



## **HIGH-LEVEL DESIGN DOCUMENT (HLD)**

### ***Medical Record System using Blockchain***



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## Abstract

Medical record keeping has always been surrounded by a lot of challenges specifically in the domain of data privacy and security. These pain points can be addressed by using blockchain technology. A record-keeping platform can be created which stores important data of patients like Name, Age, Gender, Blood Group, and Medical History. This data can be accessed by doctors and medical professionals as and when required only by using a private key.

The idea is to create a website that will store all data and use blockchain technology at the backend to ensure data security and privacy. It will also ensure that the data can be accessed from anywhere.

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# 1 Introduction

## 1.1 Why this High-Level Document?

The purpose of this high-level document is to add the necessary details to the current project description to represent a suitable model for coding. This document is also intended to help detect contradictions prior to coding, and can be used as a reference manual for how the modules interact at a high-level.

The HLD will

- Present all of the design aspects and define them in detail.
- Describe the user interface being implemented. Describe the hardware and software interfaces.
- Describe the performance requirements.
- Include design features and the architecture of the project.
- List and describe the non-functional attributes like:
  - Security
  - Reliability
  - Maintainability
  - Portability
  - Reusability
  - Application Compatibility
  - Resource Utilization
  - Serviceability

## 1.2 Scope

The HLD documentation presents a structure of system, such as the database architecture, application architecture, application flow, and technology architecture. The HLD uses non-technical two mildly technical terms which should be understandable to the administrators of the system.

# 2. General Description

## 2.1 Product Prescriptive

Healthcare systems in all countries and regions are fighting the problem of data siloes, which means that patients and their healthcare providers have an incomplete view of medical histories.

## 2.2 Problem Statement

The present system of medical records doesn't give the exact medical history of the patient and it is also not decentralized if a patient needs to obtain the records when required in some other hospital or emergency situation. Besides, patients our product would also cater to information penetrating to the medical staff i.e., doctors.

### 2.3 Proposed Solution

The possible solution to this problem is to create a blockchain-based system of medical records that can be linked to existing electronic medical record software and serve as a comprehensive, one-of-a-kind patient record. It is important to emphasize that the actual patient data does not go to the blockchain, but that each new record inserted in the blockchain, whether a doctor's note, or lab result, is translated into a unique hash function - a thin string of letters and numbers. Every hash function is different, and can only be understood if the person who owns the data - in this case, the patient - gives their consent.

In this case, whenever there is an amendment to the patient's record, and whenever the patient agrees to share part of his or her medical record, it is logged on to the blockchain as a service.

### 2.4 Further Improvements

Beyond creating Blockchain for medical records, the same product can also be extended for the consultations and where the patients can also voluntarily opt to sold their data for medical development.

The emergence of more complete, digitized and shared patient health records will have a significant impact on the health care market by promoting more advanced analysis. For example, personal medicine is a promising field, but its development is severely hampered by a lack of adequate high-quality data. Access to reliable and comprehensive demographic data will enable more robust separation and analysis of targeted drug effects

### 2.5 Technical Requirements

This document requires a bar code scanner which should be able to scan the barcode to access the medical records required by the medical staff and paramedics which is updated and stored as the data move along different doctors and medical staff.

The barcode will be able to store all the required data of patients that needs to be tracked throughout the patient admission and discharge process.

### 2.6 Data Requirements

The electronic medical record software uses the data about the patients and their medical history being stored in the database and accessed by the various medical staff including doctors and healthcare practioners. The various other data requiremets are Name, Age,

Gender, Blood Group, and Medical History showing the full detailed patient history and the past treatment records and various medicine intake of the patient

## 2.7 Programming Used

Python programming is used with Hashlib module using visual studio IDE to implement a common interface to message digest algorithm and different secure hash. SHA 256 cryptographic algorithm is used in this project to add blocks in blockchain for the medical record software project.

## 2.8 Constraints

Link the database which stores all medical record details into this code which is required for the project to be used in real-time, we have implemented the data along with code without connecting to the source database.

