will ensure a smooth user experience and robust system performance.

4.1. Requirement Identification

The chat application is a system designed to facilitate real-time communication between users. The application will enable users to send and receive instant messages and view chat history. It will incorporate user authentication for secure access, and provide notifications for new messages. The system will feature a web-based interface, allowing users to initiate and engage in conversations. Additionally, the chat application will display user presence indicators (online/offline status) to enhance the communication experience.

4.1.1. Literature Review

Many Medication Systems have been developed based on different platforms and concepts. The use of healthcare-related apps is growing but there are many issues related to their functionality. In this section, we reviewed some of the literatures and applications that are related to our work.

Epocrates enables patient care by delivering the right information, when it is needed. It has features such as; find providers for consults and referrals in the Provider Directory, review drug prescriptions and safety information, check for potentially harmful drug interactions, access timely medical news and research information, disease information, alternative medications, lab guides, and more clinical tools [1]. Doctor at Work application manages patient records, appointments, patient visit notes, bill patients, track customer payments and balance due. This app can be useful for medical professionals and students that visit patients every now and then. It also helps the patients to get the appointments with doctors and sends the reminder through SMS or by email, creates itemized bills for patients to track the due amount, maintains the visit history of the patients, etc [2]. The user is expected to first create his account to enable him have access to all the functionalities the application. It routes phone calls and text, supports documentation of every encounter for continuity of patient care.

All the existing applications discussed above are kind of more commercial and money making, but this our proposed system cares more for patient-centered approach, and provides an optimal communication between doctors and patients. This app is helpful to patients to ask questions and state their concerns to doctors regarding their health condition. This app will facilitate the patients to interact with doctors without making any physical appointments.

4.1.2. Requirements Analysis

4.1.2.1. Functional Requirements

Functional requirements describe what the system should do. They outline the specific behavior, functions, and features that the application must have to meet the needs of its users. For a online doctor consultation system, functional requirements typically include:

- **Patient Registration and Login:**

  The system should allow patients to register and log in using their credentials. The login authentication process must guarantee secure access to the system, ensuring that sensitive data is protected.

- **Doctor Selection:**

  Patients should be able to select doctors based on their medical problems or specialties.

- **Patient Form Submission:**

  Patients must fill out a form and submission should store data in the database (MongoDB).

- **Doctor's Dashboard:**

  Doctors should be able to log in and view patient information prior to consultation and prioritize urgent cases based on different factors.

- **Chat System:**

  A real-time chat feature allows patients to communicate with the doctor securely. Messages should be encrypted using AES encryption for data privacy.

