

The Health Nexus (Doctor Appointment Booking and Healthcare system)
Mid Semester Project Report

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TABLE OF CONTENTS

S.No.	Assignment	Page No.
1.	Project Selection Phase	
1.1	Software Bid	2
1.2	Project Overview	5
2.	Analysis Phase	
2.1	Use Cases	10
2.1.1	Use-Case Diagrams	13
2.1.2	Use Case Templates	14
2.2	Activity Diagram and Swimlane Diagrams	18
2.3	Data Flow Diagrams (DFDs)	20
2.3.1	DFD Level 0	21
2.3.2	DFD Level 1	22
2.3.2	DFD Level 2	23
2.4	Software Requirement Specification in IEEE Format	25
2.5	User Stories and Story Cards	
3.	Design Phase (At least two significant cases of each diagram)	
3.1	Class Diagram	44
3.2	Sequence Diagram	45
3.3	Collaboration Diagram	46
3.4	State Chart Diagrams	47

4. Implementation

4.1 Component Diagrams 48

4.2 Deployment Diagrams 49

5. Testing

5.1 Test Plan 50

5.2 Test Cases 51

Software Bid

UCS 503- Software Engineering Lab

Group : 3CO23

Dated: 21-8-2024

Team Name: Cyber Knights

Team ID (will be assigned by Instructor):

Please enter the names of your Preferred Team Members. :

☐ You are required to form a **three to four person** teams

☐ Choose your team members wisely. You will not be allowed to change teams.

Name	Roll No	Project Experience	Programming Language used	Signature
Akul Kalia	102203367	Web development , ML	HTML, CSS, Python, SQL	Akul Kalia
Anirudh Garg	102203573	Full Stack Web Development, ML	HTML, CSS, JavaScript React.JS,Node.JS	Anirudh Garg
Tanishq Goyal	102203364	Frontend Development	HTML, CSS, JavaScript,SQL, Python,React JS	Tanishq Goyal
Udhav Bansal	102203396	Frontend Development	HTML, CSS, Javascript, React JS	Udhav Bansal

Programming Language / Environment Experience

List the languages you are most comfortable developing in, **as a team**, in your order of preference. Many of the projects involve Java or C/C++ programming.

1. C++
2. HTML
3. CSS
4. JavaScript

Choices of Projects:

Please select **4 projects** your team would like to work on, by order of preference: *[Write at-least one paragraph for each choice (motivation, reason for choice, feasibility analysis, etc.)]*

	Project Name	Unique Selling Point
First Choice	The Health Nexus: Doctor Appointment booking and healthcare system.	Our healthcare system leverages AI to detect diseases early, recommends specialists tailored to patient needs, and monitors health data from smartwatches, providing personalized and accessible care, especially in

		rural areas. It can be used for booking doctor appointments and scheduling visits.
Second Choice	Suhana Stay: Hotel Booking System	The hotel booking system enhances personalized guest experiences and maximizes revenue with smart inventory management and dynamic pricing. It efficiently manages user data, including name, email, and room number, through a dedicated schema and provides APIs for seamless data integration and real-time booking updates.
Third Choice	Unnati: Woman Empowerment and employment generation	The innovative online platform empowers rural housewives by showcasing their homemade products and services, addressing the e-commerce gap for this community. A Progressive Web App ensures accessibility, while features like sentiment analysis, an Ask Desk, and an SOS tool create a supportive and safe environment. By eliminating intermediaries, the platform fosters direct exchanges, revives traditional crafts, and uplifts deserving women, helping them achieve the recognition and success they deserve.
Fourth Choice	TravelBuddy: Bus ticket booking system	Our platform offers instant booking with flexible payment options, allowing travelers to secure their trips quickly and conveniently. Whether you're booking in advance or at the last minute, our system ensures a smooth and stress-free process tailored to meet every passenger's unique needs. By accommodating various payment preferences, we make travel planning more accessible, ensuring that everyone can enjoy a hassle-free experience from start to finish.

Additional Remarks/ Inputs

Please tell us about any other factors that we should take into consideration (e.g., if you really would like to work on a project for some particularly convincing reason).

We have chosen **The Health Nexus** as our first choice because healthcare is a very important parameter and in a country like India where a lot of people struggle to find good health facilities, specialist doctors. Our project can help the people especially in rural areas to get appointment from good and experienced doctors and schedule visits. It can also reduce a lot of time and operational costs. Apart from it, we wish to integrate Artificial intelligence in this project to recommend disease specific doctors and monitor daily health stats. It is capable of serving a large number of patients and ranging from a large number of clinics to big hospitals.

Project Name: The Health Nexus(Doctor Appointment Booking and Healthcare System)

Team No. :

Executive Summary :

The healthcare landscape is rapidly evolving, with a strong push towards digital transformation. Our project, the Doctor Appointment Booking and Healthcare System, addresses the critical need for efficient, user-friendly healthcare management solutions. This system leverages advanced technology to bridge the gap between patients and healthcare providers, ensuring seamless interaction, improved healthcare access, and enhanced patient outcomes.

Presenting the Solution :

Our solution is a comprehensive, user-centric appointment scheduling and healthcare management application designed to cater to both healthcare providers and patients. The app enhances the efficiency of medical practices by streamlining processes, reducing administrative burdens, and improving patient satisfaction through easy access to healthcare services.

Novelty/Unique Selling Point :

- **Implementing Healthcare in Rural Areas:** The application goes beyond urban centers to offer doctor booking and at-door healthcare services in rural areas, improving access to quality healthcare..
- **Health Record Monitoring:** Continuous health monitoring through smartwatches and integration with daily test reports ensures that patients and doctors can track health metrics in real-time.
- **Doctor Reviews:** A robust review system for healthcare providers helps patients make informed decisions when selecting their healthcare professionals.
- **Personalized Treatment:** Tailored treatment plans based on patient data and health history, ensuring more effective and personalized care.

Objectives :

- **Improve Access to Healthcare:** Especially in underserved rural areas, by facilitating easy appointment bookings and remote healthcare services.
- **Enhance Operational Efficiency:** For doctors and healthcare staff by automating administrative tasks and optimizing patient scheduling.

- Reduce Wait Times and No-Shows: By allowing patients to book, cancel, and reschedule appointments with ease, and sending automated reminders to reduce no-shows.
- Promote Better Health Outcomes: Through AI-driven health monitoring and personalized treatment recommendations.

Project Deliverables/Outcomes :

- A fully functional, user-friendly web application that can be accessed on any web browser..
- Access to a comprehensive directory of healthcare providers with real-time availability.
- Secure and efficient health record management for both patients and providers.
- Detailed performance analytics for healthcare providers to track and improve service delivery.

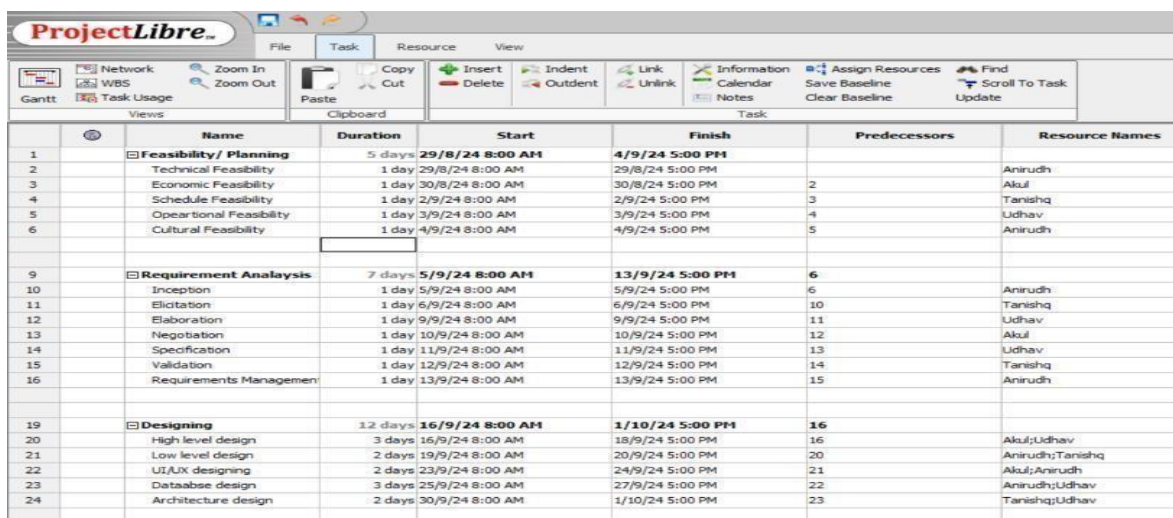
Look and Feel of the Product/Product Perspective :

The interface will be intuitive, clean, and accessible, designed with both tech-savvy and non-tech-savvy users in mind. The application will incorporate modern design principles with a focus on ease of navigation, ensuring a smooth user experience. The color scheme and layout will be soothing, reflecting the healthcare domain's calm and reassuring nature.

Scope of Application :

The Doctor Appointment Booking and Healthcare System is designed to be scalable and versatile, capable of serving a wide range of healthcare facilities from small clinics to large hospitals. It is particularly focused on expanding healthcare access to rural areas, making it a valuable tool in the global effort to provide equitable healthcare for all.

Timeline/Gantt Chart :



FEASIBILITY REPORT

Project Overview:

This project aims to develop the Doctor Appointment Booking and Healthcare System using the MERN stack. The system will provide a comprehensive platform for patients and healthcare providers, facilitating seamless appointment scheduling, secure health record management, and efficient healthcare delivery. Key features include an integrated AI system for disease detection and health monitoring, access to a comprehensive directory of healthcare providers with real-time availability, and detailed performance analytics to help providers track and improve service delivery. The web application will be fully functional, user-friendly, and accessible on any web browser, making it an invaluable tool in today's rapidly evolving healthcare landscape.

Purpose of the Report:

The purpose of this report is to assess the feasibility of developing the Doctor Appointment Booking and Healthcare System, considering technical, economic, schedule, operational, legal and cultural aspects.

1.) Technical Feasibility:

- **Technology Stack:**
 - MongoDB (database), Express.js (backend API), React (UI), Node.js (runtime environment).
- **Development Environment:**
 - Tools: Git/GitHub (version control), VSCode (IDE), Jest (testing), AWS/Heroku (deployment).
- **Security:**
 - Features: JWT (authentication), data encryption.

2.) Financial Feasibility:

- **Development Costs:** No Budget Constraints since the Doctor Appointment Booking and Healthcare System project is non-commercial. Most resources can be accessed for free or at minimal cost. This includes using open-source libraries, free development tools, and limited cloud hosting services like AWS Free Tier or GitHub Pages. The main expense will be the time and effort of students, making the financial risk negligible.

3.) Schedule Feasibility:

- **Project Timeline:** Establish a realistic project timeline with clear milestones and deadlines.
- **Resource Availability:** Ensure the availability of key resources, including developers and necessary tools, throughout the project.

- **Task Prioritization:** Prioritize critical tasks to ensure timely completion of essential features.
- **Risk Management:** Identify potential delays and develop contingency plans to keep the project on track.

