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.

Before the advent of modern technology, healthcare sector used paper based system to store the medical records, i.e., using handwritten mechanism. This paper-based medical record system was inefficient, insecure, unorganized and was not temper-proof. It also faced the issue of data- duplication and redundancy as all the institutions that patient visited had various copies of patient's medical records.

The healthcare sector faced a trend shift towards EHR systems that were designed to combine paper-based and electronic medical records (EMR). These systems were used to store clinical notes and laboratory results in its multiple components. They were proposed to enhance the safety aspect of the patients by preventing errors and increasing information access.

Electronic Health Records (EHRs) are both crucial and sensitive as they contain essential information and are frequently shared among different parties including hospitals, pharmacies or private clinics. This information must remain correct, up to date, private, and accessible only to the authorized people. Moreover, the access must also be assured under special conditions - mass crises like hurricanes or earthquakes - where disruption, decentralized responses, and chaos could potentially lead to wrong procedures or even malicious behaviors.

The introduction of blockchain -a distributed ledger where the records are stored in a linked sequence of blocks and are theoretically difficult to delete or tamper with - made possible to

design and implement new solutions for more failure-resistant EHRs applications adopting a distributed and decentralized philosophy, in contrast with the central ones based on cloud infrastructures or even local solutions. In this context, this work provides a systematic study to understand whether permissioned blockchain implementations could be of any benefit to managing health records in emergency situations caused by natural disasters.

The system allowed the patients and practitioners to share and access EHRs and be able to detect and react to the crisis situations. Moreover, it behaved correctly in the presence of malicious nodes assuring throughputs and latencies still lower, compared to current centralized systems like credit card payments, but already up to two orders of magnitude higher than permission less blockchain implementations. Even though there is still a lot of work to do, the system represented by the prototype could be an interesting alternative for networks of healthcare companies to help ensuring the continuity of treatment while preserving privacy and confidentiality in extreme situations.

A. 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.

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.

2.EXISTING SYSTEM

Electronic medical records area unit important however sensitive nonpublic info for diagnosing and treatment in attention, which require to be oftentimes distributed and shared among peers like attention suppliers, insurance corporations, pharmacies, researchers, patients, their family, among others. This poses a significant challenge on a patient's case history update. Storing and sharing information between entities for maintaining access management through varied consents solely complicate the method of a patient's treatment. They bestowed the design of an attention information entrance application for straightforward and secure management and sharing of medical information between totally different entities which will use patient information. However, the system has not been implemented nor testedhowever.

3.PROPOSED SYSTEM

The Proposed System works on a framework for administering and EMR sharing information for cancer patient care. In collaboration with a Hospital, a framework is enforced during a paradigm that ensures privacy, security, availableness, and fine-grained access management over EMR information. The proposed work will considerably cut back the turnaround for EMR sharing, improve deciding for treatment, and cut back the value. This provides a novel chance to design and implement a secure, trustable EMR information management and sharing system victimization using block chain. .

II. Admin, doctor, patient

- Patient Registration
- Doctor Registration
- Doctor Details
- Entry Form
- View Form
- Report
- Patient Report

Patient Registration:

In this module patient details are stored in database. It contains patient id, name, age, gender, contact, address, disease. The patient registration details are stored by admin.Admin collects all the information about patient, they give individual password to every user and finally we can store the information in cloud database.

Doctor Registration:

In this module doctor details are stored in database. The doctor registration details are stored by admin. The collected information's about the doctor are finally stored in the database.

Doctor Details:

In this module admin maintain all the doctors' information.Because incase of any emergency situation patients can easily find out the doctor's information.

Entry Details:

In this module admin maintain all the patient entry information.it contains patient entry records in hospital and they maintain account details of the hospital and we can finally store the information in database.

Patient Report:

In this module patient report details are stored in database. It contains patient id, name, age, gender, contact, address, disease. The patient report details are stored by admin.

A.SYSTEM TESTING

Testing is a series of different tests that whose primary purpose is to fully exercise the computer based system. Although each test has a different purpose, all work should verify that all system element have been properly integrated and performed allocated function. Testing is the process of checking whether the developed system works according to the actual requirement and objectives of the system.

The philosophy behind testing is to find the errors. A good test is one that has a high probability of finding an undiscovered error. A successful test is one that uncovers the undiscovered error. Test cases are devised with this purpose in mind. A test case is a set of data that the system will process as an input. However the data are created with the intent of determining whether the system will process them correctly without any errors to produce the required output.

B.Types of Testing

- Unit testing
- Integration testing
- Validation testing
- Output testing
- User acceptance testing

Unit Testing

All modules were tested and individually as soon as they were completed and were checked for their correct functionality.

Integration Testing

The entire project was split into small program; each of this single programs gives a frame as an output. These programs were tested individually; at last all these programs where combined together by creating another program where all these constructors were used. It give a lot of problem by not functioning is an integrated manner.

The user interface testing is important since the user has to declare that the arrangements made in frames are convenient and it is satisfied. When the frames where given for the test, the end user gave suggestion. Based on their suggestions the frames where modified and put into practice.

Validation Testing

At the culmination of the black box testing software is completely assembled as a package. Interfacing errors have been uncovered and corrected and a final series of test i.e., Validation succeeds when the software function in a manner that can be reasonably accepted by the customer.

