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BLOCKCHAIN-DRIVEN FRAMEWORK FOR SECURING ELECTRONIC HEALTH RECORDS

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ABSTRACT:

Academic research indicates an urgent need for safe, tamper-proof storage of sensitive medical information due to the rapid digitalization of healthcare data. Traditional systems are susceptible to both internal and external assaults because of their dependence on centralized servers. SEC-HEALTH implements a system for the secure storage of electronic health records (EHRs) by combining the immutable, distributed ledger technology of blockchain with the InterPlanetary File System (IPFS).This system use Solidity smart contracts to archive patient data and transaction records on the Ethereum blockchain. Comprehensive EHR files are preserved on IPFS and may be accessed via their blockchain hash addresses. The architecture guarantees data integrity, transparency, and safe access independent of trusted third parties.User modules include appointment scheduling, prescription management, patient and physician authentication, and platform registration. The graphics illustrate a fully operational web interface created in Python, implemented smart contracts, and the integration of blockchain with IPFS. The approach is resilient and decentralized, providing an alternative to traditional centralized health data management systems.

Keywords: Blockchain, Electronic Health Records (EHRs), Ethereum, Smart Contracts, Solidity, IPFS, Decentralized Storage, Data Integrity, Medical Data Management.

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I.INTRODUCTION

In the contemporary digital landscape, it is imperative to shift from manual to electronic data management, particularly in sensitive sectors such as healthcare. The integration of data on digital platforms improves efficiency while also raising significant security issues about patient information. Traditional health record systems, dependent on centralized servers, are susceptible to cyberattacks, data tampering by administrators, and unauthorized access.

To tackle these urgent concerns, SEC-HEALTH has suggested a blockchain-based system specifically designed to safeguard EHRs. The intrinsic decentralization, immutability, and security attributes of blockchain technology make it an ideal solution for the reliable and integrity-enhancing handling of healthcare data.

The SEC-HEALTH protocol employs distributed storage to provide data availability and redundancy via the allocation of records among many nodes.

The verification of cryptographic hashes for each block guarantees that the design is resistant to manipulation.

The InterPlanetary File System (IPFS) link facilitates the secure storage of substantial medical data, including electronic health records (EHR), with references preserved on the blockchain.

Smart contracts with Solidity enhance the optimization and governance of access, registration, appointment scheduling, and prescription administration for patients and doctors.

The platform provides a simple interface to enable secure communication between patients and healthcare providers. Transparency and traceability are guaranteed by the logging of each interaction on the blockchain, including sign-up, login, appointment scheduling, and medication administration.

This introduction presents SEC-HEALTH, a robust, decentralized, and secure system for modern electronic health record (EHR) management, highlighting the need of combining blockchain with IPFS in the healthcare sector.

II.RELATED WORK

Disadvantages of Centralized Health Record Systems

Data breaches, administrative meddling, and losses from single points of failure are inherent hazards linked to conventional systems that store Electronic Health Records (EHR) on centralized servers.

Blockchain Technology for Decentralized and Trustless Data Storage

SEC-HEALTH employs Blockchain technology to securely archive patient data in immutable blocks linked by cryptographic hashes. The existence of hash discrepancies facilitates the detection of any dubious alterations.

Integration of Comprehensive File Storage Utilizing IPFS

The technique use the InterPlanetary File System (IPFS) for the storing of extensive medical records, since Blockchain is inadequate for managing large datasets. Storing just the hash address on the Blockchain enables secure and efficient retrieval.

Utilizing Smart Contracts to Enable Secure Financial Transactions

Smart contracts developed in Solidity and executed on Ethereum provide secure and automated procedures for registration, appointment scheduling, and medicine administration.

Concluded Operational Protocol and User Participation

The system's modules enable users to register or log in as physicians or patients, see prescriptions, make appointments, and examine doctors' profiles. Visual representations of the user interface and the implementation process demonstrate its feasibility.

