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A Safe and Secure Personal Health Data Sharing Using Blockchain

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ABSTRACT: Hospital operations usually involve a lot of medical reports which are an integral part of operations. Hospitals these days have increased their business by integrating pathology and other test labs within the hospital for efficient and fast reports along with increased business. Hospital operations include a variety of processes from patient admission, management, to hospital expense management. This coupled with added services like pathology and pharmacy management increases operational complexity and also makes it difficult to track. Thus we use blockchain technology to keep track of every single transaction with a 100% authenticity through the Hyperledger concept. We use blockchain tech to management the medical reports of all patients along with transaction details to demonstrate how this leads to safe, efficient and secure management of the entire system. All transactions are secured by an encryption and stored as blocks to authenticate within a network of computers rather than a centralized server. Moreover we use hyperledger concept to associate and store all the associated medical documents associated with each transaction with date stamp. This allows to verify the authenticity of each report which will be detected if modified by any individual. Thus we bring forward a secure, safe, efficient and authentic medical report management system using blockchain technology.

I. INTRODUCTION

The recent advent in technology is affecting all parts of human life and is changing the way we use and perceive things previously. Just like the changes technology has offered in various other sectors of life, it is also finding new ways for improvement in healthcare sector. The main benefits that advancement in technology is offering are to improve security, user experience and other aspects of healthcare sector. These benefits were offered by Electronic Health Record (EHR) and Electronic Medical Record (EMR) systems. However, they still face some issues regarding the security of medical records, user ownership of data, data integrity etc. The solution to these issues could be the use of a novel technology, i.e., Blockchain. This technology offers to provide a secure, temper-proof platform for storing medical records and other healthcare related information.

II. RELATED WORK

BACKGROUND AND PROBLEM

Before the introduction of smart contacts on the blockchain, the main discussions on Electronic Health Record (EHR) Management focused on whether to use cloud infrastructures or local centralized systems for storing and sharing EHRs. These centralized systems implied that each hospital and healthcare company would have to keep data on premise in locally managed structures and databases.

However, centralized EHRs management systems present some issues as described below:

No patient control: The patients do not own the data and have no control over it. The patients should own and control their data.

Scattered records:

As patients seek treatments in different structures, the records are replicated. The information becomes scattered.

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Limited system interoperability:
Different hospitals and health facilities have different systems. Integration and interoperability issues are the consequences.

Inconvenient secure sharing:
Often times, the process of sharing health records is complex and time-consuming. In the U.S. a secure email standard called Direct is used to provide encrypted transmission between the sender (for example, an E.R. physician) and receiver.
The system must allow the patients and practitioners to share and access EHRs and be able to detect and react to the crisis situations by changing the network policies and allowing new nodes representing the rescuers and humanitarian help.
Moreover, it will need to behave correctly in the presence of malicious nodes. Some of the benefits that a permissioned blockchain solution can provide to the healthcare sector, and to EHRs in particular, can be listed as follows:

Security: a blockchain is secure by design. In fact, under certain conditions, the information stored on the ledger are tamper-proof ;

Resiliency: a blockchain network is able to reach consensus and operate correctly also in case of Byzantine failures;
EMR sharing: through encryption and digital signature, it is possible to securely share information.

III. PROPOSED ALGORITHMS

BLOCKCHAIN (CRYTOGRAPHIC HASH)
Secure Hash Algorithm
SHA stands for secure hashing algorithm. SHA is a modified version of MD5 and used for hashing data and certificates. A hashing algorithm shortens the input data into a smaller form that cannot be understood by using bitwise operations, modular additions, and compression functions. This is used to verify the information by generating hash codes.

Process:
- Add padding bits to the original message. ...
- Add length bits to the end of the padded message. ...
- Initialize MD buffers to compute the message digest. ...
- Process the message in successive 512 bits blocks. ...
- Produce a final 160 bits hash value.

