Continuous Health Monitoring System

Software Project-1

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Declaration

We declare that this project is our original work and has not been submitted in any form for another degree or diploma at any university or other institute of tertiary education.

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Approval

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CHAPTER 1: PROJECT INITIATION

Continuous Health Monitoring System is a system by which a patient can be monitored properly by his/her doctor without face to face interaction. This system aims to reduce the delay of getting treatment for a patient so that a patient can get his/her any kind of necessary treatment in the proper time.
The purpose of the project is to develop a proper system which will be used as a web-based application later.

Objective Of Project:

Our objective is to make a platform independent application to maintain a database of all the patients from various doctors and all the different services required by each of them. Established Continuous Health Monitoring practices should provide the needed connectivity and accountability between those two units, and when managed properly, enhances the effectiveness of both operations.

1. To get treatment rapidly
2. To get treatment who has less knowledge
3. To make it convenient for people who have limited time
4. Cost reduction
5. Reduced hassle
6. Computerized take and give treatment system

Scopes:

1. Partially automated online treatment
2. Can do self monitor using personal android phones.
3. Automatically informed to the hospital if face an accident
4. Facility to create a daily report, contact with doctor and take suggestions
5. Single and individual Admin Panel and login
6. The diversity provides a wide range of choice concerning different objectives.
7. Helps to keep track of fitness

Chapter 2: Overall Description

Perspective:

Present problems of our country

Delay in getting treatment:
The experience of any kind of accident as in road accidents most of the time victims die of over blood flow. In this situation the victim needs rapid treatment for controlling the blood flow.

Communication:
The communication through a cellphone between a doctor and a patient is not efficient to get proper treatment because many of times a busy doctor can not attend the phone calls. Also a patient does not always stay in the stage of verbal communication. Lack of proper communication reduces the chance of getting proper treatment.

Long queue before getting check-up:
In our medical system the way of getting a check-up from a doctor is too problematic. In daily check-up the doctors maintain a list of patients so that a patient has to wait a long time to meet a doctor.

Ignorance of symptoms:
Today's basic problem is most of the patients ignore some dangerous symptoms of his/her body. They do not give attention until the problems get worse. Also the reason for ignorance is the lack of knowledge about the symptoms.

Quality attributes:

Time: The elapsed time between the doctor and patient interaction in a hospital should be as minimum as possible.

User-friendly: Our system should be user friendly. The user interface should be kept simple and uncluttered. Since different type of patients will interact with this process so our project should be very easy for them to understand.

Flexibility: Our project should be so flexible that whenever we want to make changes in it very easily it can be done.

Operating Environment:

Environmental Requirements means all Laws and requirements relating to human, health, safety or protection of the environment or to emissions, discharges, releases or threatened releases of pollutants, contaminants, or Hazardous Materials in the environment.

Hardware requirements for this application needs a Pentium processor with 256 MB RAM and with 16 bit operating system. This application will run on common browsers. As this is a web application so any kind of operating environment can run this which has internet access and a web browser. It also works after android 4 and IOS 6.

Hardware

Minimum requirements for server:

- Ø Processor: Xeon based microprocessor.
- Ø RAM: 16 GB.
- Ø System Type: Linux (64 bit).
- Ø Storage: 256 GB SSD.
- Ø For Storage Service: Network File System (NFS)

Minimum requirements for Account Users (Doctor/Patient/Admin):

- Ø Processor: Dual-core.
- Ø RAM: 512 MB.
- Ø System: Windows, MAC OS X, Linux.
- Ø Web Browser: Firefox, Google Chrome, Opera

Software

- Ø Notepad++ / Sublime Text.
- Ø PHP, MySQL.
- Ø Apache

Design Implementation and Constraints

Initially this one is only for Desktop browser platforms. After successfully releasing we go for android and IOS platform. This web application handles 5 types of users so we have to cope-up with a huge number of users' requests and responses. This web application has several features that must be well designed.

CHAPTER 3: REQUIREMENT SPECIFICATION

System Feature

Description of Features

HEALTHCARE ENABLING METHODS

A variety of impressive technologies can support different applications of IoT healthcare. Applying IoT integrated with other incredible technologies is our best choice to develop the efficiency and security of our healthcare. There exist diverse, enabling technologies into IoT healthcare-based solutions that are explicitly difficult to list. Accordingly, technologies that are more appropriate and effective in medical services are shortly discussed here.