4.) Operational Feasibility:

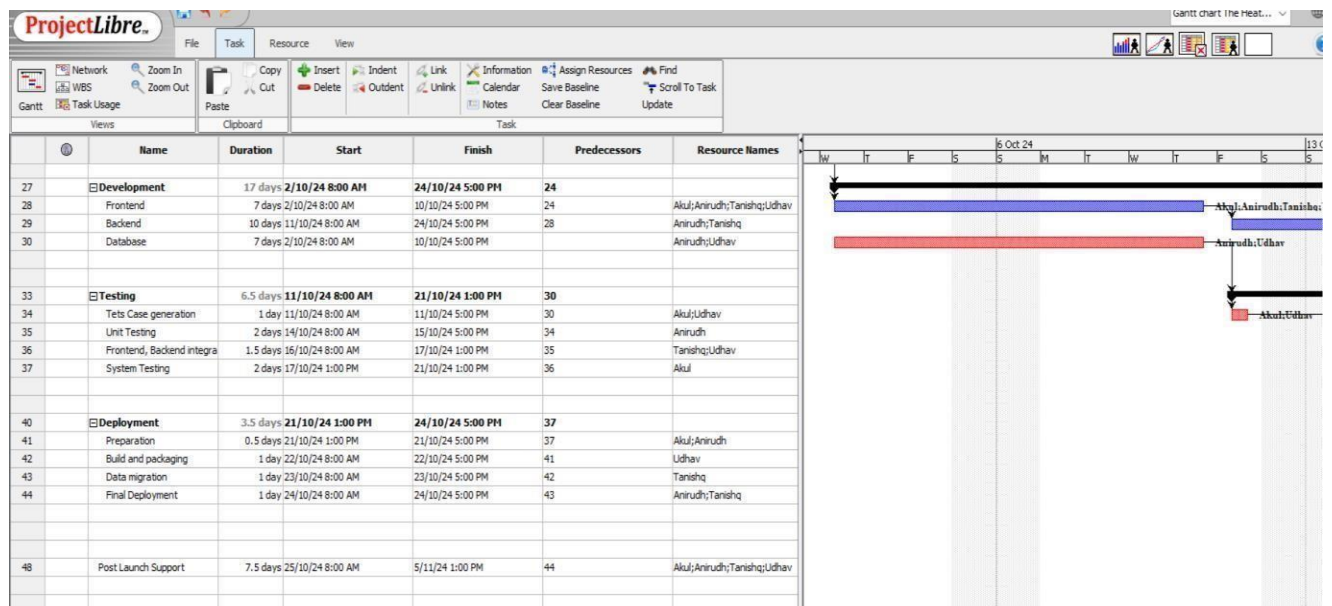
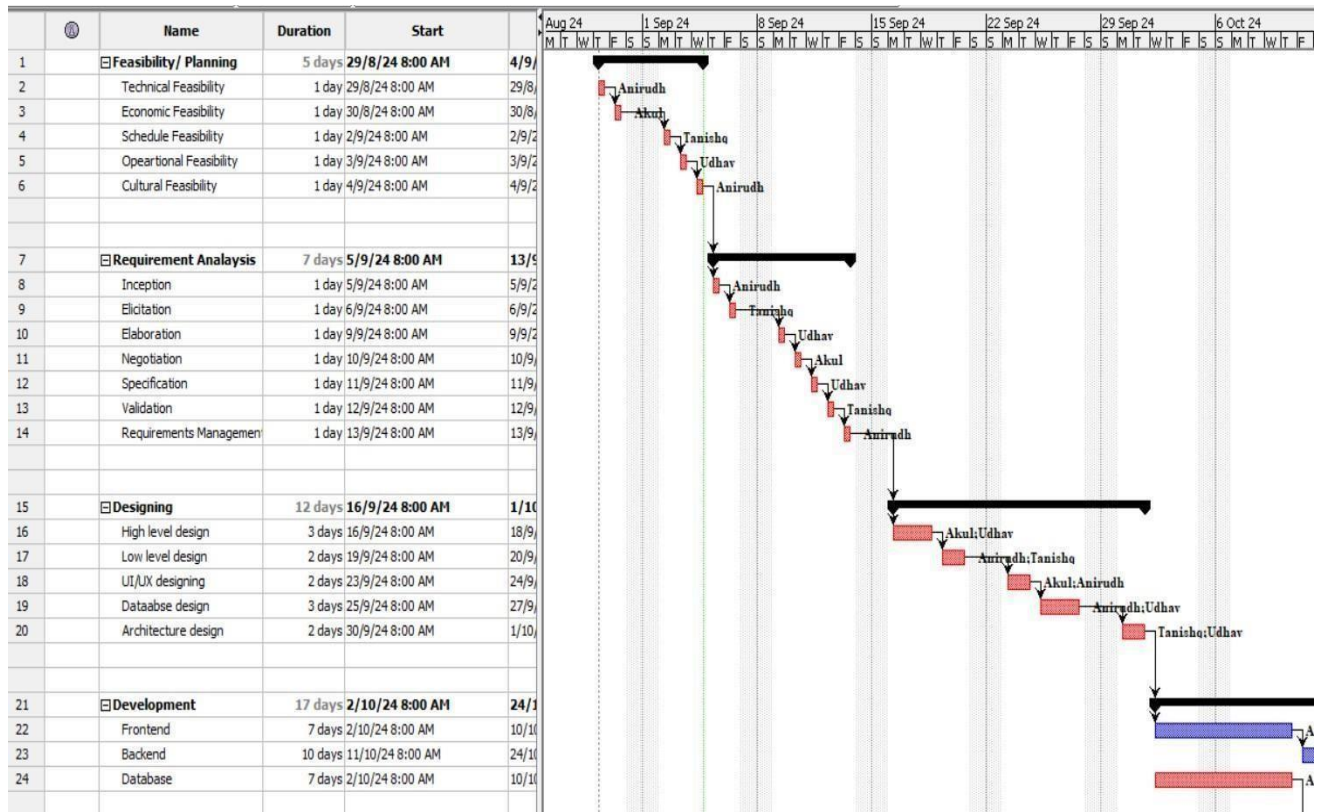
- **User Experience:** Assessing whether patients and healthcare providers will find the system easy to use and beneficial.
- **Interface Design:** Ensuring the interface is user-friendly and meets the needs of the target audience.
- **Post-Launch Activities:** Planning for post-launch activities, such as user support, system upgrades, and AI system improvements.
- **Workflow Integration:** Determining if the system integrates smoothly into existing healthcare workflows without disrupting current operations.

5.) Legal Feasibility:

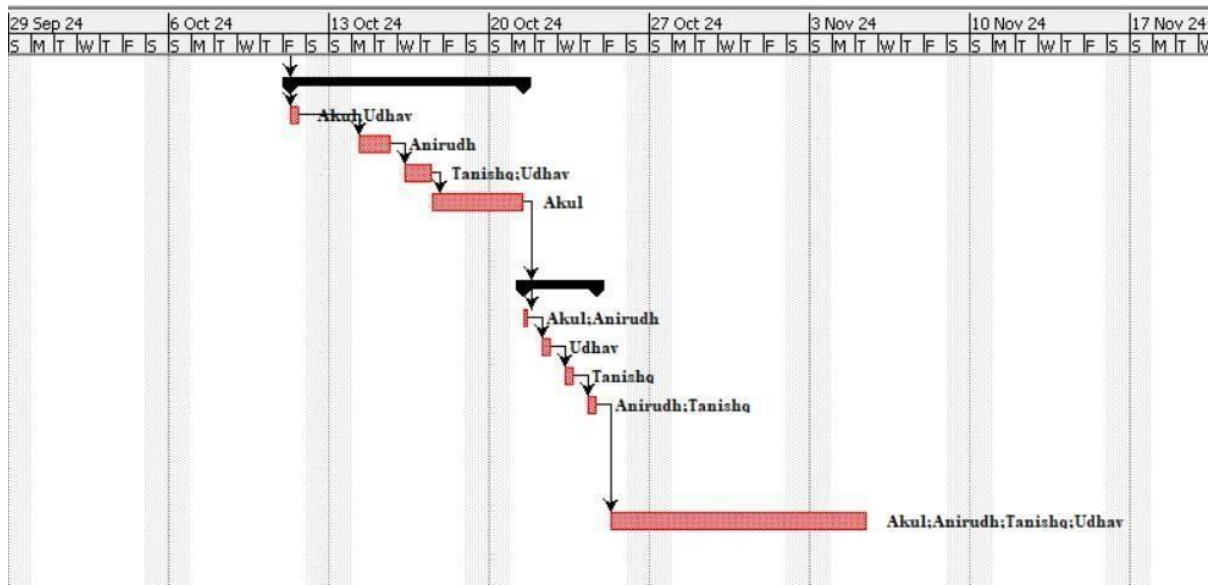
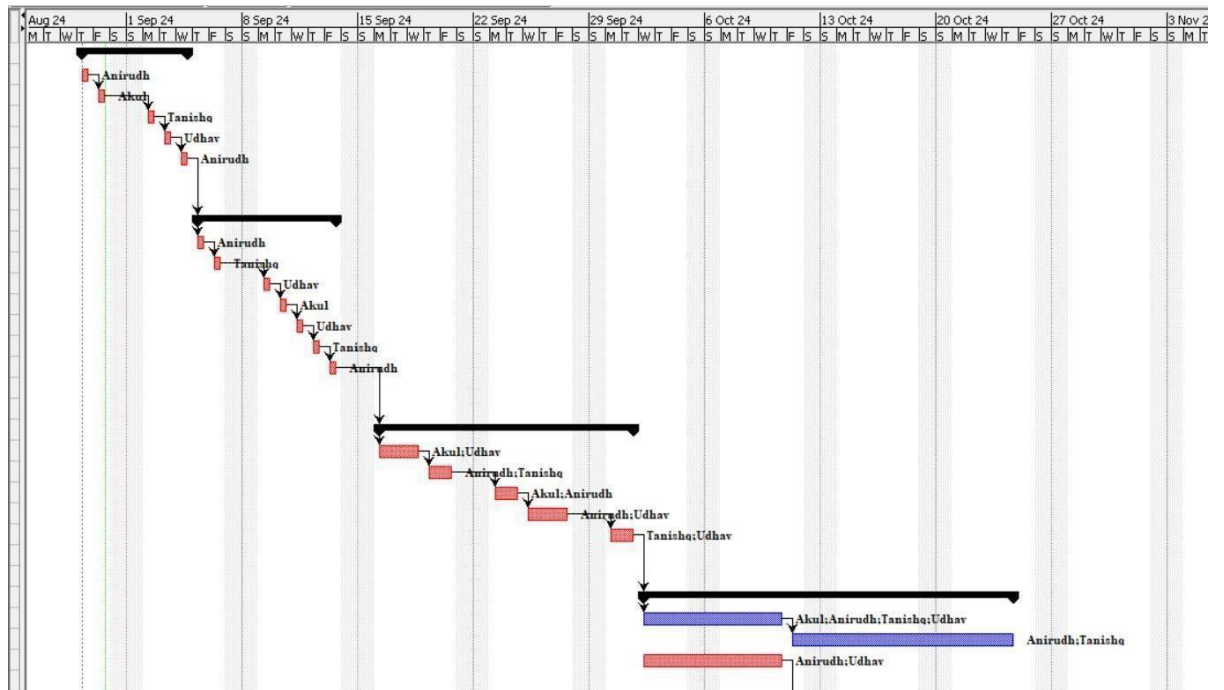
- **Compliance with Regulations:** Ensure the system complies with healthcare regulations like HIPAA or GDPR for data protection.
- **Data Privacy:** Implement strong safeguards to protect patient data and ensure legal privacy standards are met.
- **Intellectual Property:** Verify that all software components and libraries used are legally licensed or open-source.
- **Liability and Risk Management:** Assess and mitigate potential legal risks, including liability for medical advice or data breaches.

6.) Cultural Feasibility:

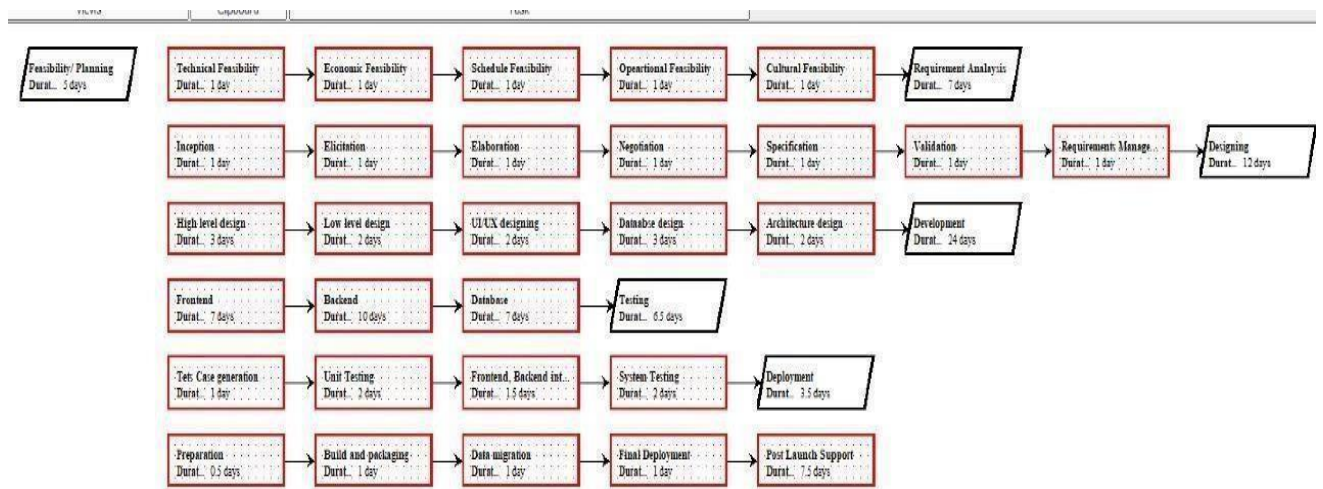
- **Patient and Provider Acceptance:** Ensure the system aligns with cultural comfort levels in technology use.
- **Language and Communication:** Support multiple languages with culturally appropriate terminology.
- **Health Beliefs and Practices:** Design with sensitivity to traditional health beliefs and practices.
- **Access and Usability:** Make the platform intuitive for users with varying digital literacy and access levels.