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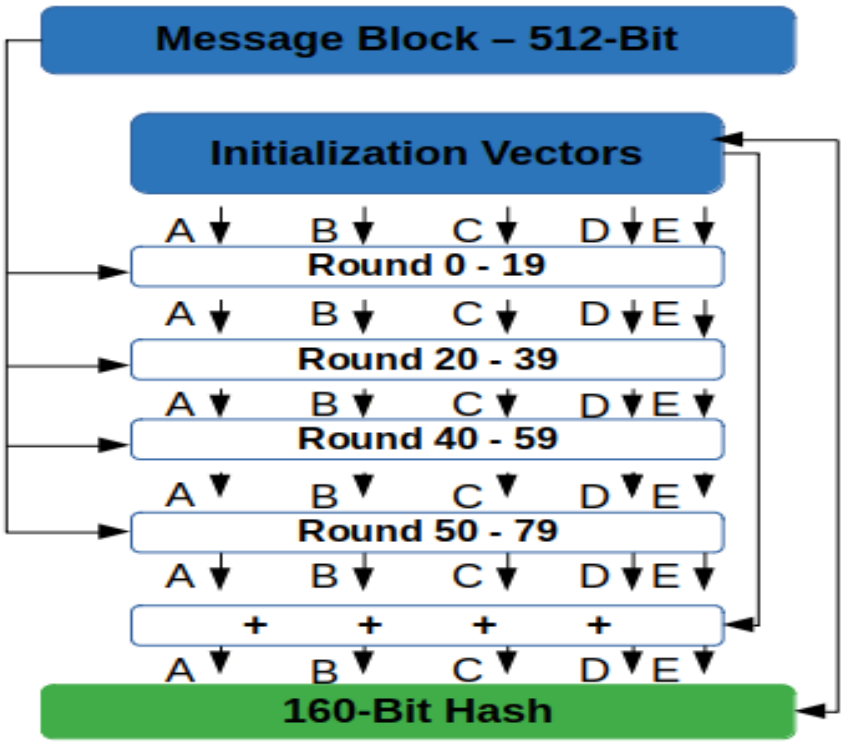

