A Mini Project Report

on

Develop a Blockchain-Based Application for Health- Related Medical Records

by

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Department of Computer Engineering

S.M.E.S. Sanghavi College of Engineering

Date:

CERTIFICATE

This is to certify that, Samir Hasan Shaikh (.) Kalyani Arjun Sansare (.) Lina Pravin Birari (.) of class **T.E Computer**; have successfully completed their mini project work on **"Develop a Blockchain-Based Application for Health- Related Medical Records** at **Institute of Technology,Management & research, Nashik** in the partial fulfillment of the Graduate Degree course in **B.E** at the department of **Computer Engineering** in the academic Year 2022-2023 Semester – I as prescribed by the Savitribai Phule PuneUniversity.

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Project Guide

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Head of Department

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CONTENTS

Abstract

Blockchain is an emerging technology being applied for creating innovative solutions in various sectors, including healthcare. A Blockchain network is used in the healthcare system to preserve and exchange patient data through hospitals, diagnostic laboratories, pharmacy firms, and physicians. The method combines IoMT (Internet of Medical Things) and blockchain to encrypt and save the user's health information. First, multiple smart sensors collect the user's health recording, and then encrypted health data will be stored in the nodes of the Ethereum blockchain, thus protecting the privacy of users The key benefits of the blockchain system are: Faster credentialing for healthcare organisations during the hiring process. An opportunity for medical institutions, insurers, and healthcare providers to monetise their existing credentials data on past and existing staff.

Introduction

Motivation

As a result, the traditional electronic healthcare model lacks transparency because of privacy and data security issues. In resolving the security-related concerns and the severe problem of enormous and highly diverse data in healthcare systems, blockchain technology offers significant prospects. Blockchain is an underlying technology of cryptocurrencies, so by understanding the concepts of Blockchain, you will be able to make smarter investments and tradings. Also, knowing the technology will help you shortlist the best ICOs based on their concepts

Problem Statement

Develop a blockchain-based application for managing and securely sharing health-related medical records. The presented medical record management system is essentially rooted in the Ethereum-based blockchain architecture. The management framework is developed and established based on the relationship among the smart contracts. The proposed architecture is modified from the framework in . The whole system is viewed as a private blockchain network, where all medical records are stored to guarantee data security, privacy and integrity. Innovatively combined with the data exchange mechanism in , the user identity is directly recognized by the system and the corresponding privilege is authorized to ensure data integrity in the blockchain networks

Objectives

Create a decentralized and secure platform for managing medical records.

Ensure the confidentiality, integrity, and availability of patient data.

Facilitate access to medical records from any authorized healthcare provider.

Design a user-friendly and intuitive interface for both healthcare professionals and patients.

Implement stringent privacy controls and data security measures.

Prevent unauthorized access to sensitive medical information.

Theory

The conventional medical record systems face the complicated administration procedure for data processing to ensure patients' privacy, leading to the enormous waste of human resources. Such an architecture is obviously inefficient for the medical record exchange. Blockchain technique has recently been adopted to secure medical data sharing and management. The cryptographic property in the blockchain networks guarantees the patients' privacy. Data integrity and incorruptibility protect medical data from being tampered. The blockchain can be viewed as a distributed database, which stores data in each network nodes to avoid the halting problem. It thus provides higher stability, consistency and attack-resistance. The problem of distributed denial-of-service attacks (DDOS) in the conventional centralized framework can be solved by the blockchain technique. Deployment of blockchain in the medical record system not only provides the reliable service but also speeds up the medical record exchange. Owing to decentralization, the ownership of the medical record is returned to the patients, allowing them to manage the medical record directly and take care of their own health.

Biofeedback is a technique that uses electrical sensors to measure human body functions such as blood pressure and heart rate. Biofeedback aims to help learn your body condition and how it works. You may have biofeedback training in clinics, medical centers and hospitals. These measurements or data about biofeedback are thus important for the future therapy. Such data storage or management is therefore required and may be integrated with the medical record system.

Developing a blockchain-based application for medical records entails the following critical steps:

a. Blockchain Setup:

- Select an appropriate blockchain platform based on the project's requirements.
- Configure and deploy the blockchain network, focusing on security.
- Set up blockchain nodes and ensure proper network security.

b. Smart Contract Development:

- Create smart contracts for managing medical records and access control.
- Define functions for adding, updating, and sharing medical records.
- Implement security measures to protect patient data, ensuring compliance with healthcare privacy regulations.

c. User Interface Development:

- Design a user-friendly and secure front-end for interacting with the blockchain.
- Enable healthcare providers to access and update medical records.
- Ensure that patients can view their own records while maintaining the privacy of their data.

d. Security Measures:

- Implement robust encryption and hashing mechanisms for secure data storage and transmission.
- Use digital signatures to verify the authenticity of medical record transactions.
- Address common security threats, such as data breaches and unauthorized access.