Timeline of Project



Gantt Chart



Network Diagram

①	Name	RBS	Type	E-mail Address	Material Label	Initials	Group	Max. Units	Standard Rate
+	Anirudh		Work	agarp3_be22@thapar.edu		A		100%	Rs.0.00/hour
+	Tanishq		Work	tpoyal1_be22@thapar.edu		T		100%	Rs.0.00/hour
+	Udhav		Work	ubansal_be22@thapar.edu		U		100%	Rs.0.00/hour
+	Aksh		Work	akalia_be22@thapar.edu		A		100%	Rs.0.00/hour
	Technology Used		Work			T		100%	Rs.0.00/hour
	HTML		Work			H		100%	Rs.0.00/hour
	CSS		Work			C		100%	Rs.0.00/hour
	JavaScript		Work			J		100%	Rs.0.00/hour
	React.JS		Work			R		100%	Rs.0.00/hour
	Node.JS		Work			N		100%	Rs.0.00/hour
	Express.JS		Work			E		100%	Rs.0.00/hour
	MongoDB		Work			M		100%	Rs.0.00/hour
	Python		Work			P		100%	Rs.0.00/hour

Use Case Diagram for Doctor Appointment Booking System



Use Case Templates

1.) Use case Title	User login
2.) Abbreviated Title	User login
3.) Use case id	1
4.) Actors	User (Patient, Doctor, Healthcare Staff)
5.) Description: Login by filling in user email id and password to access the software	
5.1) Preconditions: <ul style="list-style-type: none">○ User must be signed up and verified	
5.2) Task Sequence: <ul style="list-style-type: none">○ Enter verified email id.○ Enter set user password.○ Verify by clicking on “Log In”	
5.3) Post Conditions: User is logged in and can now access the software.	
6.) Modification History: 15-September-2024	
7.) Author: Anirudh, Akul	

Alternative Flow:

- **User has no account created:** User has to first register on the web application (The Health Nexus) by entering the details and registering themselves as patient or doctor.

1.) Use case Title	Booking Appointment
2.) Abbreviated Title	Booking Appointment
3.) Use case id	2
4.) Actors	Patient, Doctor
5.) Description: Patient will be able to book appointments.	
5.1) Preconditions	
<ol style="list-style-type: none"> 1. Patient must have an active account and be logged into the system. 2. Doctor availability must be set in the system. 	
5.2) Task Sequence:	
<ul style="list-style-type: none"> ○ Patient searches for a healthcare provider ○ Patient selects appointment time ○ System confirms appointment 	
5.3) Post Conditions:	
<ul style="list-style-type: none"> ○ A new appointment is scheduled in the system. ○ Both patient and doctor are notified of the upcoming appointment. 	
6.) Modification History: 15-September-2024	
7.) Author: Tanishq, Udhav	

Alternative Flow:

- **Appointment slot is unavailable:** If the selected time slot becomes unavailable, the system prompts the patient to select another slot.

Exceptions:

- **The patient's payment method is declined when booking a paid appointment:** The system informs the patient to update payment details or choose an alternative payment method

1.) Use case Title	Manage Appointment
2.) Abbreviated Title	Manage Appointment
3.) Use case id	3
4.) Actors	User (Patient)
5.) Description: Patient can manage the appointment, view it, reschedule it, cancel it.	
5.1) Preconditions <ul style="list-style-type: none"> 1. Patient has one or more booked appointments. 2. Patient is logged into the system. 	
5.2) Task Sequence: <ul style="list-style-type: none"> ○ Patient accesses the Manage Appointments screen. ○ Patient modifies appointment details ○ System Confirms changes 	
5.3) Post Conditions: <ul style="list-style-type: none"> ○ Appointment details are updated or cancelled as per the patient's action. ○ Notifications are sent to relevant parties. 	
6.) Modification History: 15-September-2024	
7.) Author: Anirudh, Udhav	

Alternative Flows:

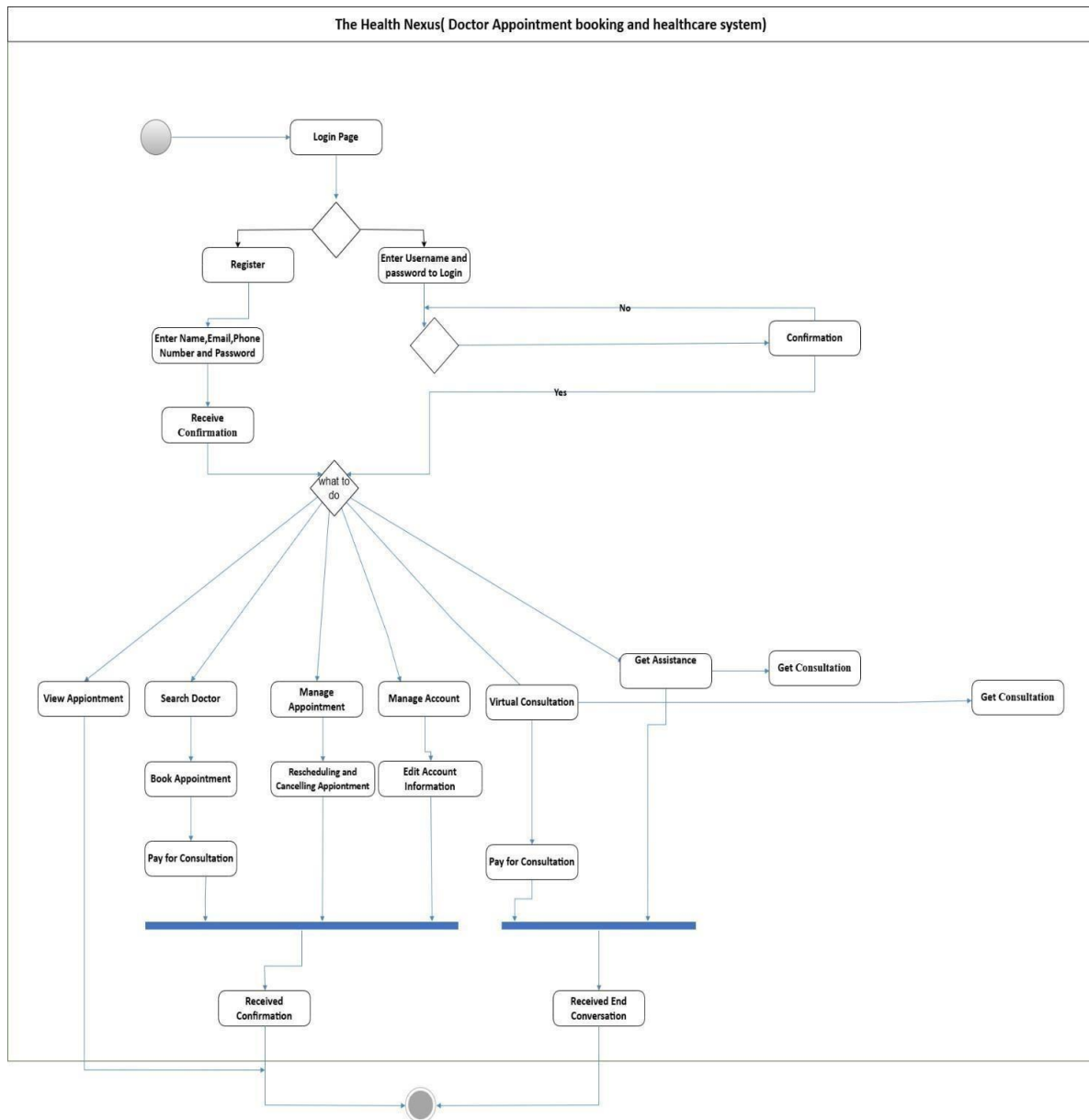
- **Patient cancels the appointment:**
The system confirms cancellation and informs the doctor
- **Patient reschedules the appointment:**
The system shows new available slots, and the patient selects a new time.

1.) Use case Title	Virtual Consultation
2.) Abbreviated Title	Virtual Consultation
3.) Use case id	4
4.) Actors	Patient, Doctor
5.) Description: Used for virtual consultation of patient with the doctor at the comfort of their home.	
5.1) Preconditions <ul style="list-style-type: none"> ○ A virtual appointment is booked. ○ Both the patient and the doctor are logged into the system during the scheduled time. 	
5.2) Task Sequence: <ul style="list-style-type: none"> ○ Patient initiates virtual consultation. ○ Doctor joins the virtual consultation: ○ Virtual consultation occurs ○ Consultation is completed: ○ System updates consultation status: 	
5.3) Post Conditions: <ul style="list-style-type: none"> ○ The consultation is successfully conducted. ○ Records and notes from the session are saved in the system. 	
6.) Modification History: 15-September-2024	
7.) Author: Udhav, Tanishq	

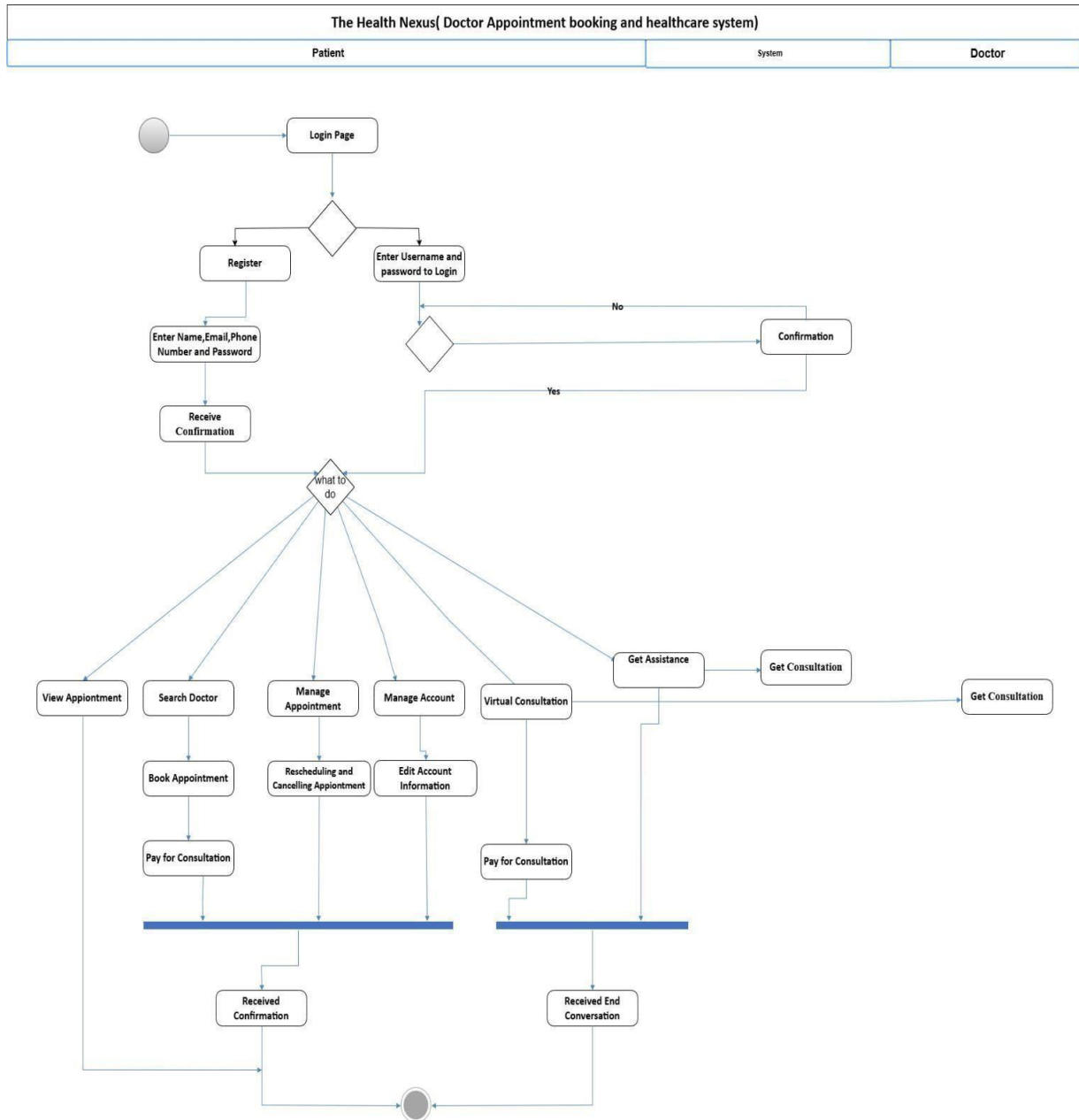
Alternative Flows:

- **Connection fails during consultation:**
If the video call disconnects, the system automatically attempts to reconnect the session.

