



Article Title: Novel And Secure Blockchain Framework For Internet Of Things Health Applications

Novel and Secure Blockchain Framework for Internet of Things Health Applications

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ABSTRACT

In recent years, rapid advancements has made in the design and development of the Internet of Things. The term "Internet of Things" (IoT) refers to the connecting of things to a physical network which contains software, sensors and other devices to communicate information between them. Security is the most important aspect of encryption over the Internet because of the value and significance of patient health records (PHR). In traditional IoT systems, sensitive data is secured by a third party during transmission in an IoT environment, which cause complicated and dangerous issues. Blockchain technology is the contemporary response in an IoT setting to solve security concerns and eliminate third parties involvement. In this paper, secure blockchain for IoT health applications is proposed and Electronic Health Records (EHRs) are the health information which is gathered and saved electronically for educational purposes in today's healthcare to deliver healthcare in patients' hands and minimize physical contact between healthcare consumers and providers. The suggested framework will enable decision-makers to enhance the healthcare industry and accumulate from the current e-government cloud computing infrastructure. As a result the suggested work of Blockchain enhance IoT systems' stability and it has the capacity to reduced costs and enhanced the efficiency.

Keywords: Internet of things, Patient health records, electronic health records, e-government cloud computing.

1 Introduction

Rapid development in many technological fields has affected almost every aspect of life in the twenty-first century. There are numerous instances of technology collecting data and embedding it in various formats for use in various applications [1]. For instance, smart gadgets (such phones and tablets) are utilised for calculate the distance travelled, the number of steps taken, heart rate, blood pressure and the number of calories burned. The Internet of Things is a new idea which was developed as a result of this example and numerous other scenarios



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involving sensors and communication devices. IoT facilitates a number of tasks, such as patient remote monitoring and treatment advancement in the hospital environment. Predicting diseases and maintaining track of patients for specific diseases based on symptoms acquired from a variety of IoT devices are just two examples of the tremendous advancements in the medical profession [2-5]. Due to the expanding advantages of digital transfer through IoT, the medical industry has adapted to cloud technology and has been using it to make health care more inexpensive & effective. Modern wireless technology has made it possible to deliver patient health information packages to a doctor or hospital employee from anywhere in the world [6]. The primary and most crucial cryptographic technique is used to encrypt sensitive data when it comes to patient history information. The digital healthcare system is considered to be the platform for transmitting and receiving patient health records. Yet, the majority of the present healthcare systems are not adequately secured since they lack encryption and access control solutions. The sharing of medical information with authorised users is a crucial element of efficient healthcare. [7-9]. Business assistants from a variety of sectors, including healthcare, real estate, administration and financial services, have recently become increasingly interested in blockchain technologies. The blockchain technology advances and the numerous uses in healthcare [10]. Additionally, the application of blockchain in healthcare will indeed collect data on enhanced operations, health records and patient record accessibility. Also, the delivery of medications through IoT frameworks connected to areas where their overstock travels from one spot to another may be updated on a regular basis by both the transmitter and the recipient [11-12]. In order to safeguard healthcare management programmes by collecting every person's daily work, this study's purpose is to identify multimedia data processing in an IoT healthcare ecosystem [13-14]. Also, the application of blockchain technology to healthcare organisations has been beneficial to society in a number of ways, such as preserving the security and accountability of patient information, enabling patients to decide who has major access to their results [15].

In this paper, the proposed technique provide a new, secure Blockchain Foundation for Internet of Things applications in the health sector. Blockchain technology is getting more and more attention, and it has been extremely successful with crypto currencies. The suggested system offers a high degree of EHR integration, interoperability and sharing amongst patients of healthcare providers as well as practitioners. As a result, the suggested work of Blockchain enhance the IoT systems' stability and increased the efficiency.

2 Proposed Methodology

The Enhanced Rich-Thin-Client Architecture (ERTCA) in the suggested system addresses the IoT device restrictions. It offers a Blockchain-based IoT solution for wealthy clients. The



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ERTCA design satisfy the research goals for the restricted IoT and the centralised architectural difficulty. In contrast to the hierarchical architecture, the Enhanced Rich-Thin-Clients Architecture (ERTCA) is created. A star topology is produced by the thin clients connected to a specific rich client. The successful management of health activities through the integration of Blockchain with IoT, which helps to develop a collaborative health monitoring system by offering data immutability and guaranteeing that business logic is retained.