A. Radio Frequency Identification (RFID)

The Radio Frequency Identification (RFID) is used to read, capture information stored on a tag attached to an object, and present like a unique identifier. It supports data transmission via short-distance radio signals [14] and can identify an object that attached RFID tag by proper signals [15]. The RFID's microchip is placed on a tag, and it communicates over a wireless connection by using different frequency bands. Transponder-reader applies radio frequency signals to collect data from the tag, values, and data encrypted tag to its location [16]. RFID is already used widely in the medical sector of developed countries for inventory management, tracking devices or patients, sterilization tracking and equipment maintenance, increasing efficiency and reducing errors. By embedding RFID in medical devices and empowering those by IoT, a lot of challenges can be solved smartly.

B. Wireless Sensor Network (WSN)

The self-configured Wireless Sensor Network (WSN) can be used for remote sensing and target tracking. WSN consists of several combinations of sensors that can interact among themselves, applying radio signals to self-organize an ap- propriate network infrastructure to report sensitive results. It can provide sensing samples to review and monitor and also can respond to queries to perform specific instructions [17], [18]. WSN has an extensive use in healthcare to monitor physical and environmental conditions. Combining IoT with WSN technology can bring revolution in real time health monitoring, at home healthcare and telemedicine approach. Figure 2 shows a WSN infrastructure utilized in healthcare.

Cloud computing denotes storing, accessing and processing information and programs via the internet as a substitute of our device's memory. The information and data are actually stored in a physical server, always accessible through the internet and controlled by the cloud computing provider. In IoT based healthcare systems, a continuous and uninterrupted

storing and processing a huge number of real time data is required. Therefore, cloud computing is a must component for IoT healthcare to succeed.

C. Big Data Analysis

Big data analysis refers to a field that treats ways to analyze and systematically extract information, trends and patterns especially related to human behaviors. It performs a vital role in the revolutionary advancement of various technologies, including social media expansion, wireless communication technology, and cloud computing. Use of IoT healthcare de- vices, particularly those which collect real time data, continues to flow into Big Data Analysis. In the medical sector, the too large or complex dataset provided by sensors or other devices in the healthcare environment requires big data analysis to enhance the performance of related diagnosis and health monitoring methods [19].

D. Ambient Intelligence (AmI)

Ambient Intelligence is nothing but total human centric artificial intelligence. Devices and systems in the medical sector need to be driven by human concern (Human-Computer Interaction), not technically determined at once. AmI is a novel paradigm of information technology, where people control themselves through a digital environment that adapts and responds to their presence, keen sensitivity, needs, habits, gestures, and emotions. It has prominent applications in IoT healthcare because of its end-users, clients, people, and cus- tomers involved in this network [19].

E. Augmented Reality

Augmented Reality adds digital image or data with real world objects to develop an enhanced version of the real physical world. A computer-generated image, video or 3d model is overlaid on a user’s real-world view with the help of this technology. AR has brought significant improvements in the healthcare industry as there are various applications that include vein visualization, surgical visualization, operating equipment and in medical training. The technology is further improving day by day to make an even more meaningful impact, to enhance existing processes, to support during treat- ment and to improve employee training [20]. Integrating AR with IoT will unlock more efficient healthcare solutions in the years to come.

F. Cloud Computing

Cloud computing denotes storing, accessing and processing information and programs via the internet as a substitute of our devices' memory. The information and data are actually stored in a physical server, always accessible through the internet and controlled by the cloud computing provider. In IoT based healthcare systems, a continuous and uninterrupted storing and process of a huge number of real time data is required. Therefore, cloud computing is a must component for

G. Grid Computing

Grid computing stands for a set of interconnected computers that perform a dedicated task together, working as a virtual supercomputer with an elevated processing power, memory and

storage. It is utilized to solve larger and more complex problems in a shorter time, to collaborate easily with other organizations and to make better use of the existing hard- ware's. Grid computing is emerging as a promising solution to many healthcare challenges, empowering several biomedical disciplines. It has enabled multiple tools of epidemiological and biomedical applications, bioinformatics research and con- tinuous monitoring of electronic health records. Combining IoT with grid computing technology will not only amplify the effectiveness and quality of treatment but also will reduce the cost of healthcare.

H. Edge Computing

Edge Computing refers to a distributed computer network architecture that brings computational power and data storage closer to the consumer to increase performance and speed. It enables the deployment of computational and storage re- sources within Radio Access Network (RAN) and delivers the content to end-users. The integrated Resource Preservation Net (RPN) with custom routing is compatible for emergency departments and intensive care units of healthcare . Edge computing is the best solution for medical devices and sensors that require instantaneous analysis of data and application of commands and closed-loop systems that maintain physi- ological homeostasis . Edge computing is a must for IoT healthcare devices to generate and process data quickly and powerfully.