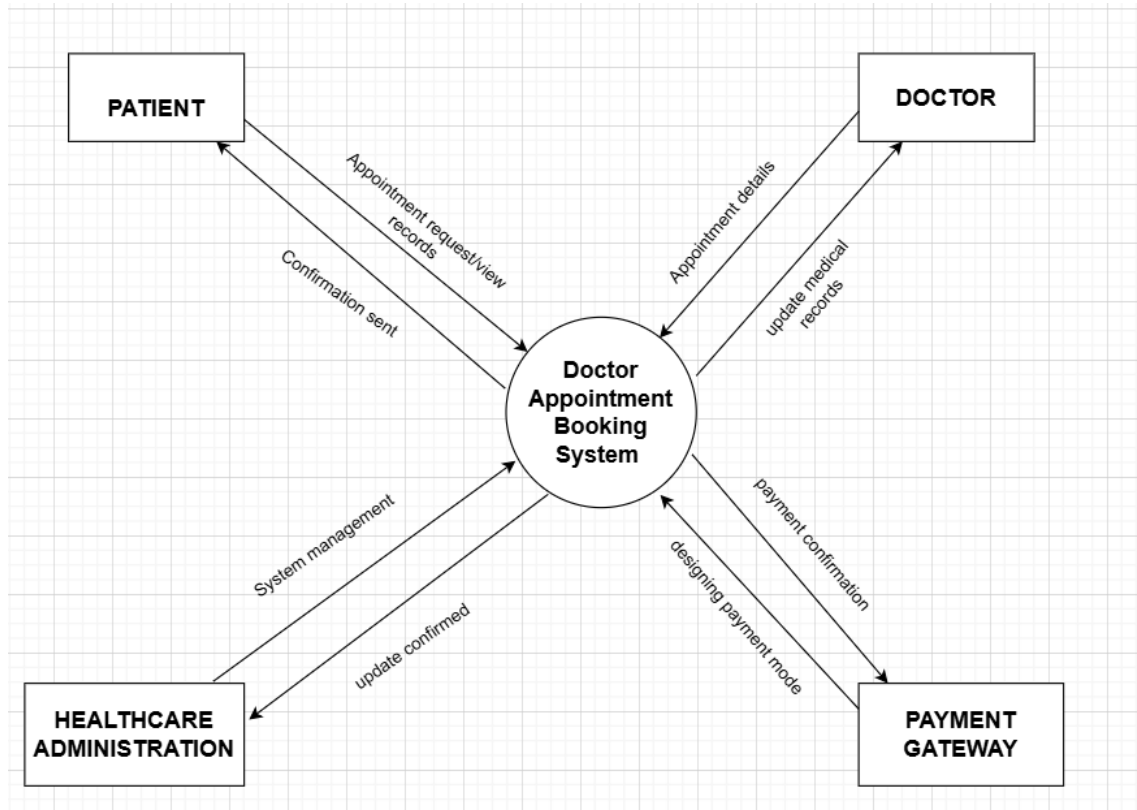
Activity Diagram



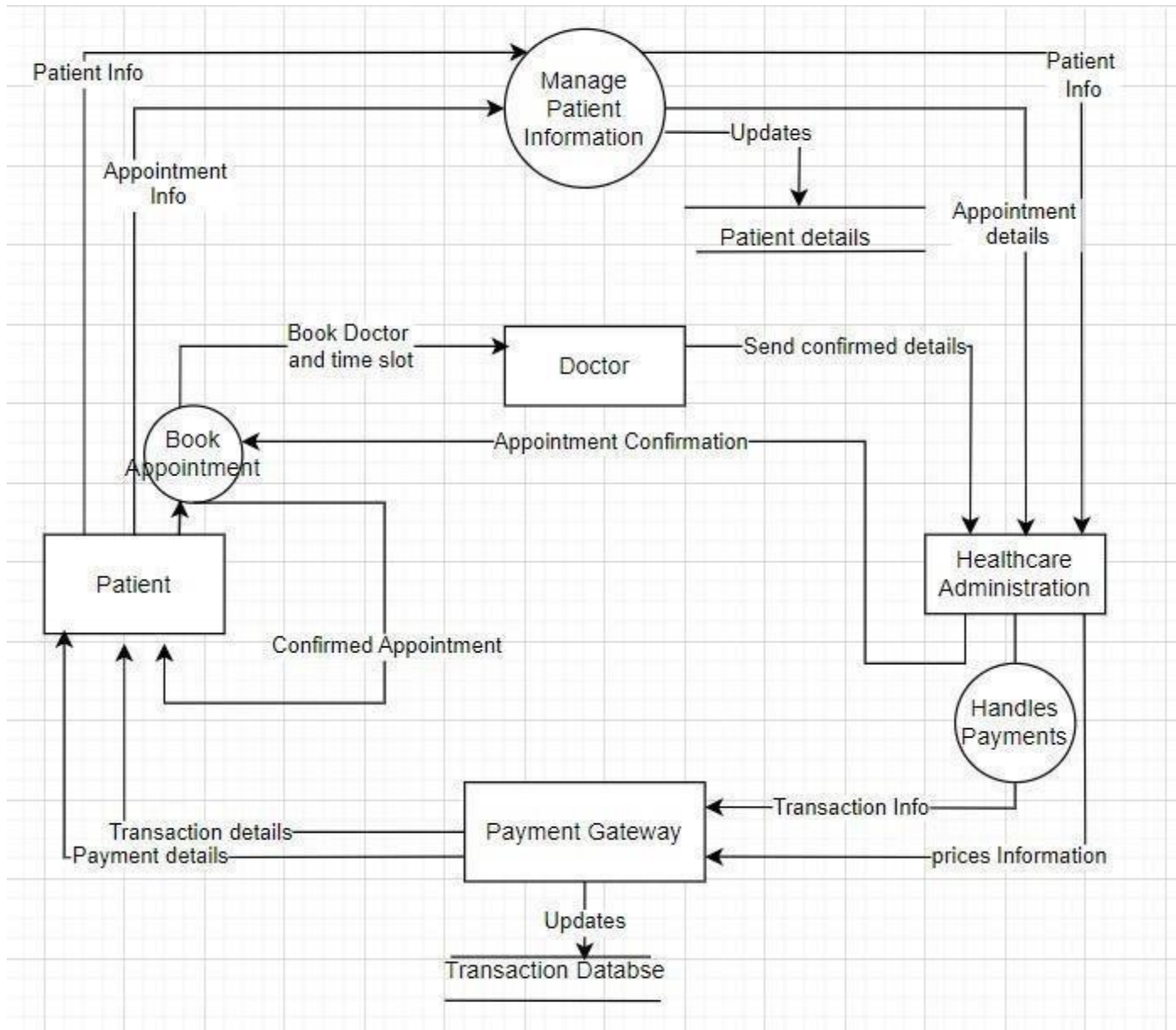
Swimlane Diagram



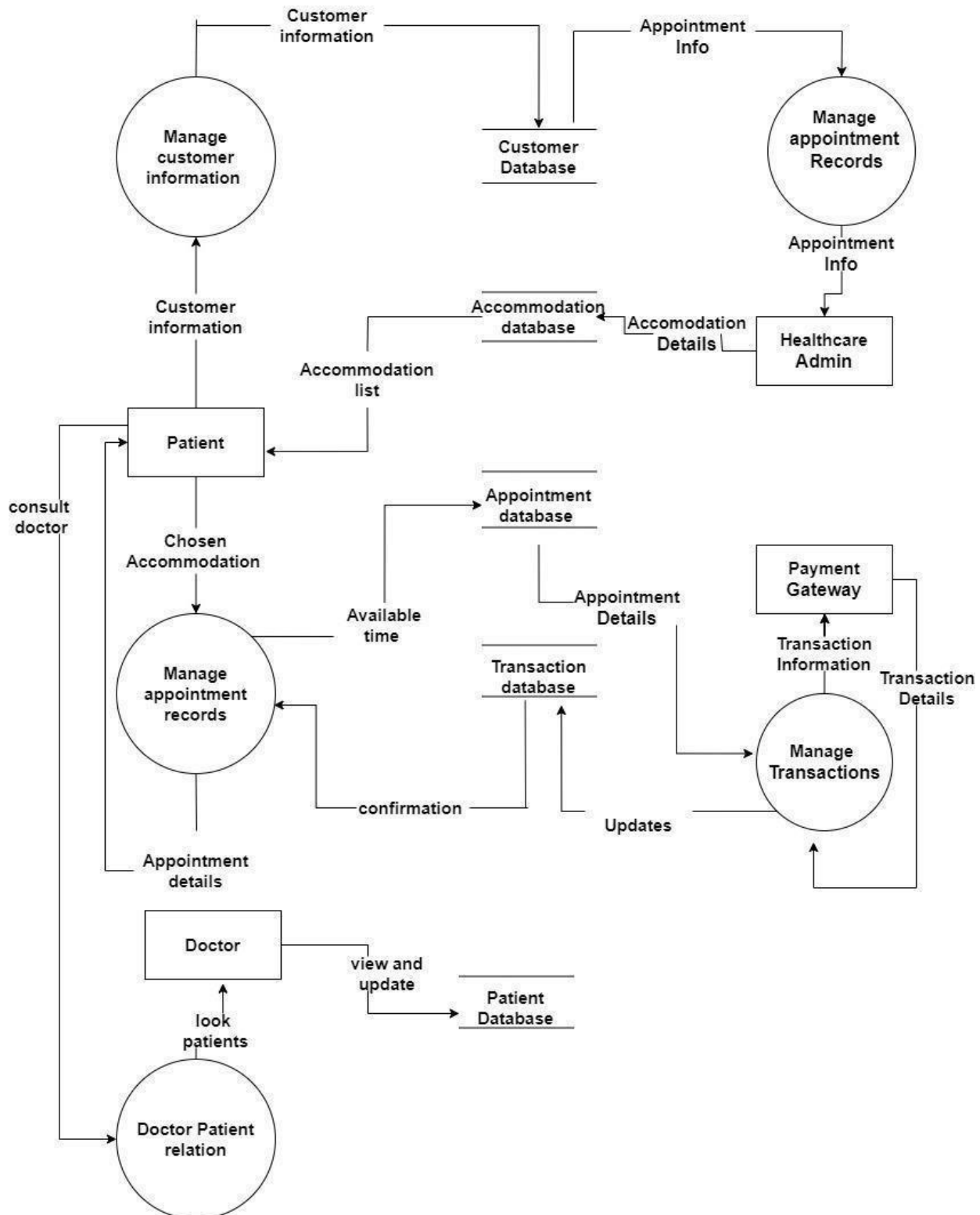
Data Flow Diagram(Level 0)



Data Flow Diagram(Level 1)



Data Flow Diagram(Level 2)



A CASE STUDY (IEEE Format)

Software Requirements Specification Document

Version 1.0

Doctor Appointment Booking and Healthcare System

Submitted By:

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TABLE OF CONTENTS

Chapter No.	Topic	Page No.
1.	<u>Introduction</u>	3
1.1	<u>Purpose of this Document</u>	3
1.2	<u>Scope of the Development Project</u>	3
1.3	<u>Definitions, abbreviations and acronyms</u>	5
1.4	<u>References</u>	7
1.5	<u>Overview</u>	7
2.	<u>Overall Description</u>	7
2.1	<u>Product Perspective</u>	8
2.2	<u>Product functions</u>	8
2.3	<u>User Characteristics</u>	9
2.4	<u>General Constraints, Assumptions and Dependencies</u>	11
2.5	<u>Apportioning of the requirements</u>	12
3.	<u>Specific Requirements</u>	13
3.1	<u>External Interface Requirements</u>	13
3.2	<u>Detailed Description of Functional Requirements</u>	14
3.2(a)	<u>Functional Requirements for Patient</u>	16
3.2(b)	<u>Functional Requirements for Doctor</u>	16
3.2(c)	<u>Functional Requirements for Healthcare Staff</u>	17
3.3	<u>Performance requirements</u>	17
3.4	<u>Logical database requirements</u>	18
3.5	<u>Quality attributes</u>	17
3.6	<u>Other requirements</u>	17
4.	<u>Change History</u>	18
5.	<u>Document Approvers</u>	18

1. Introduction

1.1 Purpose of this Document

Purpose of this SRS document is to provide a comprehensive overview of the Doctor Appointment Booking and Healthcare System. This document outlines the system's objectives, key features, and the scope of its functionality. It specifies the target users, including patients, doctors, and administrative staff, and details the requirements for both the user interface and the underlying hardware and software. The document serves as a reference for stakeholders, including the development team, project managers, and clients, to ensure a clear understanding of the system's capabilities, goals, and performance expectations. Through this document, we aim to align the vision of all parties involved in the development and deployment of the system, ensuring that it meets the needs of its intended users efficiently and effectively.

1.2 Scope of the Development Project

The goal is to design a software system for a comprehensive Doctor Appointment Booking and Healthcare System. This system aims to streamline the process of booking appointments, managing patient records, and facilitating communication between healthcare providers and patients. The system will serve as a central platform where patients can book appointments, view their medical records, and receive notifications about their health. Healthcare providers will be able to manage their schedules, access patient information, and update medical records.

The software must be able to perform the following operations:

User Authentication and Registration: The system must authenticate users (patients and healthcare providers) using secure methods, such as passwords or two-factor authentication. New users must be able to register by providing necessary details such as personal information, medical history (for patients), and professional credentials (for healthcare providers).