III.EXISTING SYSTEM

The rapid digital revolution of this period has enabled the shift of health data management systems from manual to digital procedures, allowing for the storing of vast amounts of sensitive patient and physician information. Centralized servers often house electronic health records (EHRs) inside these digital platforms. The risks associated with this centralized approach including potential data breaches or manipulation resulting from external assaults or unauthorized access by inside administrators. Despite the prevalent use of encryption, several applications may be incapable of handling the computing demands associated with key generation, management, and secure encryption. Furthermore, stringent encryption hinders data openness and interoperability, limiting access to and transmission of medical information for many stakeholders, including patients, clinicians, and healthcare organizations. Therefore, current centralized and encryption-heavy methods are inadequate, requiring a more efficient, transparent, and safe method for health data administration.

DISADVANTAGES

- Centralized servers retain confidential patient data in traditional healthcare systems.
- Medical data breaches may occur if hackers exploit weaknesses in centralized systems.
- This results in inefficient key management, elevated computational costs, and insufficient transparency and interoperability.

IV.PROPOSED SYSTEM

The SEC-HEALTH protocol provides a Blockchain-based framework to address the shortcomings of current centralized solutions, guaranteeing safe, decentralized, and tamper-proof storage of medical data. Blockchain technology differentiates itself from conventional systems by disseminating data replication among several nodes, guaranteeing data accessible despite the failure of some nodes. Cryptographic hash codes guarantee that data inside a block cannot be modified without notice, due to the immutable characteristics of Blockchain. Additionally, to address Blockchain's storage constraints, patient medical records are preserved on the decentralized Interplanetary File System (IPFS), with just the hash reference maintained on the Blockchain. The Ethereum network supports smart contracts developed in Solidity. These contracts facilitate and securely oversee data transactions between the system, patients, and clinicians. The suggested web interface enables user registration, login, appointment scheduling, report filing, and prescription viewing by integrating Blockchain and IPFS into the system's backend. This guarantees the safeguarding of privacy, transparency, and interoperability across the healthcare system.

ADVANTAGES

- Avoids the need for centralized servers, making data accessible even when nodes fail.
- Any tampering with the data may be easily detected because to the hash-based linking of blocks in a blockchain.

V.SYSTEM MODEL

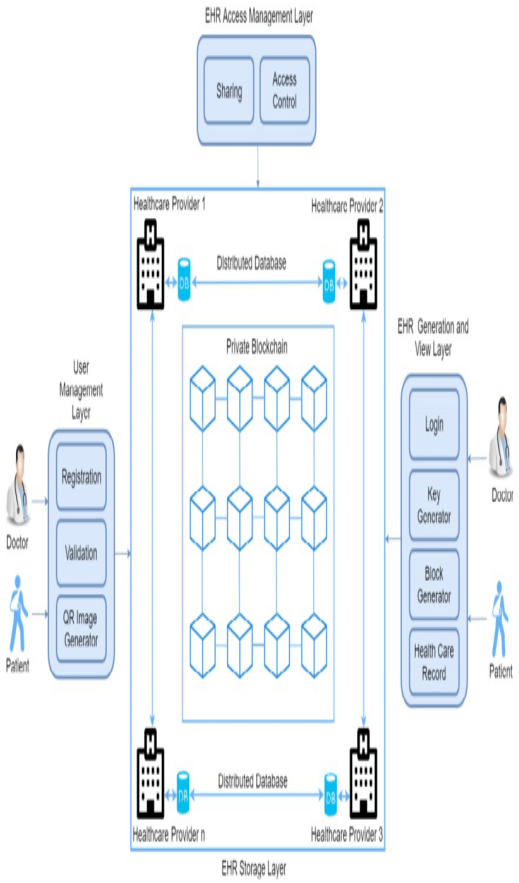


Fig 1.System Model

VI.MODULES INFORMATION

We have developed the below modules to execute this project:

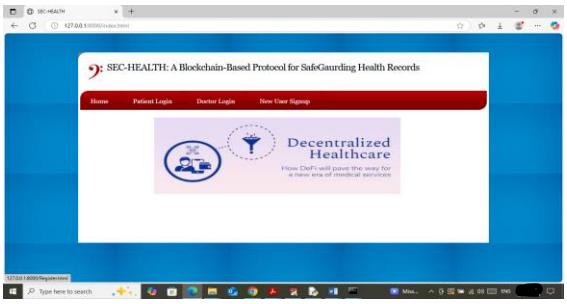
1. Registration of patients and doctors - all information will be stored on the Blockchain.