I. Fog Computing

Fog computing indicates a network architecture where edge devices process data collected from a source and links to cloud servers. It is an ideal computing system for IoT devices and other applications that require real time interaction to enhance processing speed and data security. IoT healthcare devices for real time analytics, verification and evaluation of sensitive health data requires a fog network to enable local processing, remote storage, accurate analysis and secured retrieval of data with a low response time avoiding delays. It is the standard suited technology of IoT health monitoring systems that require some specific features. It assisted the IoT healthcare system to counteract countless difficulties like reliability, energy awareness, scalability, and mobility in the years to come.

Functional Requirements:

Admin:

1. Admin will be able to assign doctor
2. Admin will be able to update database
3. Admin will be able to do incident report
4. Admin will be able to inform emergency services
5. Admin will be able to inform nurses
6. Admin will be able to handle emergency cases
7. Admin will be able to handle surgery cases
8. Admin will be able to. Generate report
9. Admin will be able to produce record
10. Admin will be able to inform patient
11. Admin will be able to delete patient ID
12. Admin will be able to handle patient mandatory information
13. Admin will be able to update patient information

System:

1. System will be able to generate patient id.
2. System will be able to generate doctor id
3. System will be able store user authentication
4. System will be able to send data to doctor
5. System will be able to send data to patient

Doctors:

1. Doctors will be able to sign up
2. Doctors will be able to sign in
3. Doctors will be able to confirm appointment
4. Doctors will be able to generate report
5. Doctors will be able to check database
6. Doctors will be able to give prescriptions

Patients:

1. Patients will be able to get rapid and continuous measurements
2. Patients will be able to proper communication
3. Patients will be able to Proper treatment
4. Patients will be able to get service without delay
5. Patients will be able to get high specificity

6. Patients will be able to monitor health problems

Non-Functional Requirements

We have four main sections:

- Security
- Performance
- Maintainability and
- Reliability

a. Security:

● Patient Identification: The system needs the patient to recognize herself or himself using the phone.
● Logon ID: The system need to hold a Logon ID and password.
● Modifications: Any modifications database can be synchronized quickly.
● Front Desk Staff Rights: Any data can be shared with from sensor
● Administrator rights: The administrator can view as well as alter any information.

b. Execution:

● Response Time: The system provides acknowledgment in just one second once the 'patient's information is checked.

● Capacity: The sensor database system needs to support at least 1000 people at once.
● User-Interface: The user interface will start working within five seconds.
● User-Interface: The user interface will start working within five seconds.

c. Maintainability:

● Back-Up: The sensor offers the efficiency for data back via gsm network.
● Errors: The system will track every mistake as well as keep a log of it.

d. Reliability:

● Availability: The sensor system is available all the time.

User Stories

User is someone who interacts with the system. There are 3 types of users who will use the system. Patient, Doctor and Admin are the 3 types of user. One by one for each type of user all the user stories are describing below.

CHAPTER 4: QUALITY ATTRIBUTES

Usability

Time: The elapsed time between the doctor and patient interaction in a hospital should be as minimum as possible.

User-friendly: Our system should be user friendly. The user interface should be kept simple and uncluttered. Since different types of patients will interact with this process so our project should be very easy for them to understand.

Flexibility: Our project should be so flexible that whenever we want to make changes in it very easily it can be done.