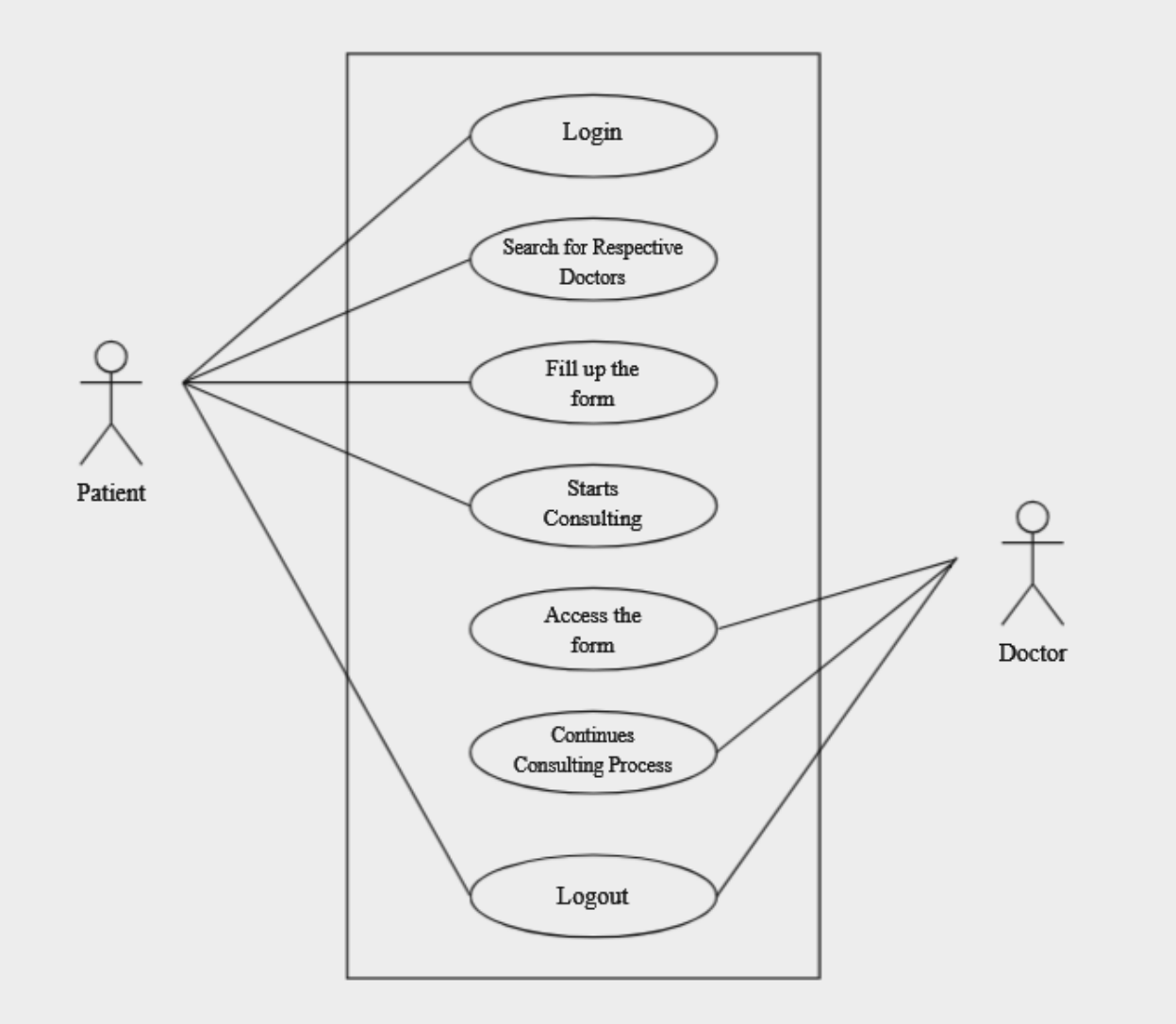

Fig: Use Case Diagram of Online Consultation System

4.1.2.2. Non-Functional Requirements

Non-functional requirements describe how the system performs certain functions, focusing on the quality attributes of the system. They address the system's performance, security, usability, and other factors that affect the user experience.

- **Security:**

  The System should implement AES encryption to secure patient-doctor conversations and ensure secure user authentication and authorization using secure protocols.

- **Performance:**

  The system should handle multiple users and real-time communication efficiently. Priority scheduling should not add latency to the system's responsiveness

- **Scalability:**

  The system should also handle high traffic, especially for urgent consultations.

- **Reliability:**

  Ensure the system is highly available and minimizes downtime. Backup mechanisms should be in place to recover chat history and patient data in case of failures.

- **Maintainability:**

  The codebase should be organized and documented in a way that makes it easy to update, fix bugs, and add new features.

4.2. Feasibility Study

A feasibility study was conducted to assess the viability of the proposed chat application across four key dimensions:

Technical Feasibility

The technical feasibility of the doctor consultation system relies on the suitability of its technology stack. Core technologies like JavaScript, WebSocket, MongoDB, and Node.js are well-established, widely used, and well-documented, ensuring ease of development and maintenance. JavaScript's versatility supports both front-end and back-end logic, while WebSocket enables real-time communication for live chats. MongoDB's flexibility and scalability make it ideal for handling diverse medical data, and AES encryption secures sensitive health information.

Operational Feasibility

Operational feasibility ensures the system fits seamlessly into the daily routines of both patients and doctors. It must be user-friendly for patients, with a simple interface for logging in, filling out forms, and starting consultations. For doctors, the system presents patient data clearly, supporting efficient consultations, with priority scheduling to address urgent cases quickly. By integrating into

existing workflows, the system reduces patient wait times and enables doctors to manage consultations effectively, even beyond regular hours.