- Deploy a strong authentication system to confirm the identity of healthcare professionals and patients.

e. Testing and Deployment:

- Rigorously test the application, including smart contracts, for correctness, security, and compliance.
- Deploy the application on the selected blockchain network, making it accessible to authorized users.

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Software Requirement Specification

Hardware Requirements

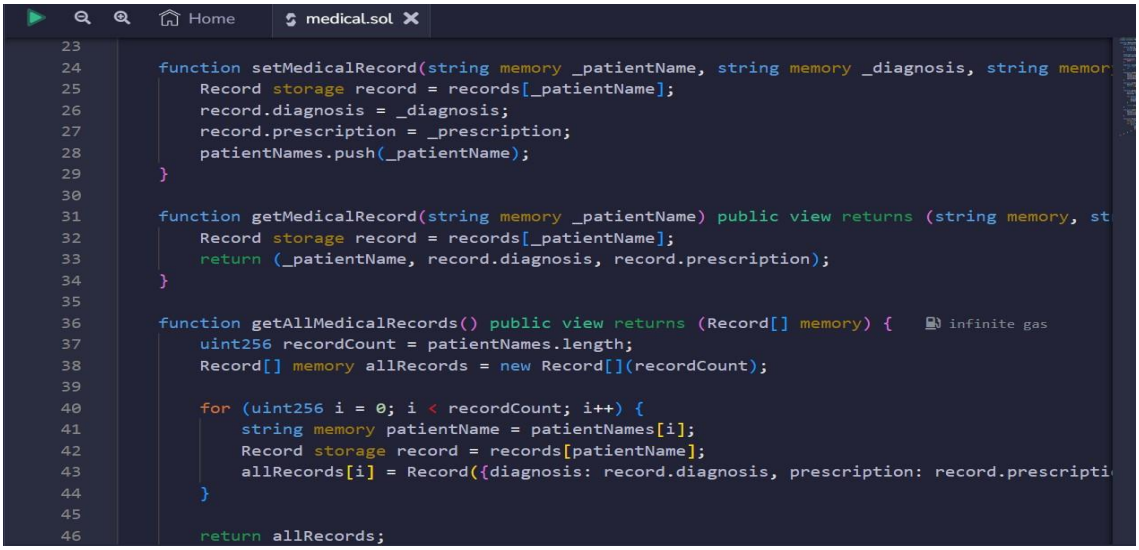
- **64 Bit System**
- **RAM 4GB**
- **Processor i5**
- **Hard Drive**
- **Secure servers or cloud infrastructure for hosting the blockchain network.**
- **End-user devices (computers, smartphones) for healthcare providers and patients.**

Software Requirements

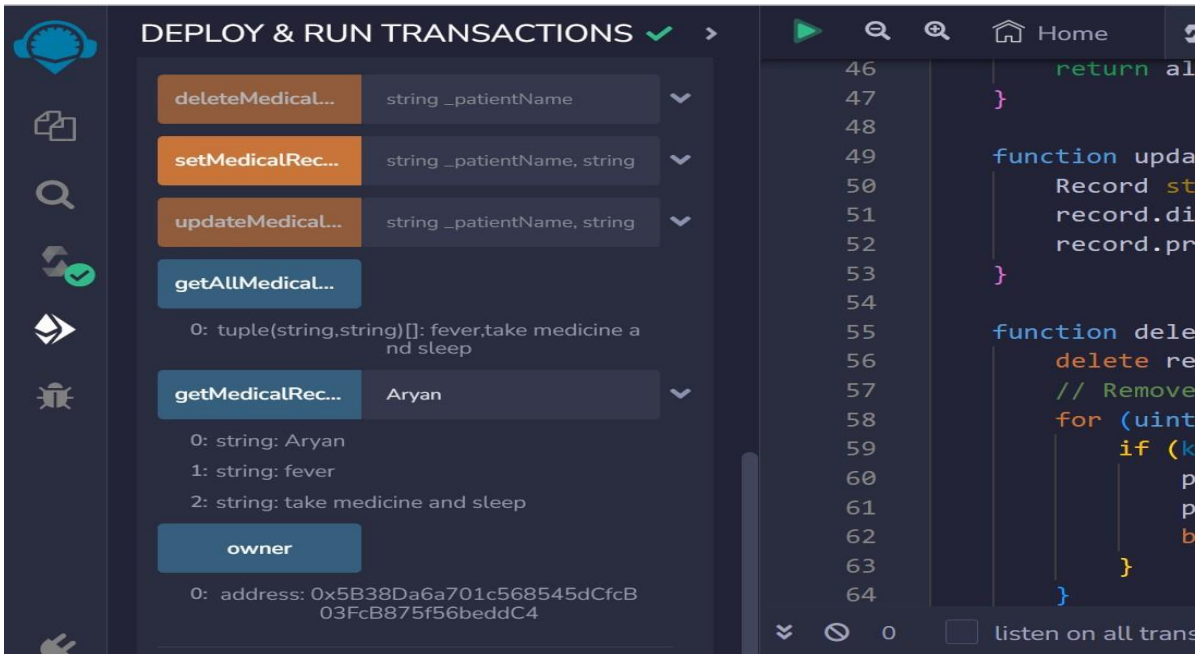
- **A suitable blockchain framework (e.g., Ethereum, Hyperledger Fabric) for the project.**
- **Smart contract development tools (e.g., Solidity for Ethereum).**
- **Web3 libraries for interacting with the blockchain.**
- **Front-end technologies to create a user-friendly interface.**
- **Robust security tools for data protection.**