Appointment Booking and Management: The system must allow patients to view available appointment slots and book appointments with healthcare providers. Healthcare providers must be able to manage their schedules, including setting availability and rescheduling appointments. Both patients and providers should receive automated notifications and reminders about upcoming appointments.

Electronic Health Records (EHR) Management: The system must store and manage electronic health records for each patient, allowing healthcare providers to update medical records after consultations. Patients should have secure access to their records, including prescriptions, lab results, and treatment history.

Payment Processing and Billing: The system must facilitate secure online payments for consultations and treatments. It should generate invoices and track billing history for both patients and healthcare providers. Integration with insurance providers for claims processing may be included as a future enhancement.

Telemedicine Integration: The system must support telemedicine features, enabling virtual consultations between patients and healthcare providers. This includes video conferencing, secure messaging, and the ability to share medical documents and images during consultations.

Reporting and Analytics: The system must generate reports and analytics for healthcare providers, such as patient visit history, treatment outcomes, and financial summaries. These insights can help providers improve patient care and manage their practice more effectively.

Initially, we plan to implement these functionalities for a single clinic with an intended audience of 100 patients and 10 healthcare providers as part of the Pilot Phase. Once the Pilot Phase is successful, we plan to extend the system to other clinics within the healthcare network and eventually integrate it with larger healthcare systems and hospital networks.

The scope of this system is not limited to a single healthcare facility. It has the potential to be expanded to a broader healthcare network, enabling seamless coordination and management across multiple facilities. Additionally, the system can be adapted for use in different healthcare sectors, such as dental clinics, mental health services, and specialized medical practices, ensuring versatility and wide applicability across the healthcare industry.

Definitions

S.No	Term	Definition
1	Electronic Health Record (EHR)	A digital version of a patient's paper chart, containing the medical and treatment history of patients, accessible and updatable by healthcare providers.
2	Telemedicine	The use of telecommunication technologies to provide healthcare services remotely, allowing patients and doctors to communicate without the need for in-person visits.
3	Appointment Booking System	A software module that allows patients to schedule, reschedule, and cancel appointments with healthcare providers through an online platform.
4	Patient Portal	A secure online platform where patients can access their health information, book appointments, communicate with healthcare providers, and manage their health data.
5	Two-Factor Authentication	A security process in which the user provides two different authentication factors to verify their identity, enhancing the security of online accounts.
6	Healthcare Provider	A professional such as a doctor, nurse, or specialist who offers medical services to patients, including diagnosis, treatment, and follow-up care.
7	Medical Billing	The process of submitting and following up on claims with health insurance companies to receive payment for services provided by healthcare providers.
8	Insurance Claim	A request made by a healthcare provider to an insurance company to cover costs of medical services provided to a patient.
9	Patient Record	A collection of a patient's personal, medical, and treatment information stored within the healthcare system.
10	Health Information Exchange (HIE)	The electronic sharing of health-related information among organizations according to nationally recognized standards.

Table 1: Definitions

Table 2: Full Form for Most Commonly Used Mnemonics

S.No.	Mnemonic	Full Form
1	EHR	Electronic Health Record
2	HIE	Health Information Exchange
3	HIPAA	Health Insurance Portability and Accountability Act
4	PHI	Protected Health Information
5	PHR	Personal Health Record
6	EMR	Electronic Medical Record
7	PPO	Preferred Provider Organization
8	HMO	Health Maintenance Organization
9	CPT	Current Procedural Terminology
10	ICD	International Classification of Diseases

These tables provide definitions and full forms for terms and acronyms that are commonly used in the context of a Doctor Appointment Booking and Healthcare System.

1.3 References

1. Electronic Health Records (EHR) Definition Link:
http://en.wikipedia.org/wiki/Electronic_health_record
2. Telemedicine Overview. Link:
<http://en.wikipedia.org/wiki/Telemedicine>
3. Patient Portal Definition. Link:
http://en.wikipedia.org/wiki/Patient_portal
4. HIPAA Privacy Rule Overview by HHS.gov. Link:
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5. Medical Billing and Coding Guide by the American Medical Association (AMA). PDF Link:
<https://www.ama-assn.org/sites/ama-assn.org/files/corp/media-browser/public/ama-cpt-coding-guide.pdf>
6. Telemedicine Standards by American Telemedicine Association (ATA). PDF Link:
<https://www.americantelemed.org/wp-content/uploads/2021/01/ATA-Clinical-Guidelines.pdf>
7. Health Information Exchange (HIE) Overview by HIMSS. Link:
<https://www.himss.org/resources/health-information-exchange>

8. ICD-10 Coding Resources by World Health Organization (WHO). Link:
<https://www.who.int/standards/classifications/classification-of-diseases>
9. Data Security in Healthcare. A White Paper by John Smith, Security Architect, ABC Health. PDF Link:
<https://www.abc-health.com/white-papers/data-security-in-healthcare.pdf>
10. EHR Interoperability in Healthcare Networks. A Research Paper by Jane Doe, Department of Health Informatics, XYZ University. PDF Link:
<https://www.xyzuniversity.edu/papers/ehr-interoperability.pdf>

1.4 Overview

The remaining sections of this document provide a general description of the Doctor Appointment Booking and Healthcare System, including the characteristics of the users, the product's hardware, and the functional and data requirements. The general description of the project is discussed in Section 2 of this document. Section 2 outlines the functional requirements, data requirements, and the constraints and assumptions made while designing the healthcare system. It also presents the user's perspective on how the product will be used. Section 3 provides the specific requirements of the product. Section 3.0 also discusses the external interface requirements and provides a detailed description of the functional requirements.

2. Overall Description

2.1 Product Perspective

The Doctor Appointment Booking and Healthcare System is envisioned as a comprehensive, web-based platform designed to streamline the process of scheduling medical appointments, managing patient records, and facilitating communication between patients and healthcare providers. This system is not a standalone application but a crucial part of a broader healthcare management ecosystem that aims to improve patient care, reduce administrative overhead, and enhance the overall efficiency of healthcare services. The system will function as a cloud-based application accessible from any internet-enabled device, including desktop

computers, tablets, and smartphones. This accessibility ensures that patients and healthcare providers can interact with the system from any location, at any time, making it a flexible and convenient solution for both routine and urgent healthcare needs. The system will integrate seamlessly with existing healthcare infrastructure, such as Electronic Health Records (EHR) systems, billing systems, and pharmacy management systems. This integration is crucial for providing a holistic view of patient care, enabling healthcare providers to access up-to-date medical records, manage billing, and prescribe medications, all from a single platform. Key stakeholders in this project include patients, doctors, healthcare administrators, and IT staff responsible for maintaining the system. Each stakeholder group will interact with the system differently, requiring a user interface that is intuitive and easy to navigate, regardless of the user's technical expertise.

2.2 Product Functions

The Doctor Appointment Booking and Healthcare System will offer a wide range of functionalities aimed at improving the patient experience and optimizing healthcare provider workflows. Key product functions include:

1. Appointment Booking and Management:

- Patients can search for healthcare providers based on various criteria such as specialization, location, and availability. Once a suitable provider is found, patients can book an appointment directly through the system.
- The system will provide real-time updates on doctor availability, ensuring that patients can only book appointments that fit within the provider's schedule.
- Appointment reminders and notifications will be sent to both patients and healthcare providers to minimize no-shows and ensure that all parties are informed of upcoming appointments.

2. Patient Record Management:

- The system will allow healthcare providers to access and update patient records during appointments. This includes viewing past medical history, recording new diagnoses, prescribing medications, and noting treatment plans.
- Patients will have secure access to their medical records, enabling them to review their health history, view test results, and track their treatment progress.

3. Doctor Availability Management:

- Healthcare providers can set their availability through the system, specifying their working hours, breaks, and any exceptions (such as holidays or conferences).
- The system will automatically update the provider's schedule to reflect any changes, ensuring that patients always have access to accurate appointment slots.

4. Communication Tools:

- The system will facilitate secure messaging between patients and healthcare providers, allowing for follow-up questions, prescription requests, and other communications that do not require an in-person visit.
- Video consultation capabilities will be integrated, allowing patients to have virtual appointments with their healthcare providers when necessary.

5. Billing and Insurance Integration:

- The system will integrate with healthcare providers' billing systems, allowing for the automatic generation of invoices based on services rendered.
- Insurance information can be stored in the system, streamlining the process of claim submissions and reducing the administrative burden on healthcare providers.

6. Data Analytics and Reporting:

- Healthcare administrators can generate reports on various aspects of the healthcare services provided, such as appointment statistics, patient demographics, and revenue.
- Data analytics tools will provide insights into patient care trends, helping providers to improve service delivery and patient outcomes.

2.3 User Characteristics

The system will cater to a diverse range of users, each with specific needs and levels of technical expertise:

1. Patients:

- Patients range from young, tech-savvy individuals who prefer digital interactions to older individuals who may be less familiar with technology. The system's user interface will be designed to accommodate this wide range of users, offering an intuitive, easy-to-navigate experience with clear instructions and support features.
- Patients will primarily use the system to book appointments, manage their health records, and communicate with their healthcare providers. Some patients may also use the system to track their treatment progress and monitor ongoing health conditions.

2. Doctors and Healthcare Providers:

- Healthcare providers using the system will include general practitioners, specialists, nurses, and other medical staff. These users will need quick access to patient records, appointment schedules, and communication tools. The system will provide a dashboard view that aggregates all relevant information, enabling providers to manage their time efficiently and focus on patient care.
- Providers will also use the system to document patient interactions, prescribe treatments, and collaborate with other healthcare professionals. The system must be robust, reliable, and secure to support these critical functions.

3. Healthcare Administrators:

- Administrators will use the system to manage user accounts, configure system settings, and generate reports. These users require access to advanced tools for monitoring system performance, managing data security, and ensuring compliance with healthcare regulations.
- The system will provide a comprehensive set of administrative tools that allow for the efficient management of the entire healthcare operation, from patient intake to billing and follow-up care.

4. IT and Support Staff:

- IT professionals will be responsible for maintaining the system, ensuring uptime, performing backups, and implementing software updates. The system will include features that allow IT staff to monitor performance, troubleshoot issues, and

manage user access.

- Support staff may also be involved in providing technical assistance to end users, addressing any issues or questions that arise during system use.

2.4 General Constraints, Assumptions, and Dependencies

Several constraints, assumptions, and dependencies must be considered during the development and implementation of the Doctor Appointment Booking and Healthcare System:

1. Regulatory Compliance:

- The system must comply with all relevant healthcare regulations, such as the General Data Protection Regulation (GDPR) in Europe or the Health Insurance Portability and Accountability Act (HIPAA) in the United States. Compliance will require stringent data protection measures, including encryption, access controls, and audit trails.

2. Data Security:

- Given the sensitive nature of healthcare data, the system must implement robust security measures to protect against unauthorized access, data breaches, and other cybersecurity threats. This includes secure login procedures, regular security audits, and adherence to best practices for data storage and transmission.

3. Scalability and Performance:

- The system must be designed to scale with the growth of the healthcare organization. As the number of users increases, the system should be able to handle larger volumes of data and more simultaneous transactions without compromising performance.

4. Interoperability:

- The system must be able to integrate with other healthcare systems, including EHR platforms, billing systems, and laboratory management systems. Interoperability is essential for providing a seamless experience for users and ensuring that all relevant data is accessible when needed.

5. User Accessibility:

- The system must be accessible to users with disabilities, in compliance with accessibility standards such as the Web Content Accessibility Guidelines (WCAG). This includes features like screen reader compatibility, keyboard navigation, and high-contrast modes.

6. System Availability:

- The system must be available 24/7, with minimal downtime for maintenance. Healthcare providers and patients will rely on the system for time-sensitive information, making high availability a critical requirement.

7. Data Accuracy and Integrity:

- The system must ensure the accuracy and integrity of all data stored within it. This includes implementing validation checks, preventing duplicate records, and providing mechanisms for correcting errors when they occur.

8. Dependencies:

- The system's performance and reliability will depend on the quality of the underlying infrastructure, including network connectivity, server hardware, and database management systems. Any issues with these components could impact the overall performance of the system.

2.5 Apportioning of Requirements

The development of the Doctor Appointment Booking and Healthcare System will be divided into several phases to ensure a smooth and controlled implementation:

1. Phase 1: Core Functionality Development

- In the first phase, the focus will be on developing the core functionalities of the system, including user registration, appointment booking, and doctor availability management. Basic patient record management and communication tools will also be implemented during this phase.

2. Phase 2: Integration with External Systems

- Once the core functionality is in place, the system will be integrated with external systems such as EHR platforms and billing systems. This phase will also involve the development of APIs to facilitate third-party integrations.

3. Phase 3: Advanced Features and AI Integration

- In the final phase, advanced features will be developed, such as AI-driven appointment scheduling, predictive analytics, and personalized health recommendations. These features will enhance the system's functionality and provide additional value to users.