### 3. Design Details

#### 3.1 Process Flow

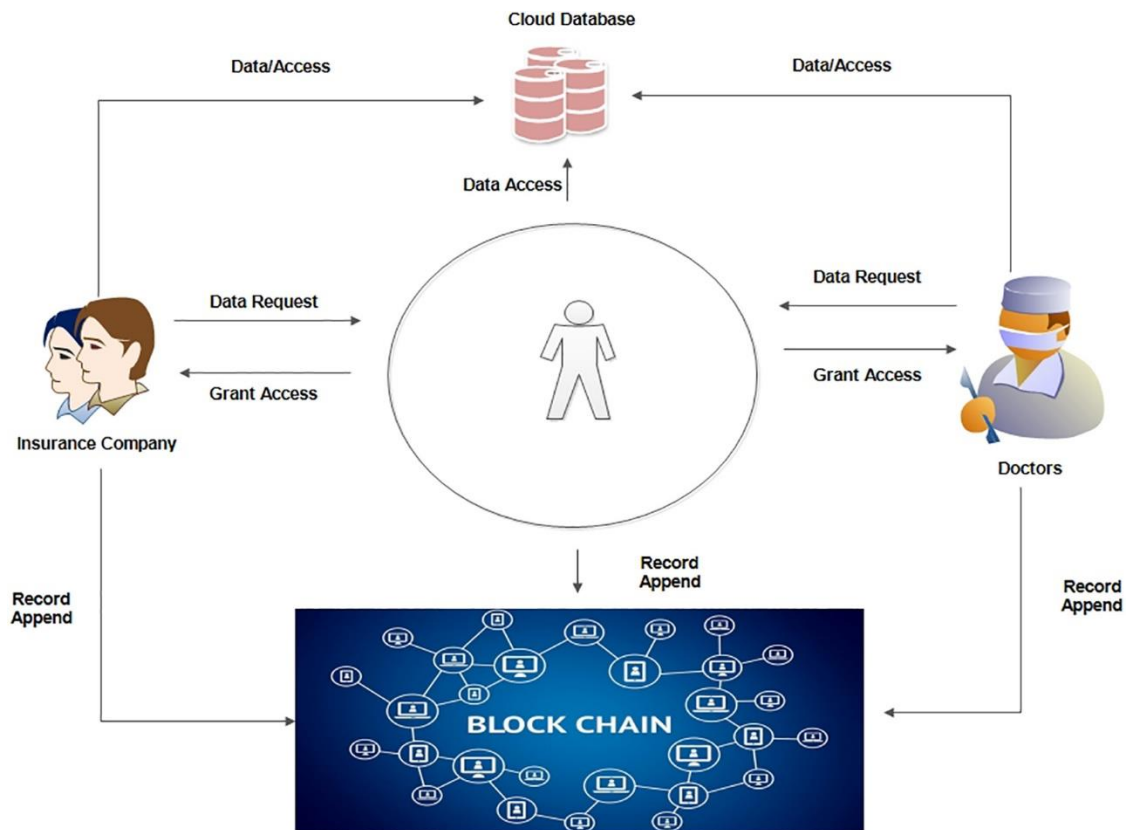


Fig 3.1.1 : Depiction of process flow diagram for healthcare records

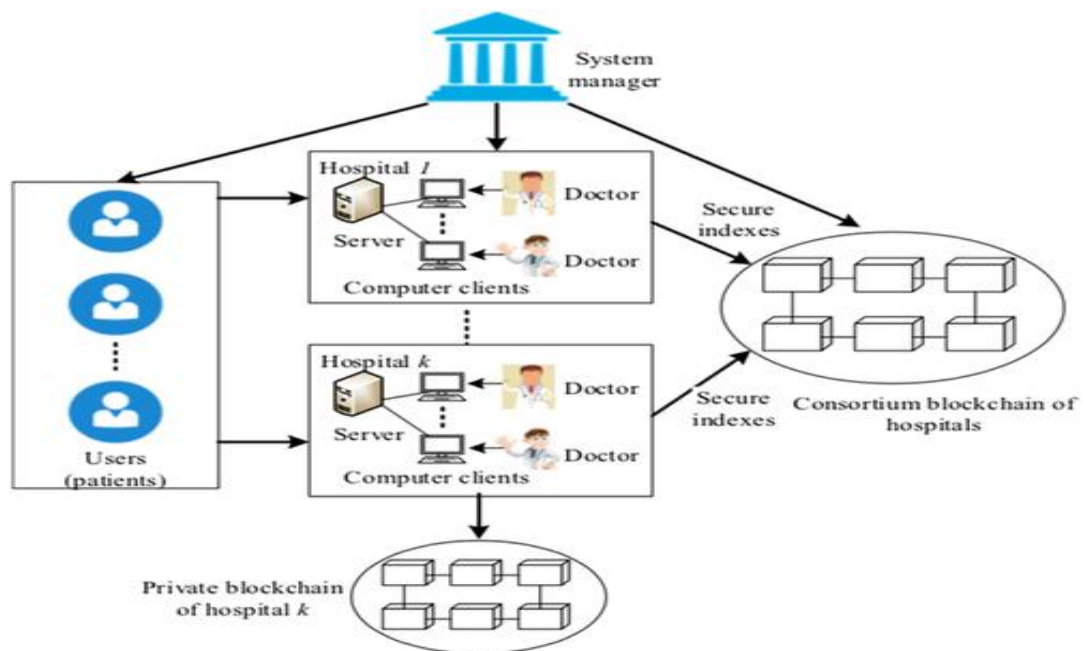


Fig 3.1.2: Depiction of healthcare database management system

### 3.2 Event Log

The medical data of the patients is captured in the database through this blockchain. So, whenever any information is required by the medical staff the following details will be displayed:

- Patient ID
- Patient Name
- Age
- Gender
- Address
- Blood Group
- Phone Number
- Email ID

### 3.3 Error Handling

It is difficult to make modifications or replace the patient's medical data after it has been entered. However, to deal with human or type-in mistakes, a new record can be created with a detailed description of the modification.

Notifications and alerts can be used to address maintenance concerns when a specific data point has to be amended or updated. With the aid of a medical record database, healthcare personnel may retrieve or retain all relevant information about a patient. It also keeps track of each patient's information and may tell you when they last saw or spoke with a doctor. It shows the last time a record was saved or modified.

### 3.4 Performance

**Consensus protocol or algorithm** - The consensus protocol or algorithm is the process or procedure by which a transaction is propagated, vetted, and concluded in a blockchain network. This consensus process is also responsible for striking a delicate balance between a blockchain network's degree of decentralization, scalability, and security. As a result, the consensus mechanism used has a direct impact on the performance of the blockchain network.

**Latency in the network** - This is the most critical aspect determining the network's overall performance in a distributed design. When a transaction has to be validated, it must be broadcast to all nodes and the responses gathered for majority-based consensus. As a result, having dedicated network bandwidth can help reduce network latency and increase total throughput.