2. Patient login - when logging in, the patient may see a list of available physicians and schedule an appointment with their preferred choice.

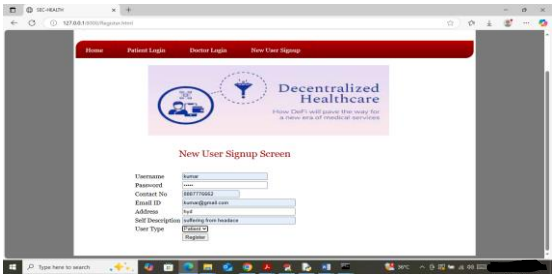
3. Patient login - when logging in, the patient may access the prescriptions issued by their physician.

4. Physician login - upon logging in, the physician may see a list of appointments and create prescriptions for each pending visit.

.VII.SCREEN SHOTS



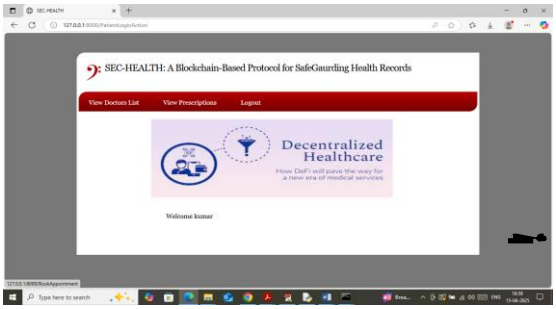
To access the next page, choose the "New User Sign Up" option on the previous screen.



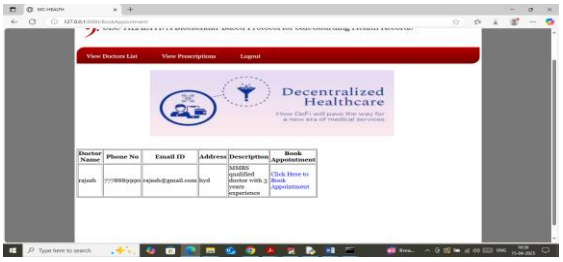
Select the button to go to the next page when the patient has completed registration on the previous screen.

Upon completing the registration procedure, I will provide the whole log acquired from the blockchain after the information storage. This log includes the transaction number, block number, and hash code. An infinite number of patients may be included.

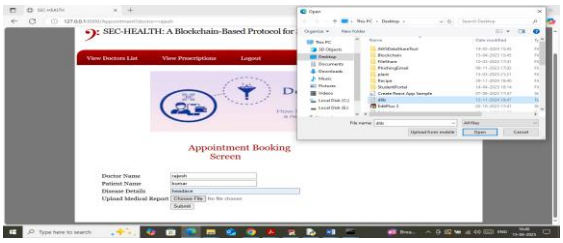
Click the button to go to the next page when the physician has finalized their registration with all relevant information and experience.



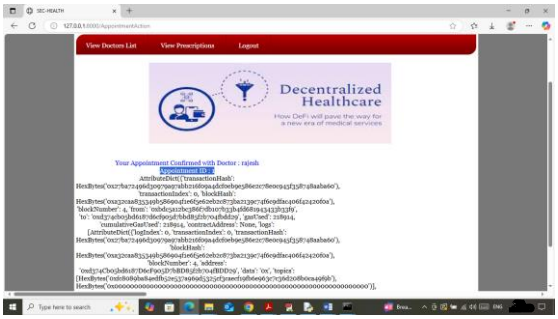
Patients may go to the next page by clicking the "View Doctors List" link on the previous screen.



To schedule an appointment with a certain physician, patients may see their options on the top screen and thereafter use the "Click Here for Appointment" link. This will guide them to the next page.