4. Phase 4: Testing and Deployment

- After all features have been implemented, the system will undergo rigorous testing to ensure that it meets all performance, security, and usability requirements. Once testing is complete, the system will be deployed to the production environment.

5. Phase 5: Post-Deployment Support and Maintenance

- Following deployment, the system will be monitored continuously to identify and address any issues that arise. Regular updates will be released to introduce new features, fix bugs, and improve overall performance.

3. Specific Requirements

3.1 External Interface Requirements:-

- **Minimal Graphics Interface:** The system will feature a simple graphical interface, utilizing a basic keypad for user input. The interface will be user-friendly and straightforward to navigate, ensuring ease of use for all patients.
- **Display Requirements:** The system will operate on hardware with a screen resolution not exceeding 320 x 240 pixels, suitable for small form factors such as portable or wall-mounted devices commonly used in healthcare settings.
- **Sound and Animation:** The initial version of the system will not include sound or animation, focusing solely on the core functionalities. However, future variants may introduce sound features, such as greeting patients by name when they book an appointment or check in via the system.
- **Input Devices:** The system will primarily rely on a simple keypad for input, allowing patients to easily navigate through menus and select options related to booking appointments, viewing available slots, and accessing healthcare information.

3.2 Detailed Description of Functional Requirements

Table 3 shows a template that will be used to describe the functional requirements for three types of users: patients, doctors, and administrative staff. This template provides a clear framework for defining the functionalities specific to each user type. From this template, one can easily deduce the functional requirements for other potential user types

within the system.

Table 3: Template for describing functional requirements

Purpose	A description of the functional requirements and their reasons.
Inputs	<p>Patient details (name, contact information, medical history).</p> <ul style="list-style-type: none">- Doctor details (name, specialization, availability).- Appointment details (date, time, type of consultation).- User interaction data via keypad input.- System-generated data (e.g., timestamps, confirmation codes).- Legal domains: Personal information, medical data, scheduling data.
Processing	<p>Booking and scheduling appointments based on availability.</p> <ul style="list-style-type: none">- Validity checks: Ensure inputs are within correct formats (e.g., valid dates, unique patient IDs).- Handle abnormal situations: Alert user if a doctor is unavailable or if the input data is incorrect.- Time-sensitive processing to ensure prompt scheduling and avoid double-booking.- Automatic updates of available slots upon successful bookings.
Outputs	<p>Confirmation of appointment details (date, time, doctor's name).</p> <ul style="list-style-type: none">- Error messages for invalid input (e.g., incorrect patient ID, unavailable time slot).- Display of available slots after input.- System-generated output in the form of appointment summaries and receipts.- Storage of booking information in the healthcare system's database.- Error handling to provide clear guidance to the user on correcting input errors.

3.2.1 Functional Requirements for Doctor Welcome Screen

Table 4: Functional requirements for Doctor Welcome Screen.

Purpose	This screen provides information specific to each doctor upon successful identification using their ID number and secure login credentials. The system verifies these credentials against the values stored in the central database server.
Inputs	A doctor can view a page of information by selecting options on the welcome screen. Options might include viewing upcoming appointments, patient records, or messages. Selection is performed through a user-friendly interface, such as a mouse, keyboard, or touch input.

Processing	The menu responds to selections by retrieving the requested information from the database and displaying it on the screen. Processing includes querying the database for patient records, appointment schedules, and other relevant data.
Outputs	Output consists of a screen displaying information specific to the doctor. For example, upon selecting "View Today's Appointments," the doctor may see a list of all scheduled appointments for the day, including patient names, appointment times, and any notes related to each patient.

3.2.2 Functional Requirements for Patient's Welcome Screen

Table 5: Requirements for Staff Welcome Screen

Purpose	This system allows patients to book appointments with doctors by selecting available time slots and provides confirmation details. It also manages patient and doctor data within the healthcare system's central database.
Inputs	A patient can book an appointment by choosing from available time slots for their selected doctor. The selection is performed using a simple keypad interface. Patient details such as name and contact information are also inputs.
Processing	The system processes the booking request by checking the availability of the chosen time slot and doctor. Upon successful validation, it schedules the appointment and updates the database with the booking information. In case of any conflicts or errors, the system prompts the user with appropriate messages.
Outputs	The system outputs a confirmation screen displaying the appointment details (doctor's name, date, time). If the selected slot is unavailable or input data is invalid, the system will display error messages. Additionally, it provides options to view or modify existing appointments.

3.2.3 Functional Requirements for Doctor cum Patient Welcome Screen

Table 6 gives the functional requirements for Doctor cum Patient Welcome Screen.

Purpose	This screen provides information and functionality specific to booking and managing doctor appointments, as well as accessing healthcare services.
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Inputs	A user can view and select from available options, such as booking an appointment, viewing medical history, and consulting a doctor. Inputs may include patient information, preferred doctor, and appointment date/time. Selections are performed via a user-friendly interface.
Processing	The system processes the user's input by interacting with the database to check doctor availability, book appointments, and retrieve or update medical records. The system also provides recommendations for healthcare services based on user input.
Outputs	Output consists of confirmation screens for booked appointments, notifications regarding doctor availability, and access to medical records. For example, if a user selects a specific doctor and time slot, the system confirms the booking and provides a summary, including the appointment details and any follow-up instructions. If the user views their medical history, the system retrieves and displays relevant records.

3.3 Performance Requirements

The following outlines the performance and deployment characteristics of the Doctor Appointment Booking and Healthcare System. These requirements ensure that the system operates efficiently and meets user expectations in various scenarios.

- **System Compatibility:** The software is designed to run on a web-based platform and is compatible with both desktop and mobile devices. It cannot be operated on legacy systems that do not support modern web technologies.
- **Concurrent User Support:** The software must support simultaneous access by multiple users, including patients, doctors, and administrative staff. The system is designed to handle up to 10,000 concurrent users without degradation in performance. Load balancing mechanisms should be employed to distribute traffic and ensure system stability.
- **Data Handling:** The system will manage both textual information (e.g., patient records, appointment details) and multimedia content (e.g., scanned documents, diagnostic images). The system should efficiently handle varying amounts of data, which can differ greatly depending on the user.
- **Fault Tolerance and Reliability:** The system should be designed with fault tolerance in mind, ensuring that failures in one part of the system do not cause widespread disruption. The system should have an uptime of 99.9%, with provisions for failover and disaster recovery.

3.4 Logical Database Requirements

Figure 1 shows the E-R diagram for the entire system.

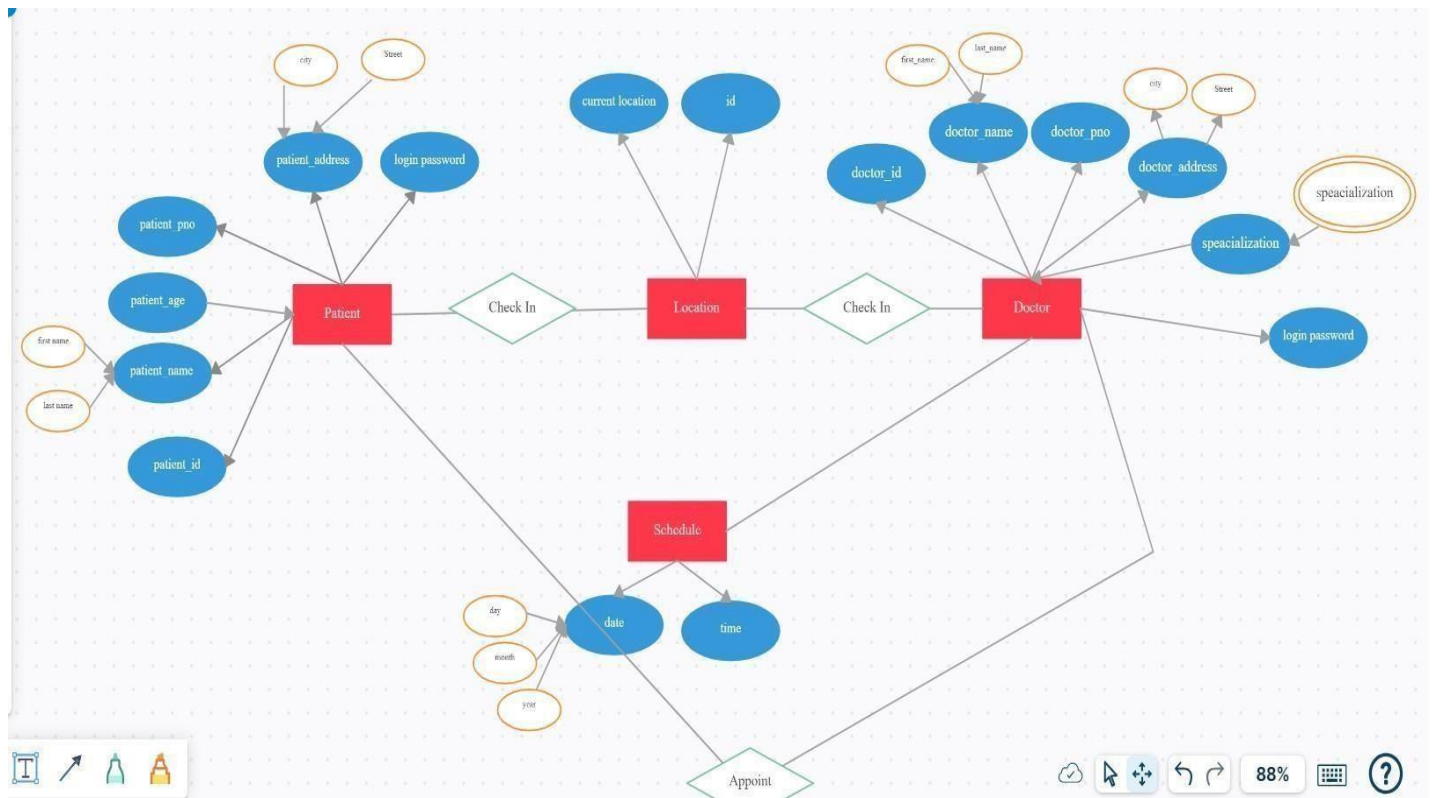


Figure 1

3.5 Quality Attributes

The Doctor Appointment Booking and Healthcare System is designed to cater to a diverse range of users, including patients, doctors, administrative staff, and healthcare providers. The following quality attributes are crucial for ensuring a seamless and efficient user experience:

- **Performance and Responsiveness:** The system must load quickly and provide a smooth user experience across various devices, including desktops, tablets, and smartphones. Pages should load within 2 seconds under normal conditions, ensuring that users can access services without delay.
- **Usability:** The interface should be intuitive and user-friendly, accommodating users with different levels of technical proficiency. Clear instructions, easy navigation, and accessible design are critical to ensuring that all users can effectively interact with the system.
- **Robustness and Error Handling:** The system must be resilient to a wide range of input possibilities from users, including incorrect entries, unexpected responses, and unforeseen interactions. It should provide meaningful error messages and guide users toward correct actions without causing frustration or system crashes.