Economic Feasibility

The economic feasibility of the system is strong, as it uses open-source technologies like JavaScript, Node.js, and MongoDB, minimizing initial development costs. With no licensing fees and flexible cloud hosting options, the system can scale affordably as users increase. Long-term, it reduces healthcare provider costs by enabling remote consultations and saves patients money by avoiding frequent in-person visits. Overall, the system offers cost-effectiveness both in development and ongoing use.

Schedule Feasibility

The schedule feasibility depends on completing the project within a typical college semester. With proper planning, a 3 to 6-month timeline is achievable, considering team size and resources

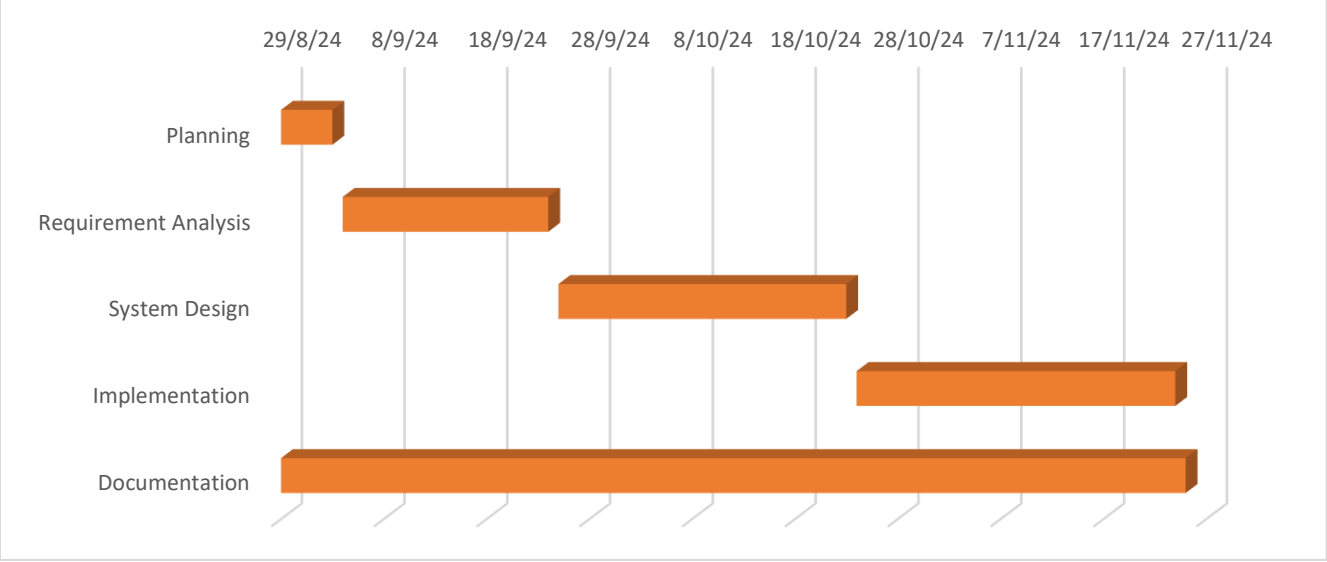

Fig: Gantt Chart

4.3 High Level Design of System

4.3.1. Workflow of a System

The doctor consultation system starts with patient login. After logging in, the patient fills out a form with details like age, gender, symptoms, illness, current medications and urgency. Based on this information, the patient selects a doctor and enters a real-time chat facilitated by WebSocket, secured with AES encryption. The doctor logs in, reviews the patient's form before the chat, and prepares for the consultation. For urgent cases, the system prioritizes patients using a scheduling algorithm. After the consultation, all data, including form details and chat logs, are securely stored in MongoDB. This workflow ensures seamless communication, data security, and prioritization of urgent cases.