Output Testing

After performing the validation testing the next step is output testing of the proposed system. Since the system cannot be useful if it does not produce the required output. Asking the user about the format in which the system is required tests the output displayed or generated by the system under consideration. Here the output format is considered in two ways. one is on screen and another one is printed format. The output format on the screen is found to be corrected as the format was designed in the system phase according to the user needs. And for the hardcopy the output comes according to the specifications requested by the user.

User Acceptance System

An acceptance test as the objective of selling the user on validity and reliability of the system. It verifies that the procedures operate to system specification and mat the integrity of vital is maintained.

Performance Testing

This project is an application based project, and the modules are interdependent with the other modules, so the testing cannot be done module by module. So the unit testing is not possible in the case of this driver. So this system is checked only with their performance to check their quality.

C.IMPLEMENTATION:

It making the new system available to a prepared set of users (the deployment), and positioning on-going support and maintenance of the system within the Performing Organization (the transition). At a finer level of detail, deploying the system consists of executing all steps necessary to educate the Consumers on the use of the new system, placing the newly developed system into production, confirming that all data required at the start of operations is available and accurate, and validating that business functions that interact with the system are functioning properly. Transitioning the system support responsibilities involves changing from a system development to a system support and maintenance mode of operation, with ownership of the new system moving from the Project Team to the Performing Organization.

List of System implementation is the important stage of project when the theoretical design is tuned into practical system. The main stages in the implementation are as follows:

- Planning
- Training
- System testing and
- Changeover Planning

Planning is the first task in the system implementation. Planning means deciding on the method and the time scale to be adopted. At the time of implementation of any system people from different departments and system analysis involve. They are confirmed to practical problem of controlling various activities of people outside their own data processing departments. The line managers controlled through an implementation coordinating committee. The committee considers ideas, problems and complaints of user department, it must also consider;

- The implication of system environment
- Self-selection and allocation form implementation tasks
- Consultation with unions and resources available
- Standby facilities and channels of communication

The following roles are involved in carrying out the processes of this phase. Detailed descriptions of these roles can be found in the Introductions to Sections I and III.

_ Project Manager
_ Project Sponsor
_ Business Analyst
_ Data/Process Modeler
_ Technical Lead/Architect
_ Application Developers
_ Software Quality Assurance (SQA) Lead
_ Technical Services (HW/SW,LAN/WAN, TelCom)

_ Information Security Officer (ISO)

_ Technical Support (Help Desk, Documentation, Trainers)

_ Customer Decision-Maker

_ Customer Representative

_ Consumer

The purpose of Prepare for System Implementation is to take all possible steps to ensure that the upcoming system deployment and transition occurs smoothly, efficiently, and flawlessly. In the implementation of any new system, it is necessary to ensure that the Consumer community is best positioned to utilize the system once deployment efforts have been validated. Therefore, all necessary training activities must be scheduled and coordinated. As this training is often the first exposure to the system for many individuals, it should be conducted as professionally and competently as possible. A positive training experience is a great first step towards Customer acceptance of the system.

During System Implementation it is essential that everyone involved be absolutely synchronized with the deployment plan and with each other. Often the performance of deployment efforts impacts many of the Performing Organization's normal business operations. Examples of these impacts include:

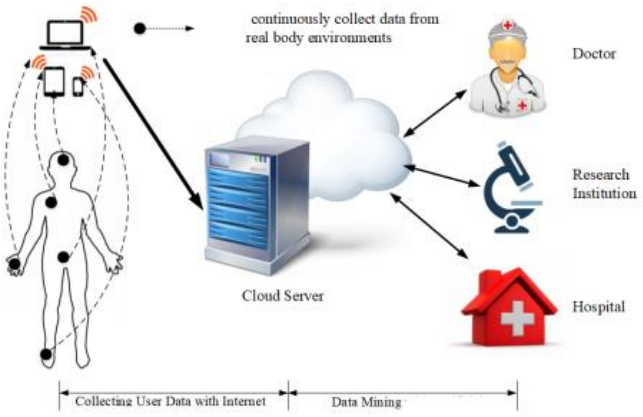
Consumers may experience a period of time in which the systems that they depend on to perform their jobs are temporarily unavailable to them. They may be asked to maintain detailed manual records or logs of business functions that they perform to be entered into the new system once it is operational.

Technical Services personnel may be required to assume significant implementation responsibilities while at the same time having to continue current levels of service on other critical business systems.

Technical Support personnel may experience unusually high volumes of support requests due to the possible disruption of day-to-day processing.

Because of these and other impacts, the communication of planned deployment activities to all parties involved in the project is critical. A smooth deployment requires strong leadership, planning, and communications. By this point in the project lifecycle, the team will have spent countless hours devising and refining the steps to be followed. During this preparation process the Project Manager must verify that all conditions that must be met prior to initiating deployment activities have been met, and that the final 'green light' is on for the team to proceed. The final process within the System Development Lifecycle is to transition ownership of the system support responsibilities to the Performing Organization. In order for there to be an efficient and effective transition, the Project Manager should make sure that all involved parties are aware of the transition plan, the timing of the various transition activities, and their role in its execution.

Due to the number of project participants in this phase of the SDLC, many of the necessary conditions and activities may be beyond the direct control of the Project Manager. Consequently, all Project Team members with roles in the implementation efforts must understand the plan, acknowledge their responsibilities, recognize the extent to which other implementation efforts are dependent upon them, and confirm their commitment.



Collection of data sharing Architecture

III. CONCLUSION

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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