**Node Infrastructure** – Blockchain nodes are made up of a runtime engine and a database that is housed on a server.

### 3.5 Reusability



The project's code and components may be reused, and with proper tweaks, we can scale it to meet new requirements as well. The code may be scaled up much more by including real-time data in the system.

### 3.6 Application Compatibility

Python is utilized as a communication bridge between all of the project's components. Each component has its own task to accomplish, and the Python code is in charge of ensuring that data flows smoothly.

## 4 Dashboard

We will also be displaying the charts about the patient past medical records, which will be useful to detect or study the healthcare data of the patients by the doctors and even the medical students to mitigate the risk of the disease

## 5 Conclusion

The use of blockchain technology in medical records has a lot of potential, especially in these five areas: transparency, traceability, trust, sustainability, and cost-effectiveness. Because each transaction on the blockchain is saved as a hash code that identifies which parties were engaged, transaction details, and the date, every member of the healthcare team can track all data from anywhere in the application. Blockchain has become a trustworthy technology because of its distributed nature, allowing network users to perform transactions with great confidence based on the information given.

The model we created will aid in not just keeping track of a patient's medical history, but also in detecting fraudulent sources. Mishandling of sensitive patient data can also be avoided since, thanks to the tracker, the traceability of health data is increasing at each level. The medical tracker using blockchain technology can reduce transaction and enforcement costs of data storage in the health care domain by establishing smart storage and secure databases, making it easier to comply with self-enforcing contractual obligations without the need for an existing trusted the third party.