4. Change History

200209 Version 1.0 – Initial Release

5. Document Approver

SRS for Doctor Appointment Booking and Healthcare system

(Name)

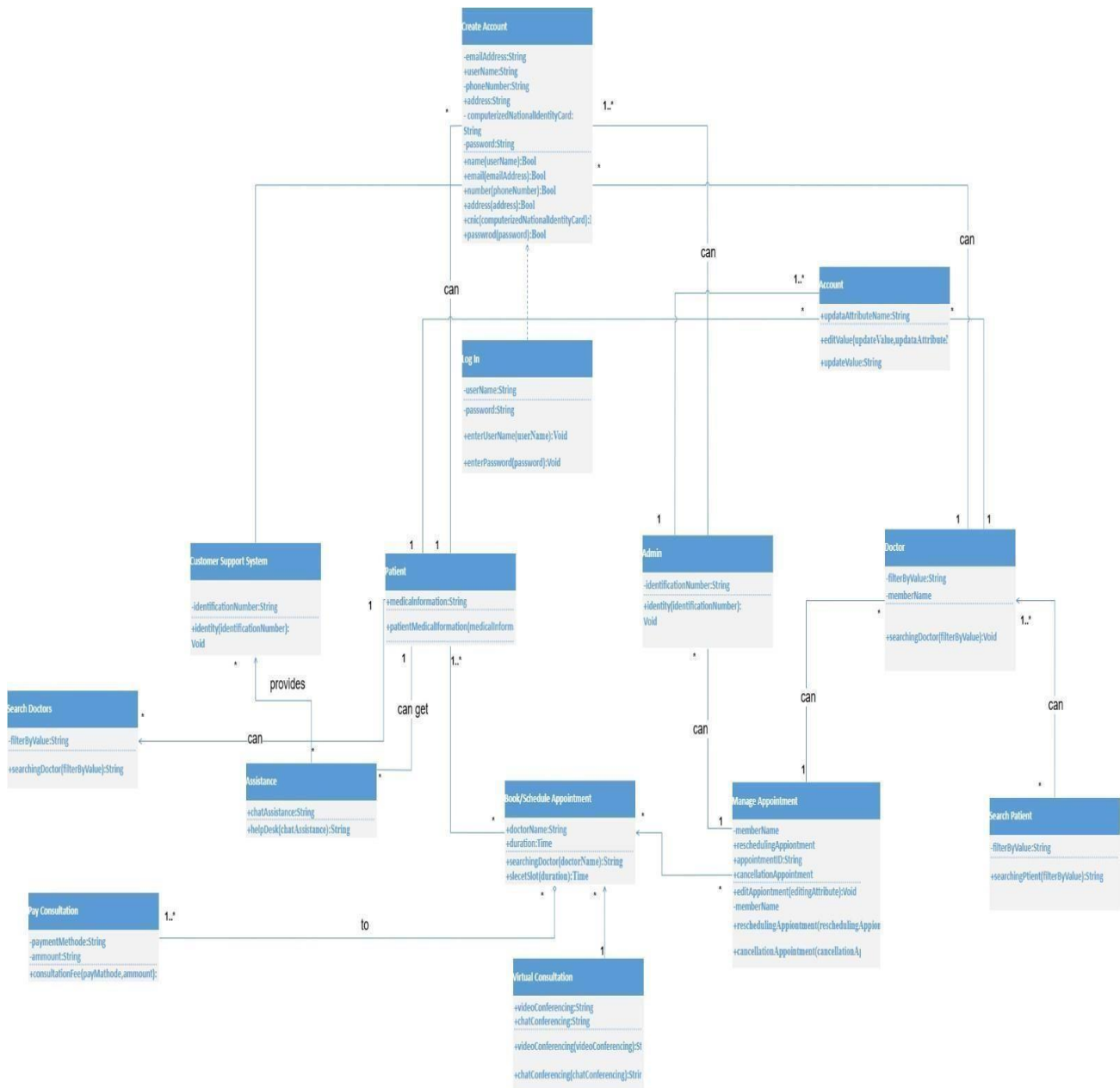
Designation

Date:

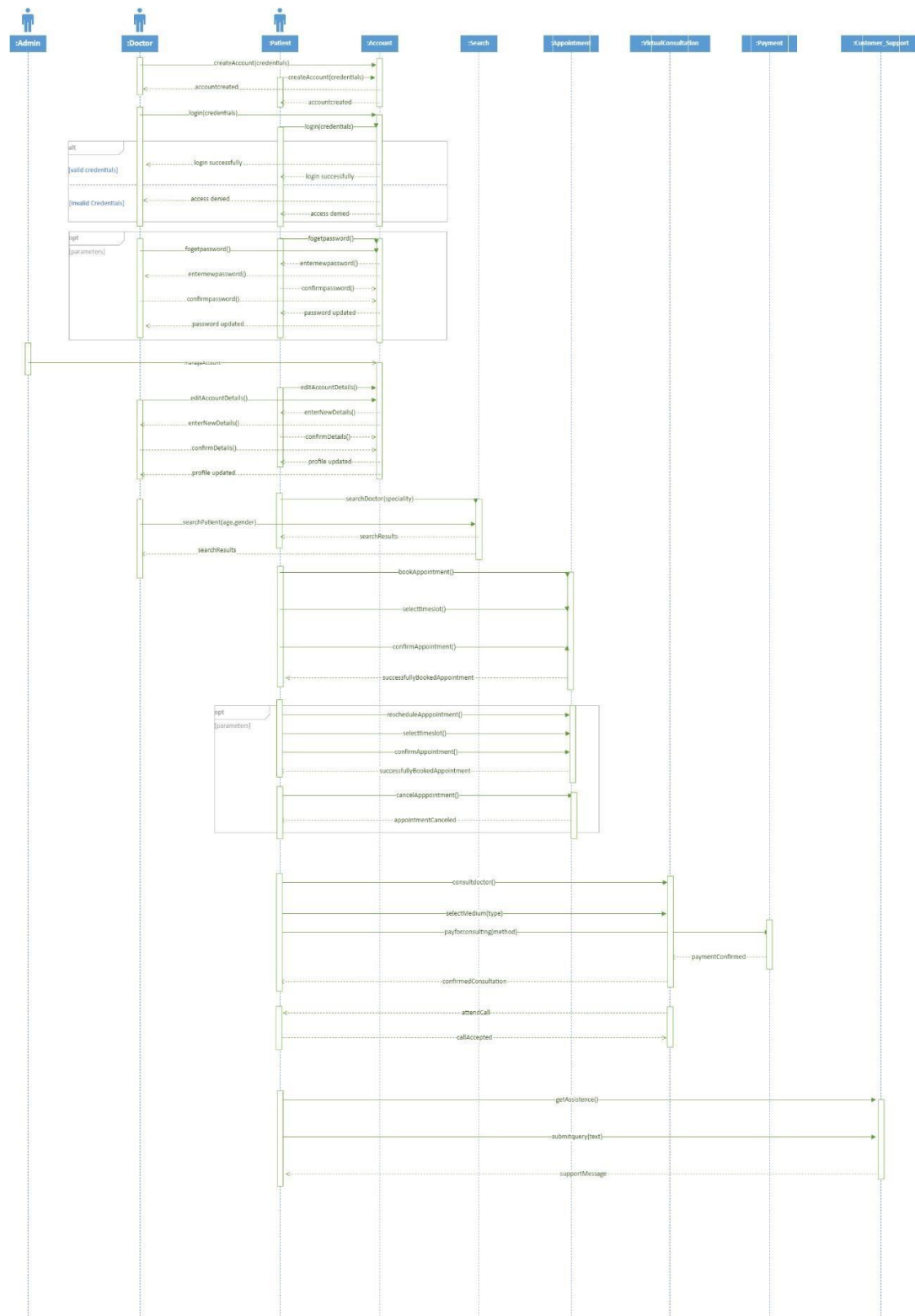
3.

Design Phase

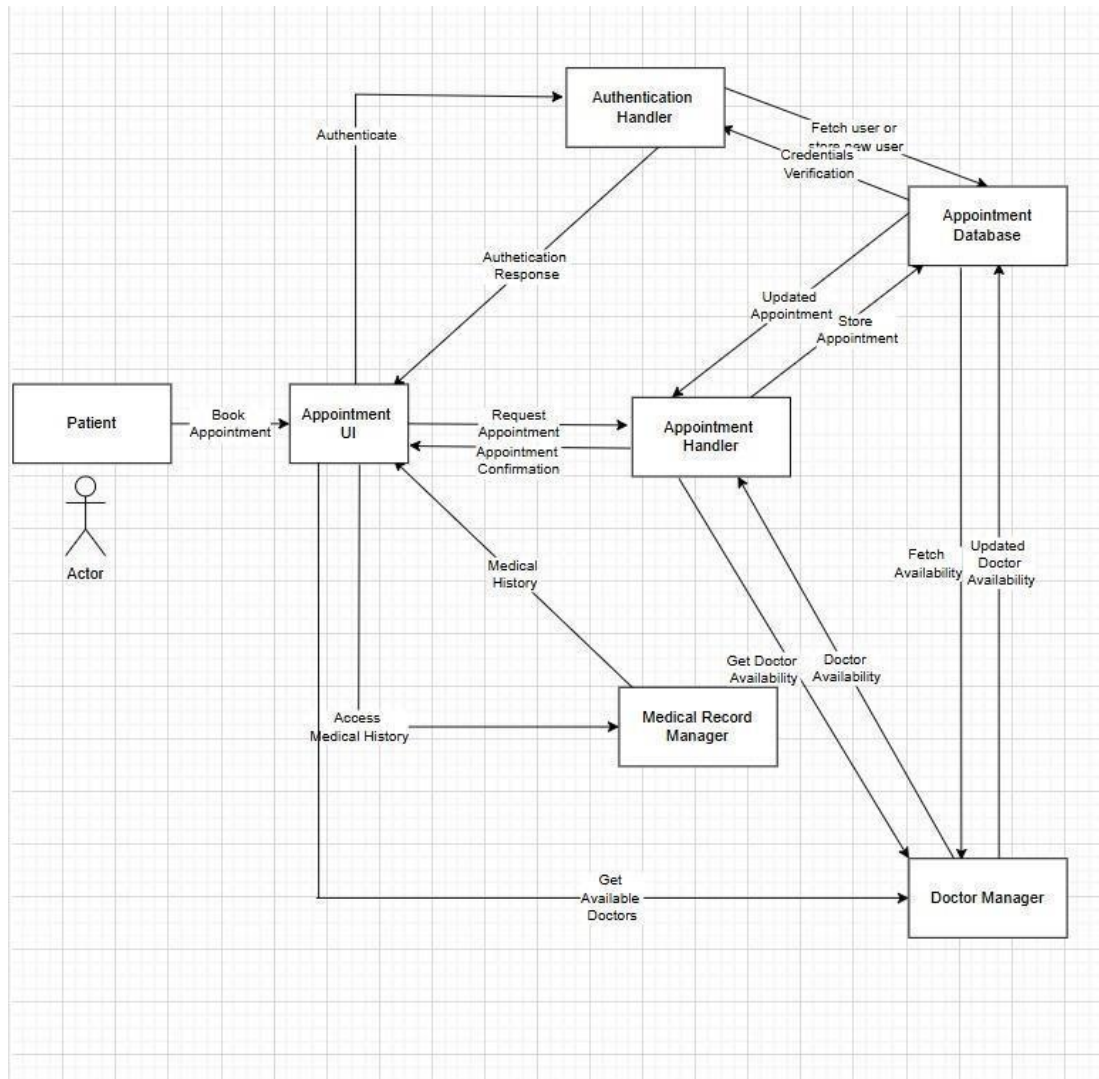
Class Diagram for Doctor Appointment Booking System



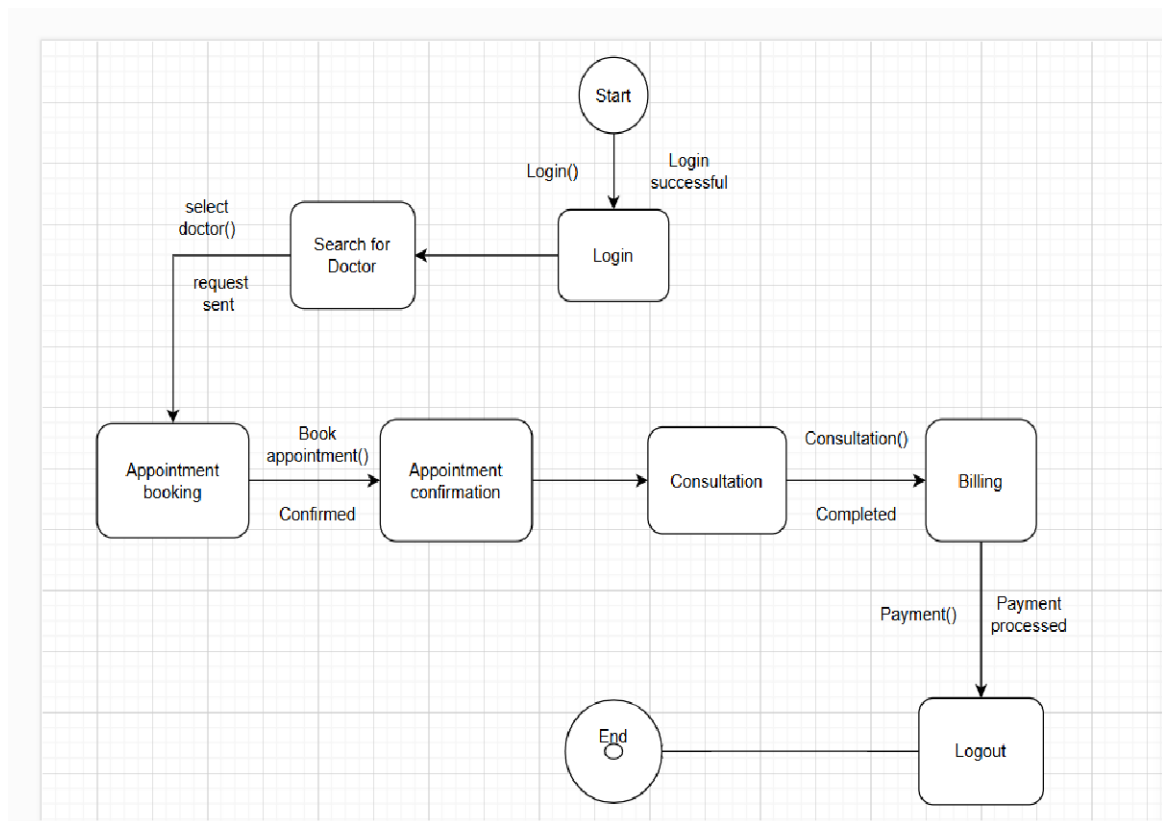
Sequence Diagram for Doctor Appointment Booking System