Performance

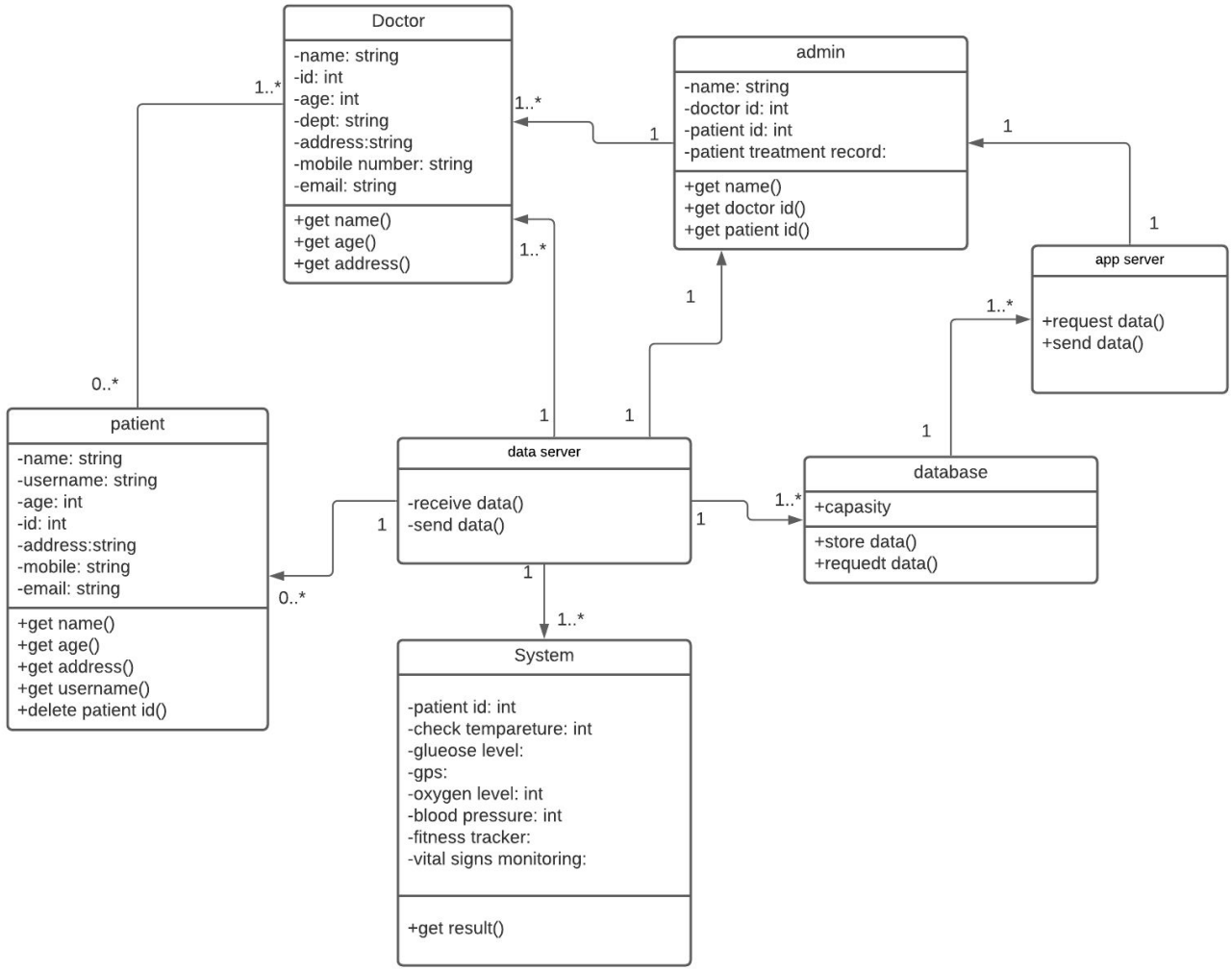
- Response Time: The system provides acknowledgment in just one second once the 'patient's information is checked.

- Capacity: The sensor database system needs to support at least 1000 people at once.
- User-Interface: The user interface will start working within five seconds.
- User-Interface: The user interface will start working within five seconds.