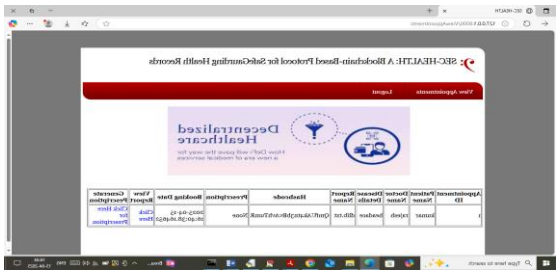
Patients may input their medical history and submit relevant information for their physician's consideration throughout the appointment scheduling process on the aforementioned website. Users may go to the site below by clicking the buttons.



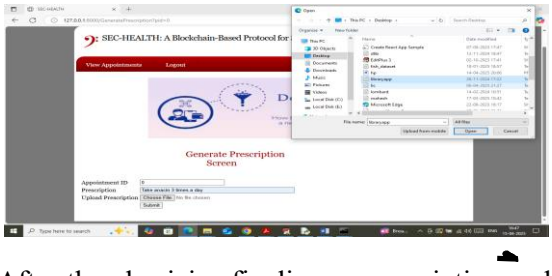
The details of the authenticated medical consultation are shown above, accompanied by the Blockchain record. An IPFS server will

store all booking data recorded on the Blockchain, as well as any submitted reports. To access the further page, click on the "View Prescription" hyperlink.

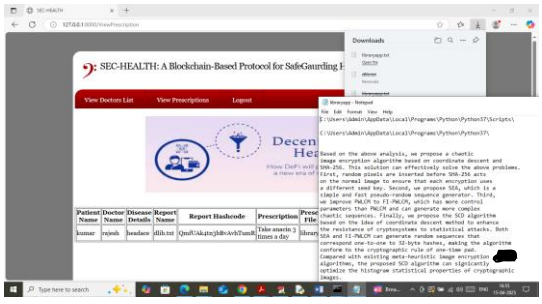
Upon logging in, the doctor will see the webpage shown below, as demonstrated in the prior image.



The physician may get the patient's comprehensive information, including their medical condition and the report hashcode address recorded in IPFS, shown on the screen above. By clicking the "Click Here" link, the doctor will have access to the report and will have the opportunity to download it.



After the physician finalizes a prescription and uploads the prescription slip for the patient, they may go to the next page by pressing a button.



The successful download of the prescription is shown in the browser's status bar, as seen in the screen above. You are likewise authorized to contribute any kind of information, including images.

All electronic health records of your patients may be administered on Blockchain and IPFS using the previously described interfaces.

VIII.CONCLUSION

The SEC-HEALTH system employs blockchain technology to provide a resilient and secure framework for the management of electronic health records. The platform addresses the shortcomings of conventional centralized health record systems by using the irreversible, secure, and decentralized attributes of blockchain technology, together with IPFS for external file storage. The integration of Ethereum smart contracts enables the automated and transparent management of appointments, medications, and interactions between patients and providers. Our technology improves patient data security, offers clients verifiable transaction records, and enables traceability via blockchain logs. The intuitive design streamlines registration, login, consultation, and prescription management, advantageous for both patients and professionals. This system exemplifies the effective use of blockchain technology for the administration of healthcare data in real-world contexts.

IX.FUTURE ENHANCEMENTS

Although SEC-HEALTH has created a solid framework for secure health data management, it may greatly benefit from improvements that would boost its adaptability, scalability, and broader acceptance. To guarantee the system functions well and can support the increasing volume of users and medical data, it is imperative to improve storage methods, transaction throughput, and blockchain effectiveness. Subsequent versions of SEC-HEALTH may enhance interoperability and facilitate real-time medical data exchange across institutions by integration with national health databases, hospital management systems, and other healthcare platforms. To enhance data security and confidentiality, further stringent privacy measures may be implemented using sophisticated cryptographic

methods such as zero-knowledge proofs. This enables selective access to sensitive medical information.

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