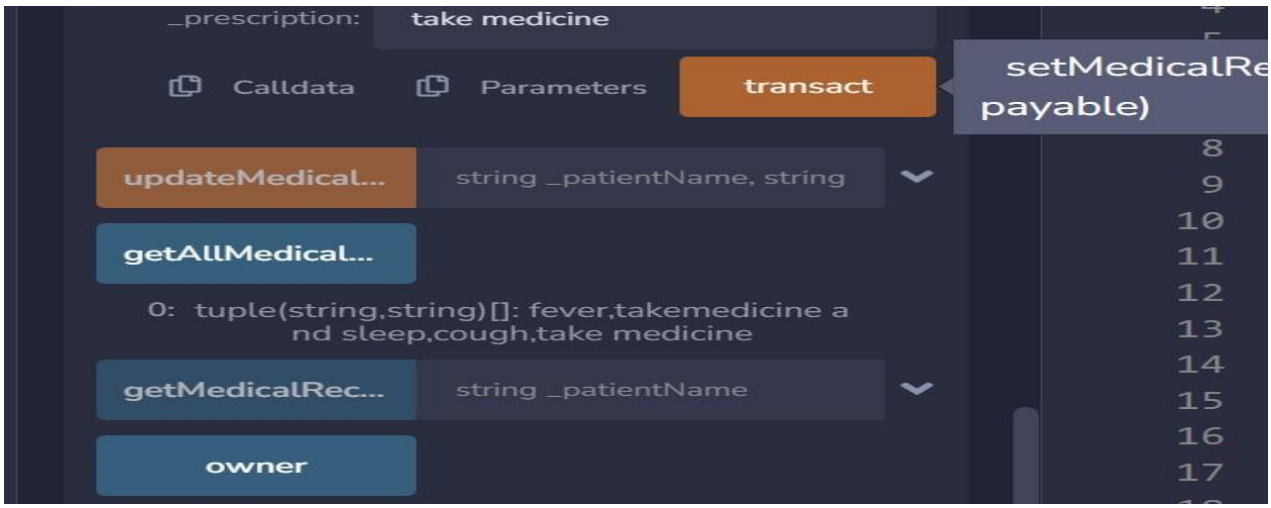
Screenshot


Home
medical.sol
//SPDX-License-Identifier: MIT
pragma solidity ^0.8.0;
contract MedicalRecord {
address public owner;
struct Record {
string diagnosis;
string prescription;
}
mapping(string => Record) records;
string[] patientNames;
constructor() { 1009893 gas 988000 gas
owner = msg.sender;
}
modifier onlyOwner() {
require(msg.sender == owner, "Only the owner can perform this action");
_;
}


Home
medical.sol
function setMedicalRecord(string memory _patientName, string memory _diagnosis, string memor
Record storage record = records[_patientName];
record.diagnosis = _diagnosis;
record.prescription = _prescription;
patientNames.push(_patientName);
}
function getMedicalRecord(string memory _patientName) public view returns (string memory, st
Record storage record = records[_patientName];
return (_patientName, record.diagnosis, record.prescription);
}
function getAllMedicalRecords() public view returns (Record[] memory) { infinite gas
uint256 recordCount = patientNames.length;
Record[] memory allRecords = new Record[](recordCount);
for (uint256 i = 0; i < recordCount; i++) {
string memory patientName = patientNames[i];
Record storage record = records[patientName];
allRecords[i] = Record({diagnosis: record.diagnosis, prescription: record.prescripti
}
return allRecords;