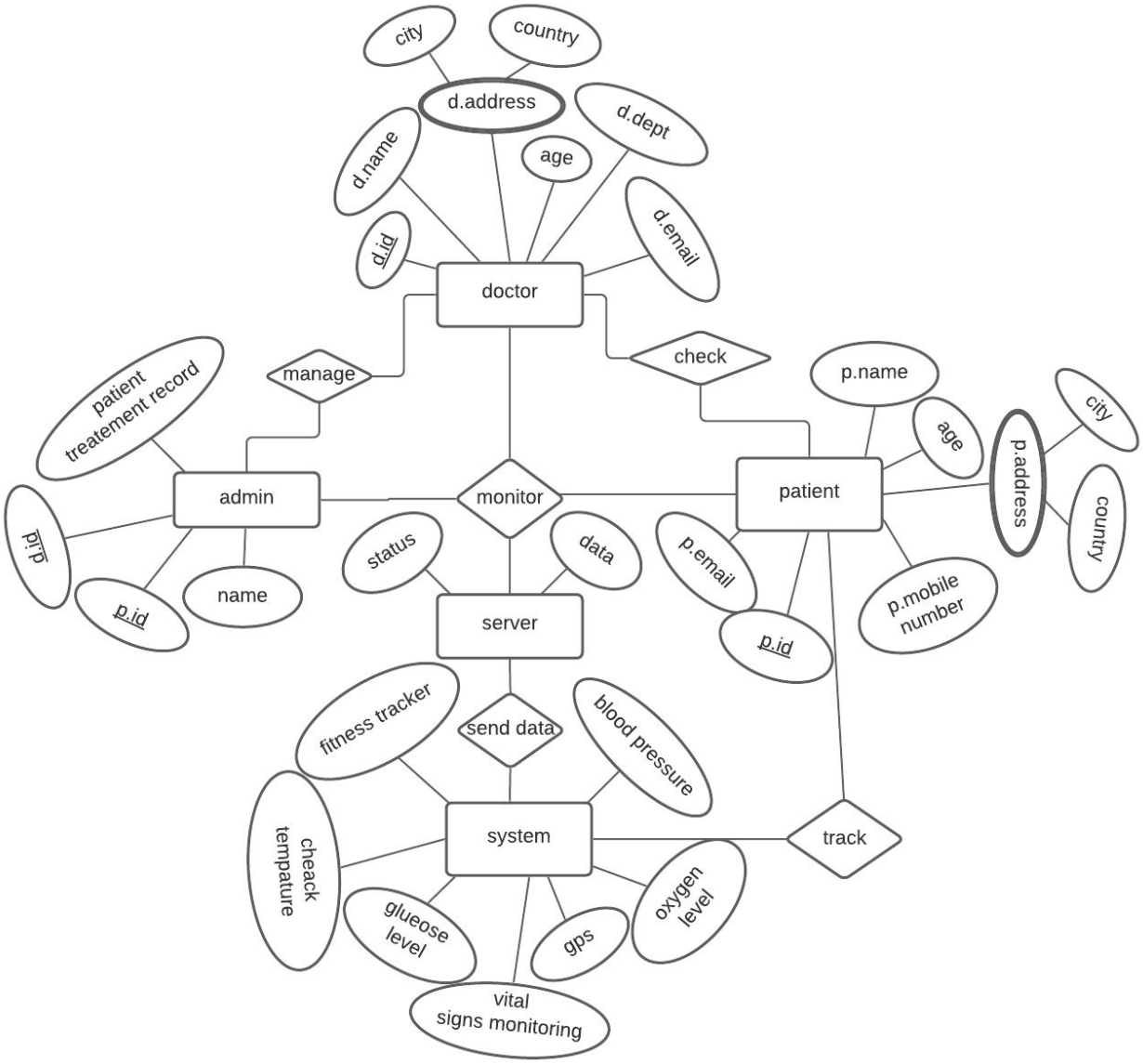
CHAPTER 5: DATA REQUIREMENTS SPECIFICATION

Logical data model-UML diagrams:

Class Diagram:



E-R Diagram:


city
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monitor
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data
p.email
p.id
p.mobile number
server
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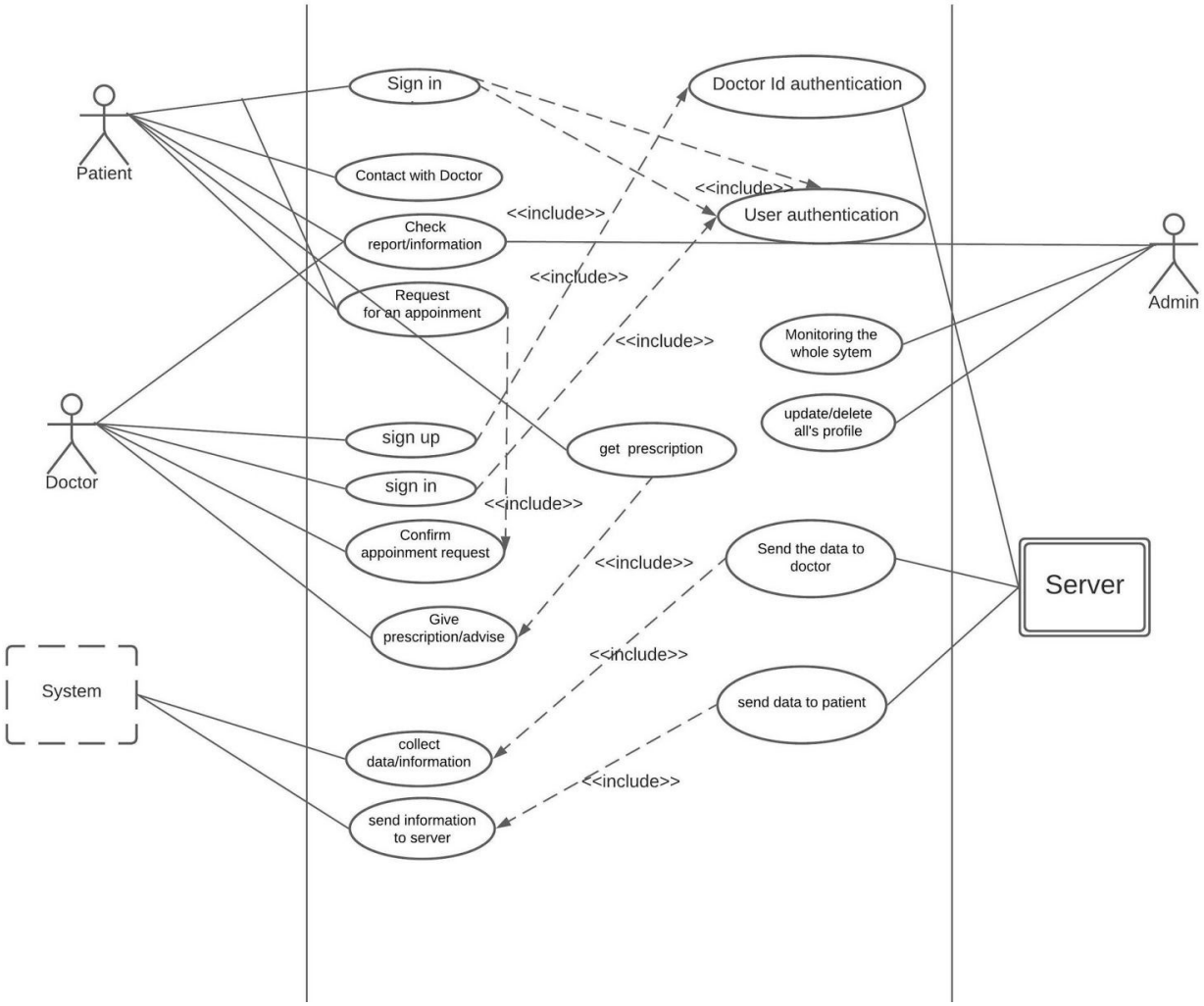
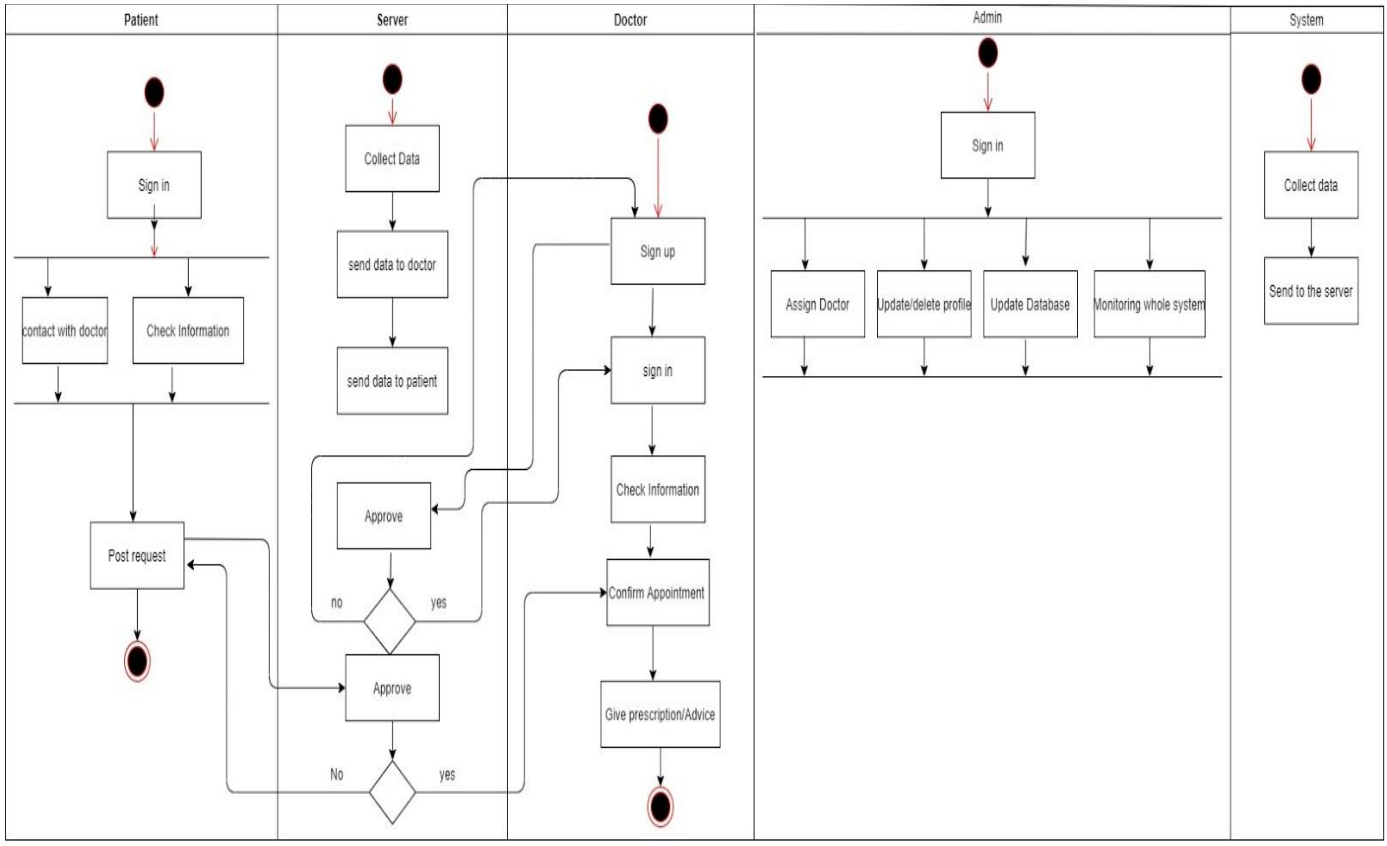
system
track
glueose level
gps
oxygen level
vital signs monitoring