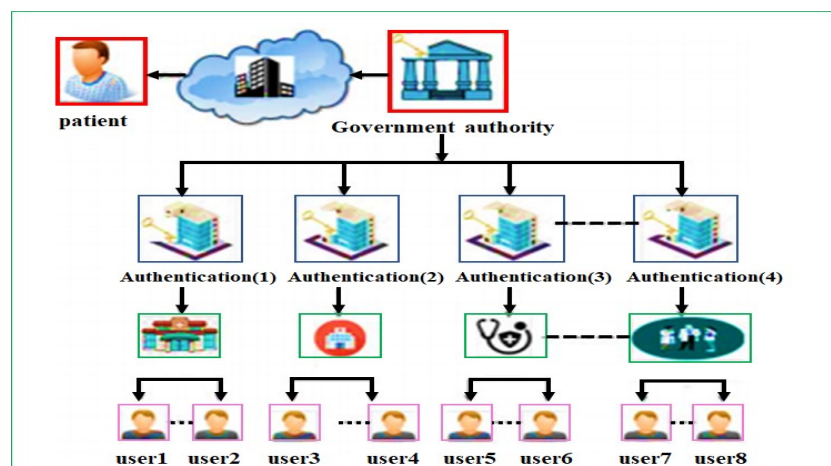


Figure 1: Block diagram for the proposed work

It is a useful method to encrypt the PHRs prior to outsourcing in order to guarantee the patients' control over access to their own PHRs. A unique patient-centered framework and a collection of strategies for restricting access to PHRs maintained on semi-trusted servers are proposed in this research. Each patient's PHR file is encrypted using attribute-based encryption (ABE) methods in order to achieve fine-grained and scalable data access control. Fine-grained data access control techniques which operate with semi-trusted servers it is crucial to ensuring patient-centric privacy management over their own PHRs. This solution uses attribute-based encryption (ABE) as the primary encryption primitive to safeguard the sensitive personal health information retained on a server which is only partially recognized. By encrypting the file with a set of attributes, a patient will share her PHR with a subset of users without having to be aware of the full list of users because access controls are stated using ABE based on the attributes of users or data.

2.1 Modules

2.1.1 Health care providers

Healthcare providers are people who deliver coordinated healthcare services of all kinds to every member of a community. The healthcare professionals are made up of the following



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individuals: doctors, nurses, pharmacists, surgeons, medical technicians, lab workers and other staff members.

2.1.2 Trusted Authority

The following activities fall under the scope of the trusted authority (TU), which has to be the Ministry of Health or any other department of government: Verify the identities of every user who communicates with the system. Make political parameters needed for cryptographic activities available and generate keys for healthcare providers.

2.1.3 Patient and Service Providers Identity Proofing

Patients and service providers must register with the recognized health authority when applicants use the portal for the first time in order to interact with the system. Applicants send, update and receive health information from the central database of the e-government cloud through the online portal with restricted access, based on the end user's privileges.

2.1.4 The Proposed Access Control

The patient uploads their EHR to the cloud in accordance with the access guidelines for each service provider based on their domains and categories to initiate the hierarchy. The THA encrypts the patient's electronic health record (EHR), attaches it with the established policies and gives various decryption keys to the appropriate service providers. When a healthcare service provider retrieves an encrypted EHR, the service provider decrypts the file if the properties associated with his or her decryption key as well as the access structure of the encrypted file match.

2.1.5 Data Distribution

It is inappropriate for the trusted central authority to encrypt the EHR independently for each user given the size of the EHR database and the number of users with various levels of access privileges. It is more effective to still encrypt the EHR once and then distribute it to several attribute authorities (AAs), in accordance with each AA's functions.

2.1.6 Access Structure of EHRS

The major benefits of utilizing the suggested access structure include lightweight key management, that reduces and mitigates the stress placed on the GA in order to encrypt the EHR, produce decryption keys, and distribute them to authorized users when the number of users is high.

2.2 Block Chain

A blockchain is a digitalized, decentralized, distributed public ledger which serves as a common, synchronized database for monitoring of crypto currency transactions. Since blockchain are essentially decentralized databases, the data does not have a single owner. Users



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interact to choose which data are added to the blockchain, guaranteeing that identical copies of the data are received and continuously updated. E-hospital, in any environment, generates a wealth of complicated and rich data, ranging from sensitive patient-identifiable data to operational analytics.