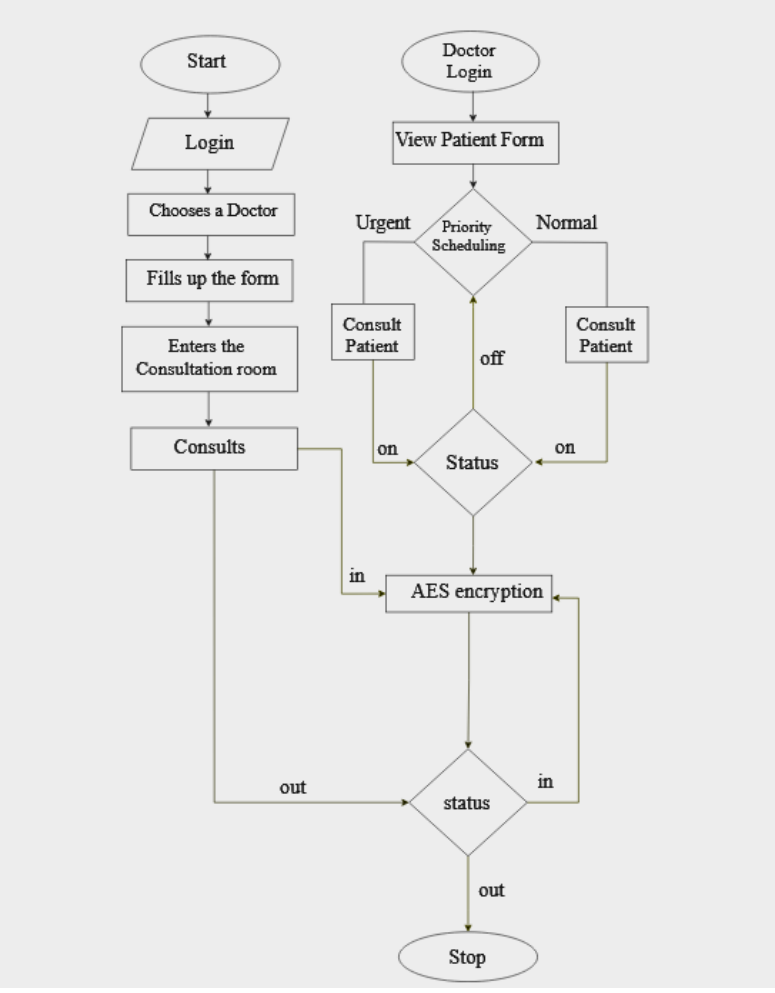

Fig: Workflow Diagram of Chatting Application

4.4 Description of Algorithm

4.4.1. AES Encryption

AES is a symmetric encryption algorithm used to secure data by transforming it into an unreadable format that can only be decrypted with the correct key. In our system, AES ensures secure communication between patients and doctors by encrypting chat messages. During implementation, before any data is transmitted between users, it is encrypted using AES, and only authorized recipients with the correct key can decrypt and access the data.

4.4.1. Priority Scheduling

Priority scheduling is a method used to handle tasks based on their urgency or importance. In our system, it helps prioritize cases by urgency, age, and symptoms, ensuring that critical cases are addressed first. Implementation involves assigning each patient a priority level based on the information provided in the form (e.g., severe symptoms or advanced age). The system then queues patients accordingly, so doctors can handle the most urgent consultations first, improving response time for critical cases.

5. Expected Outcomes

The doctor consultation system will streamline medical consultations by allowing patients to receive real-time, secure consultations online, reducing the need for in-person visits. Patients will benefit from faster diagnosis and treatment due to pre-consultation form submissions, while urgent cases will be prioritized for prompt care. For doctors, the system will improve workflow by providing access to patient details beforehand, enhancing the consultation process. AES encryption will ensure data security, and patient records will be stored for future reference, ensuring continuity of care. Overall, the system will improve accessibility, efficiency, and security in remote medical consultations.

6.References

[1] Epocrates, Inc., developed by athenahealth, Inc. *Epocrates* (Version 22.5), a clinical reference app for healthcare professionals: Sept. 20, 2023.

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[2] M. Gupta and S. Sharma, "Healthcare Platform for Online Consultation," *Jaypee University of Information Technology*, 2020.

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