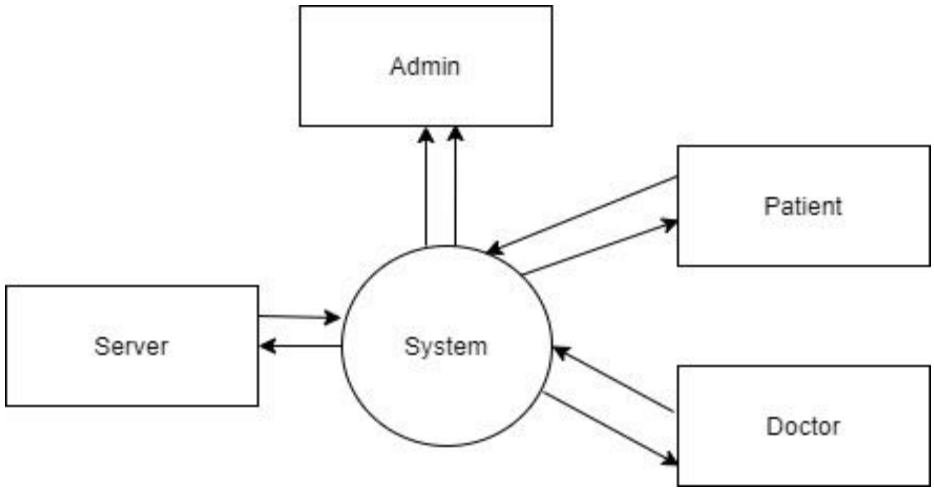
Use Case Diagram:



Activity Diagram:



Ecosystem Diagram:



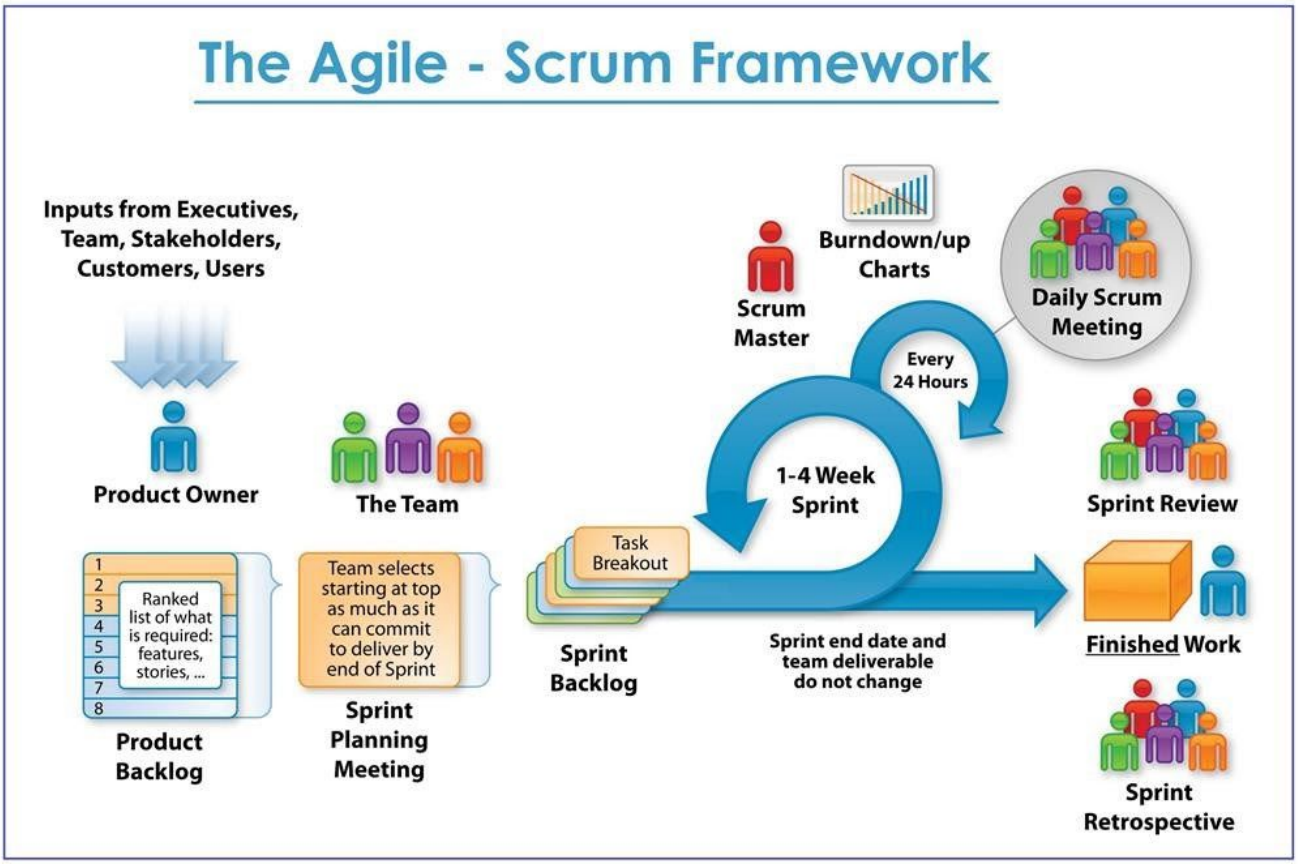
CHAPTER 6: SDLC and TESTING

Process Model

An appropriate model for the development of our website was the Scrum model which is one of the agile models.

Why Choose This Model

The Scrum framework is simple. This model is fully transparent for the development team. It contains smaller iterations, daily scrum meetings and sprint reviews. Scrum is comparatively easy to implement and focuses on quick and frequent deliveries. Scrum is a lightweight agile development process framework. Nowadays it is one of the widely used development frameworks, which is a subset of agile. Scrum process Framework needs a development cycle (sprint) to develop projects. These frameworks divide the work as small as possible so that it helps to maximize the productivity. It is commonly used to manage Complex software and product development. Scrum uses an iterative and incremental process. These processes increased productivity and reduced time then the classic "waterfall" process. Rapidly changing requirements can smartly adjust by these framework



Testing

Controlling and monitoring Process of Monitoring and control process views are the whole task within scope and schedule. Also, under the budget so the process precedes with minimal risks. Throughout the project Monitoring and Controlling process is executed. These are some items that must be considered,

- Each day Status Meeting will be held.
- Every week the task will be checked whether they meet the satisfaction level or not.
- The internal and external reports to be generated by separate specific departments and shows the progress report in the next Status Meeting.
- In weekly meetings Stakeholders should be present. So, they can review the current process.
- The risk checklist that will be used to identify, analyze, prioritize, monitor and mitigate risks.

Programming testing is characterized as an action to check whether the real outcomes coordinate the normal outcomes and to guarantee that the product framework is sans deformity. During this phase web results are too important. Cause this is a web-based application. Check Each and every page working fast and smooth and every option is working or not. This phase helps the project completeness with every angle. There are several steps to finish the testing phase.

Functionality Testing

Functionality testing is black box testing. In this testing all the functions are checked that they are working or not. After the tester this testing can be done by the end user.

Usability Testing

The Usability test is like a user-friendly test. How easily users use this web app. So, people like you or a small group of people who will test the web app.

Interface Testing

In interface testing there will be 2 things will be tested- Web Application and Cloud Server

- Web Application: Test the web application and check all the operation and sending data with checking output result. If there are any errors, we will find out easily.
- Cloud Server: When CRUD operation is done check the cloud server working or not. If not, then the cloud server should be fixed.

Security Testing

Security testing is one of the major tests. Check all the logout and login functions working well using cookies and sessions. Thus, data will be checked both server and client site. User and Contractor are never allowed to login as admin so make sure that thing or all data can be violated.

CHAPTER 7: REFERENCES

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