Fig 1.Algorithm Block diagram

IV. RESULTS

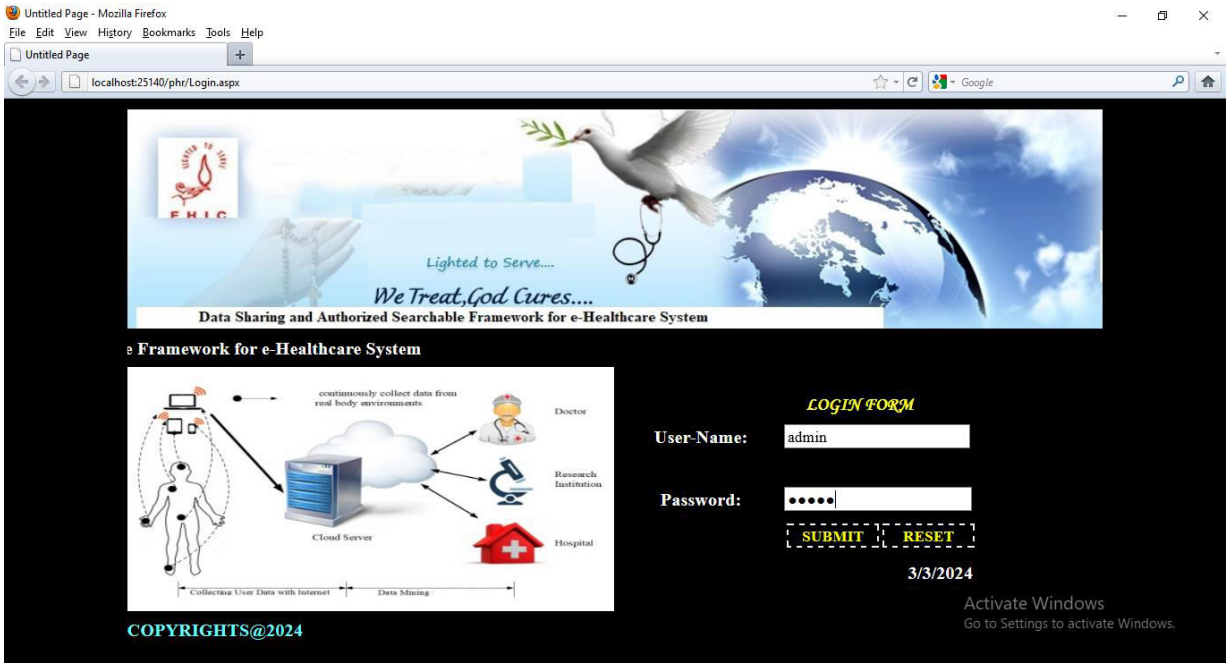

Fig 2. Login Page

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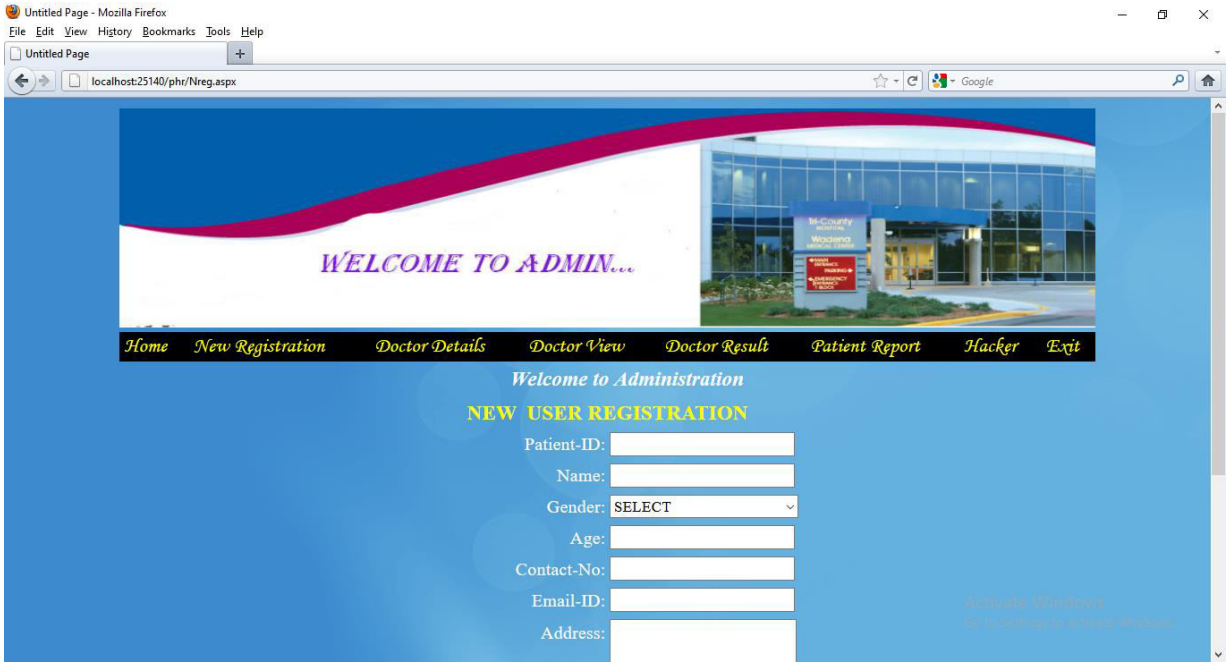