Home
medical.sol
return allRecords;
}
function updateMedicalRecord(string memory _patientName, string memory _diagnosis, string me
Record storage record = records[_patientName];
record.diagnosis = _diagnosis;
record.prescription = _prescription;
}
function deleteMedicalRecord(string memory _patientName) public onlyOwner { infinite gas
delete records[_patientName];
// Remove the patient name from the array
for (uint256 i = 0; i < patientNames.length; i++) {
if (keccak256(abi.encodePacked(patientNames[i])) == keccak256(abi.encodePacked(_pati
patientNames[i] = patientNames[patientNames.length - 1];
patientNames.pop();
break;
}
}
}
}


DEPLOY & RUN TRANSACTIONS
deleteMedical...
string _patientName
setMedicalRec...
string _patientName, string
updateMedical...
string _patientName, string
getAllMedical...
0: tuple(string,string)[]: fever,take medicine a nd sleep
getMedicalRec...
Aryan
0: string: Aryan
1: string: fever
2: string: take medicine and sleep
owner
0: address: 0x5B38Da6a701c568545dCfcB 03FcB875f56beddC4
Home
46 return al
47 }
48
49 function upda
50 Record st
51 record.di
52 record.pr
53 }
54
55 function dele
56 delete re
57 // Remove
58 for (uint
59 if (k
60 p
61 p
62 b
63 }
64 }
0
listen on all trans


_prescription: take medicine
Calldata
Parameters
transact
setMedicalRe
payable)
updateMedical...
string _patientName, string
getAllMedical...
0: tuple(string,string)[]: fever,takemedicine a nd sleep,cough,take medicine
getMedicalRec...
string _patientName
owner
8
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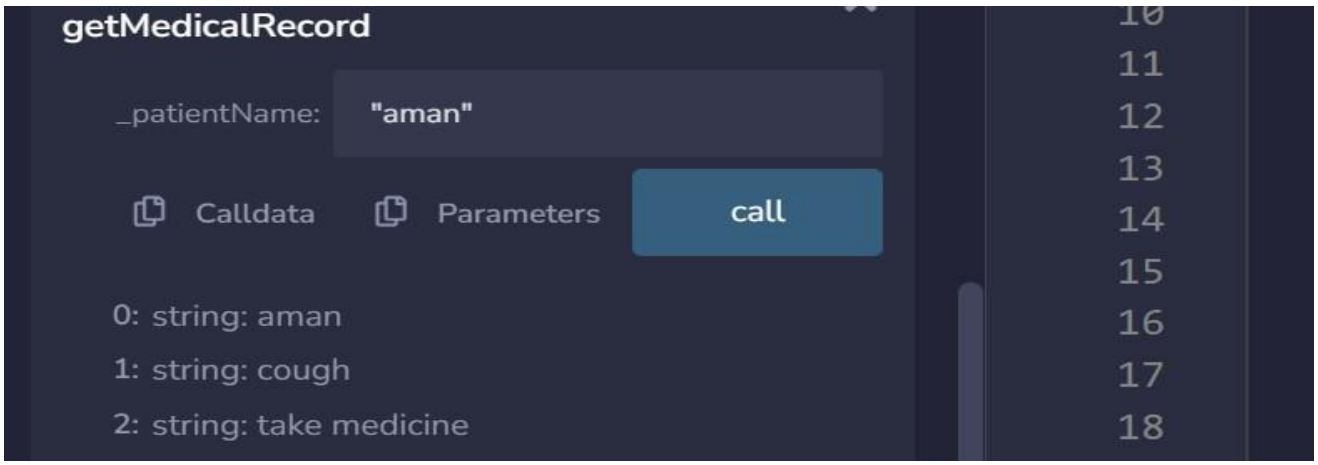
17


getMedicalRecord
_patientName: "aman"
Calldata
Parameters
call
0: string: aman
1: string: cough
2: string: take medicine
10
11
12
13
14
15
16
17
18

Conclusion

Developing a blockchain-based application for health-related medical records offers a promising solution to address issues in traditional medical record management. By harnessing blockchain technology, we can establish a secure, transparent, and accessible platform for managing patient data while ensuring patient privacy and data secure. investigated the blockchain-based and patient-oriented medical record system with the smart contract on EVM. In the future, the drug pedigree may be included into the blockchain. The drug traceability is thus carried out for efficient management and control.

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