Collaboration Diagram for Doctor Appointment Booking System

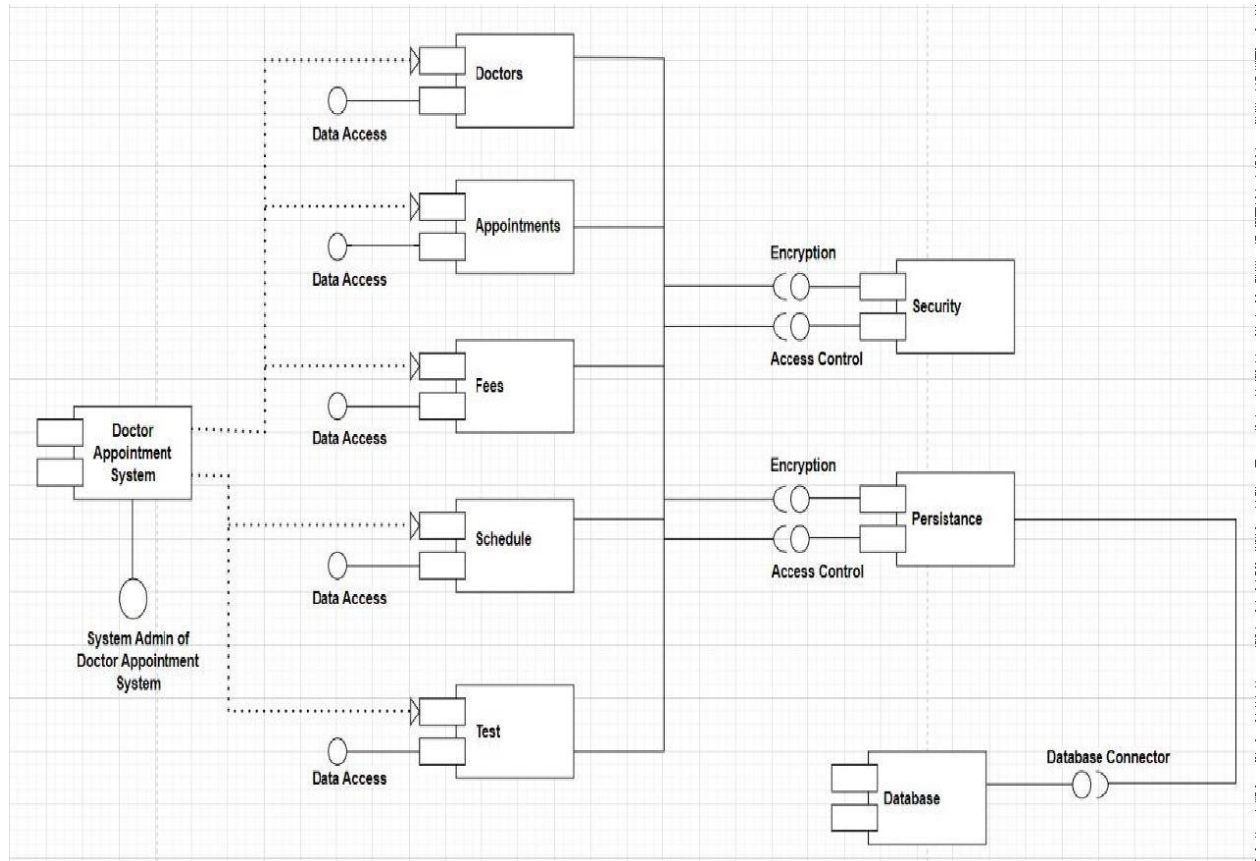


State Chart Diagram for Doctor Appointment Booking System

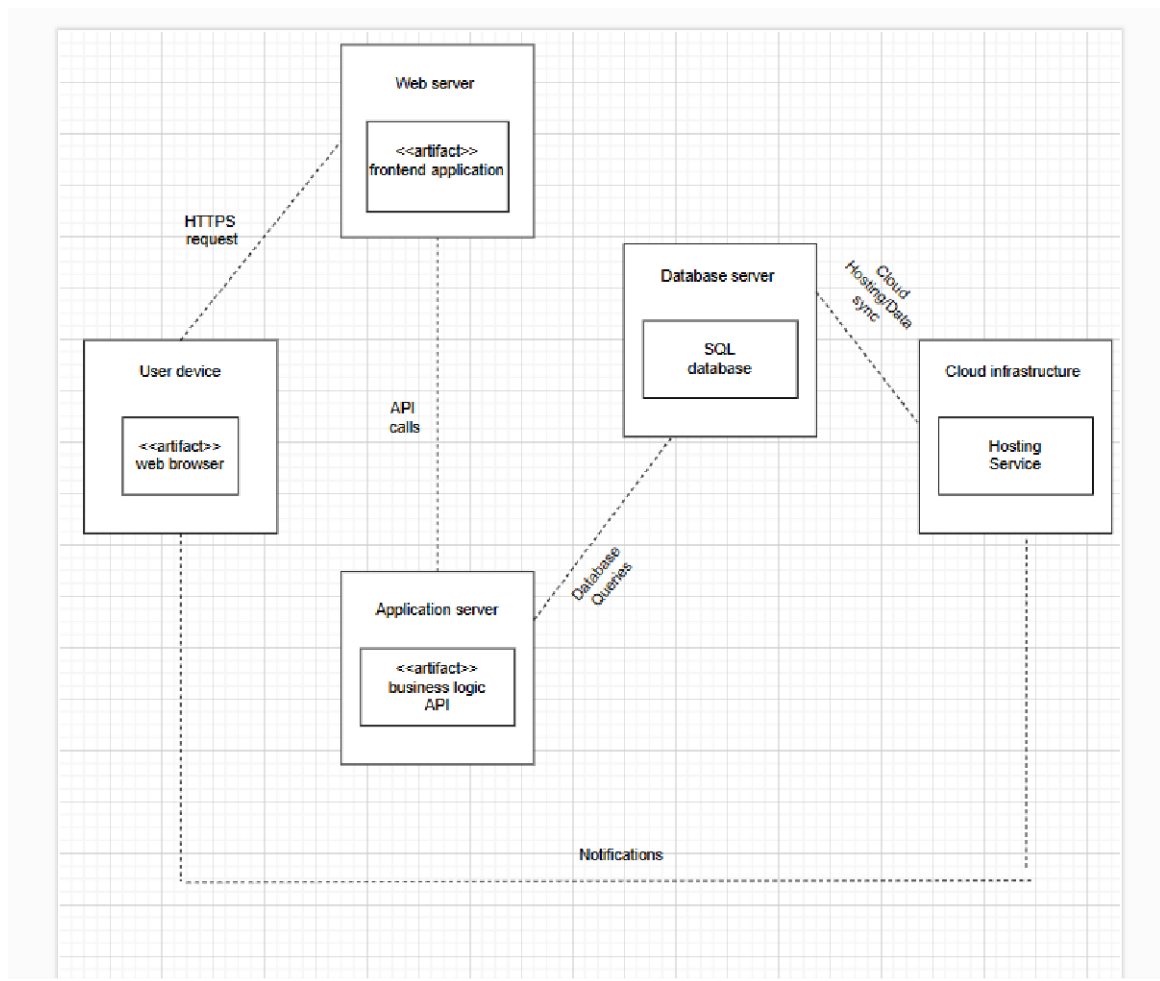


4. Implementation

Component Diagram for Doctor Appointment Booking System



Deployment Diagram for Doctor Appointment Booking System



Test Cases

Test Case #: 1

Test Case Name: User Login

System:

Subsystem:

Designed by: Anirudh Garg

Design Date: 14/11/2024

Executed by: Anirudh Garg

Execution Date: 14/11/2024

Short Description: User login functionality

Pre-conditions

User must have a registered account.

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Enter username	NA		
2	Enter password	NA		
3	Click Login	The system logs the user in and redirects them to the dashboard.	Pass	

Post-conditions

User is authenticated and session is initiated

Test Case #: 2

Test Case Name: User Registration

System:

Subsystem:

Designed by: Anirudh Garg

Design Date: 14/11/2024

Executed by: Akul Kalia

Execution Date: 14/11/2024

Short Description: User registration

Pre-conditions

User must provide unique email ID and other required details.

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Enter valid email and password	NA		
2	Click sign in	System confirms successful registration	Pass	

Post-conditions

User is registered in the database

Test Case #: 3

Test Case Name: Search for healthcare provider

System:

Subsystem:

Designed by: Udhav Bansal

Design Date: 16/11/2024

Executed by: Udhav bansal

Execution Date: 16/11/2024

Short Description: Search for healthcare provider

Pre-conditions

User must be logged in, and doctors must have set availability in the system.

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Enter search criteria like specialization, location, or availability.	NA		
2	Click on proceed	System displays a list of doctors matching the criteria.	Pass	

Post-conditions

Search results are displayed, ready for user selection.

Test Case #: 4

Test Case Name: Book Appointment

System:

Subsystem:

Designed by: Udhav Bansal

Design Date: 16/11/2024

Executed by: Tanishq Goyal

Execution Date: 16/11/2024

Short Description: Booking appointment with doctor

Pre-conditions

User must be logged in, and doctors must have set availability in the system.

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Select a doctor	NA		
2	Choose a time slot	NA		
3	Confirm booking	Appointment is successfully booked, and notifications are sent to both patient and doctor.	Pass	

Post-conditions

Appointment is stored in the system, and the availability is updated.

Test Case #: 5

Test Case Name: Manage Appointments

System:

Subsystem:

Designed by: Anirudh Garg

Design Date: 16/11/2024

Executed by: Udhav Bansal

Execution Date: 17/11/2024

Short Description: Reschedule or cancel appointment

Pre-conditions

User must have one or more booked appointments.

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Select an appointment to reschedule or cancel	NA		
2	Reschedule Appointment	New time slot is confirmed and updated.	Pass	
3	Cancel Appointment	Appointment is removed, and notifications are sent.	Pass	

Post-conditions

System reflects updated or removed appointment.

Test Case #: 6

Test Case Name: Virtual Consultation

System:

Subsystem:

Designed by: Akul Kalia

Design Date: 15/11/2024

Executed by: Tanishq Goyal

Execution Date: 16//11/204

Short Description: Test case ensures that a virtual consultation between a patient and a doctor is conducted smoothly

Pre-conditions

A virtual appointment is scheduled, and both patient and doctor are logged in.

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Patient initiates the consultation	N/A		
2	Doctor joins	Secure video call is initiated. Notes and recommendations can be shared	Pass	

Post-conditions

1. Consultation is completed, and records are updated.

Test Case #: 7

Test Case Name: Payment Processing*

System:

Subsystem:

Designed by: Udhav
Bansal

Design Date: 15/11/2004

Executed by: Akul Kalia

Execution Date: 16/11/2024

Short Description: Ensures smooth payment, updates status, and stores billing records post-appointment.

Pre-conditions

User has a booked appointment requiring payment

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Select payment method	N/A		
2	Proceed to pay	Payment is processed successfully, and receipt is generated	Pass	

Post-conditions

1. Payment status is updated, and records are stored in the billing system.

Test Case #: 8

Test Case Name: Access Medical Records

System:

Subsystem:

Designed by: Tanishq

Design Date: 15/11/2024

Goyal

Execution Date: 16//11/204

Executed by: Udhav

Short Description: Ensures secure retrieval and display of patient records without modification permissions.

Pre-conditions

Patient has previous consultations or uploaded records.

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Navigate to "Medical Records" section	N/A		
2	View document	Records are retrieved and displayed securely.	Pass	

Post-conditions

User has access to their records without any modification permissions.

Test Case #: 9

Test Case Name: Doctor Availability Management

System:

Subsystem:

Designed by: Akul Kalia

Design Date: 15/11/2024

Executed by: Anirudh

Execution Date: 16//11/204

Garg

Short Description: Ensures doctors can update their availability, adjusting patient booking slots accordingly

Pre-conditions

Doctor must be logged in.

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Update availability settings for specific dates or times.	System confirms the update and adjusts available slots for patients.	Pass	

Post-conditions

New availability is reflected in patient booking options.

Test Case #: 10

Test Case Name: System Scalability Test

System:

Subsystem:

Designed by: Akul Kalia

Design Date: 15/11/2024

Executed by: Akul Kalia

Execution Date: 16/11/204

Short Description: Ensures system performance and reliability under high user load with various operations.

Pre-conditions

Simulate multiple users accessing the system simultaneously.

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Perform various operations (login, booking, payments, etc.) under high load.	System maintains performance without downtime or errors	Pass	

Post-conditions

1. System successfully handles concurrent transactions, ensuring reliability