Fig 3. Admin Page

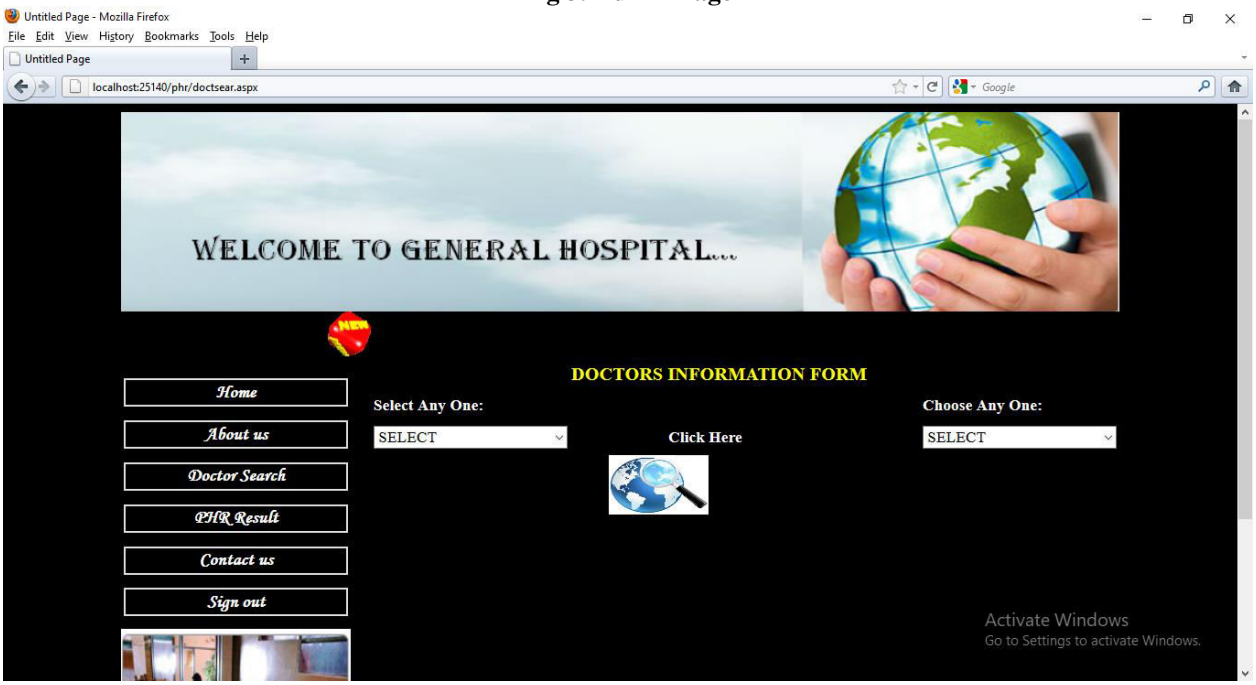

Fig 4. Doctor Information in Hospital

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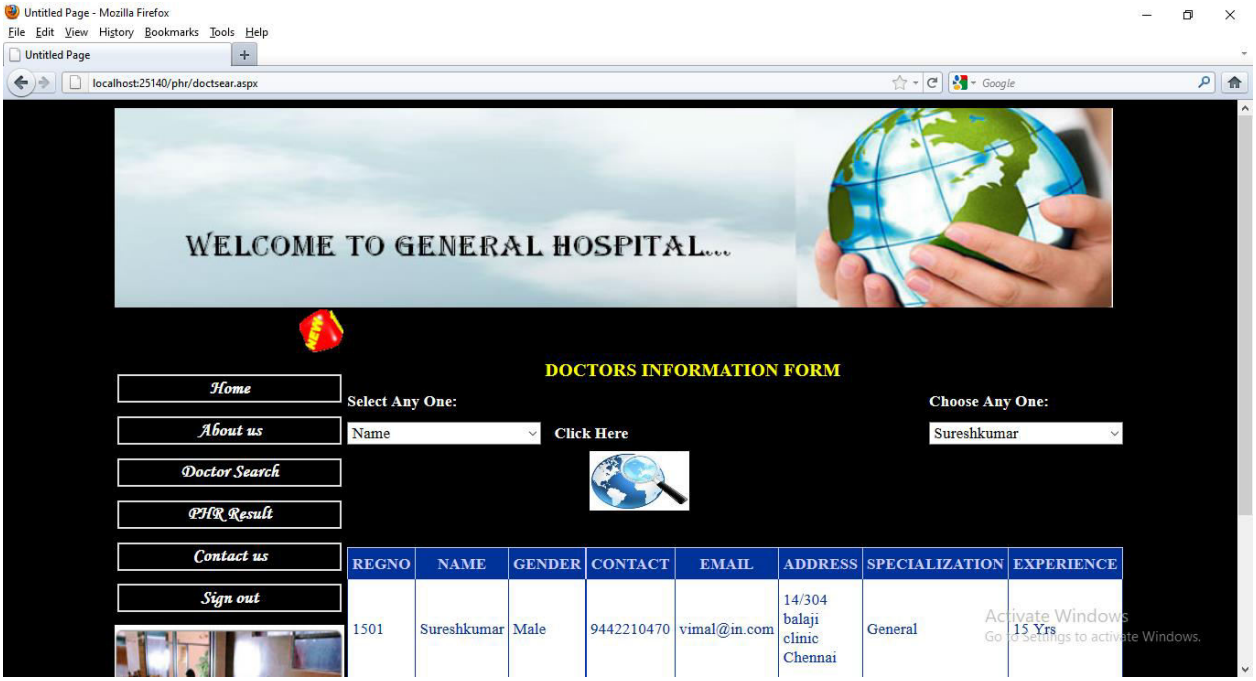

Fig 5. Doctor Page

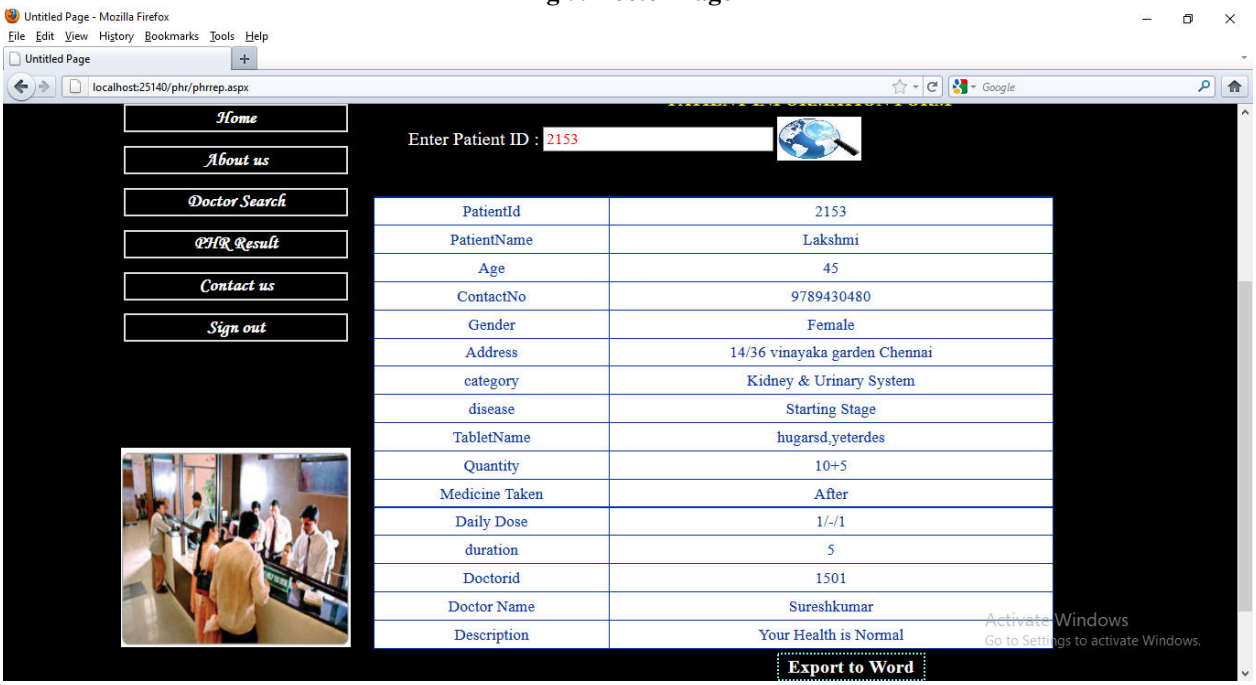

Fig 6. Information Page

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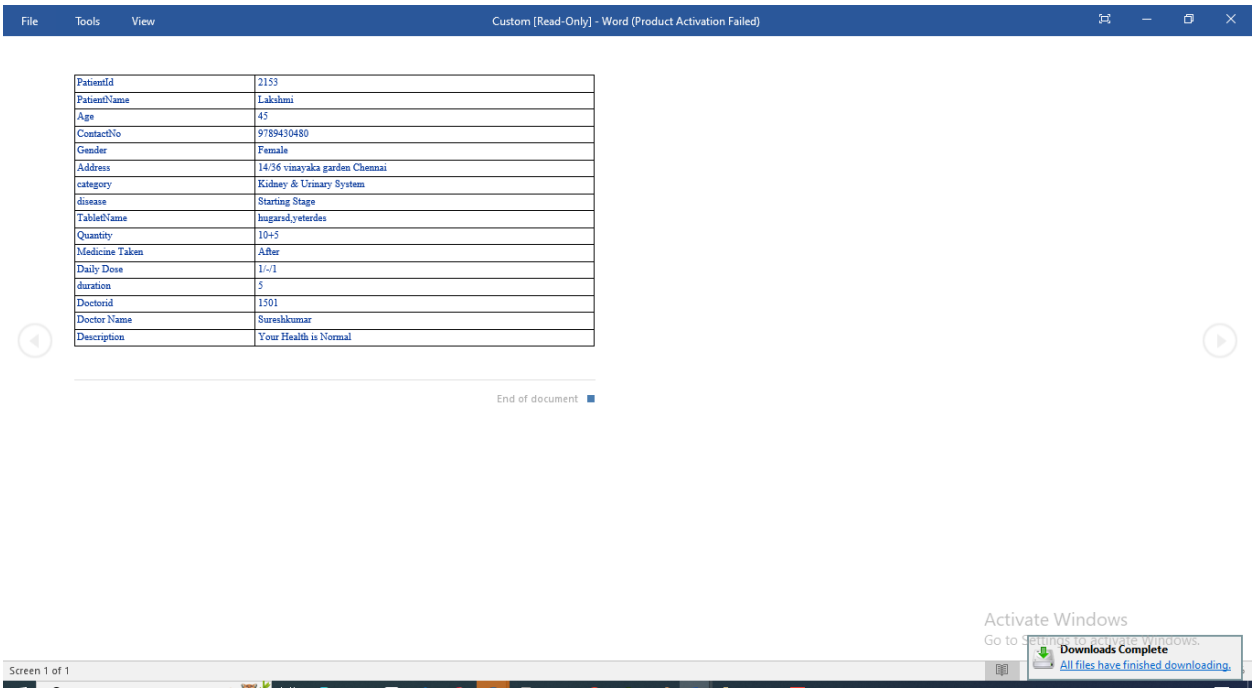

Fig 7. Final Output

V. CONCLUSION AND FUTURE ENHANCEMENT

Thus we use blockchain technology to keep track of every single transaction with a 100% authenticity through the Hyperledger concept. We use blockchain tech to management the medical reports of all patients along with transaction details to demonstrate how this leads to safe, efficient and secure management of the entire system. All transactions are secured by an encryption and stored as blocks to authenticate within a network of computers rather than a centralized server. Moreover we use hyperledger concept to associate and store all the associated medical documents associated with each transaction with date stamp. This allows to verify the authenticity of each report which will be detected if modified by any individual. Thus we bring forward a secure, safe, efficient and authentic medical report management system using blockchain technology.

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