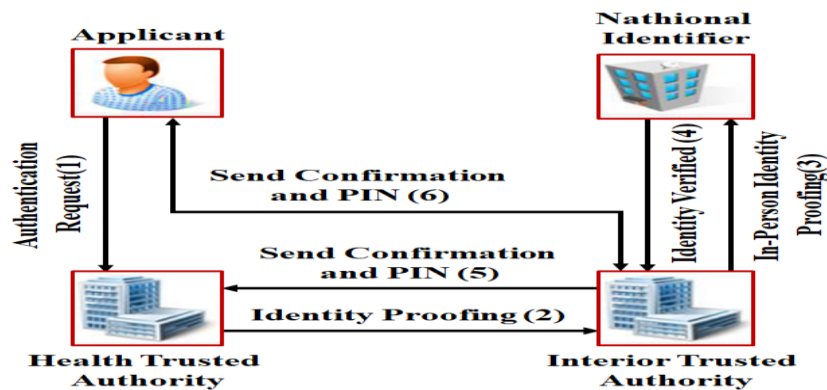


Figure 2: *Flow diagram*

3 Results and Discussion

The below methods illustrates the user login, patient registration, doctor login, nurse login and the patient details are represented by the below figures. As a result, the proposed technique of Blockchain enhance the IoT systems' stability and increased the efficiency.

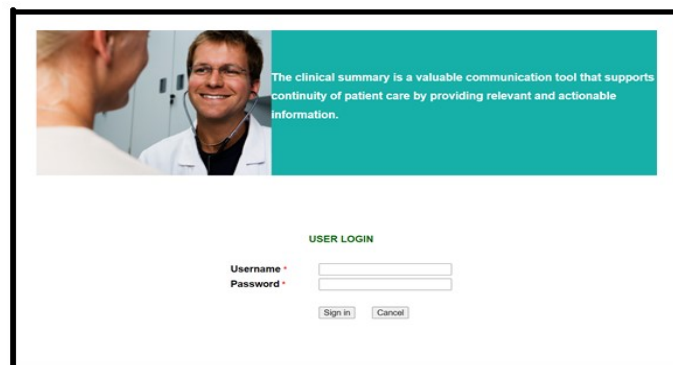


Figure 3: *User login*

Almost, a logon requires that the user have (1) a user ID and (2) a password as illustrated from Figure 3.



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The screenshot shows a web application titled "Novel and Secure Blockchain Framework for Health Applications in IoT". The navigation bar includes "Home", "Aboutus", "Login", and "Registration". The "PATIENT REGISTRATION" form contains the following fields: Username, Password, ConfirmedPassword, Name, Date of Birth (with a calendar icon), Age, Address, Mobile, and Email. Each field is marked with a red asterisk indicating it is required.

Figure 4: Patient registration

Patient Registration is demonstrated in Figure 4. A hospital patient registration form is used by medical practitioners to collect patient details before their stay in the hospital. This include an overview of medical history, health insurance information, as well as a list of medications and allergies.

The screenshot shows the "DOCTOR LOGIN" section of the application. It features a header image of a doctor with a teal overlay containing the text: "The clinical summary is a valuable communication tool that supports continuity of patient care by providing relevant and actionable information." Below the image is a login form with fields for "Username" and "Password", both marked with red asterisks. "Sign in" and "Cancel" buttons are located at the bottom of the form.

Figure 5: Doctor Login

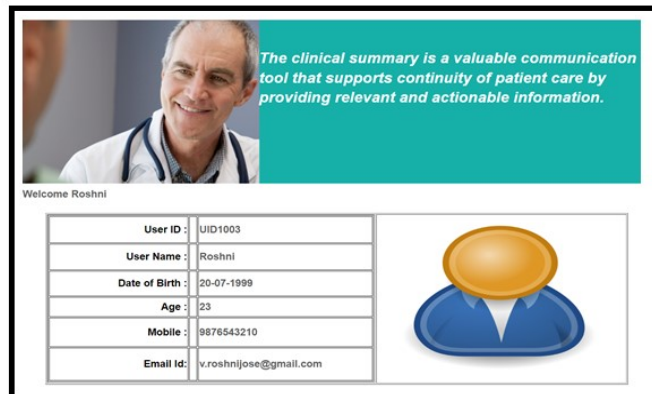
The screenshot shows the "NURSE LOGIN" section of the application. It features the same header image and teal overlay as Figure 5. Below the image is a login form with fields for "Username" and "Password", both marked with red asterisks. "Sign in" and "Cancel" buttons are located at the bottom of the form.

Figure 6: Nurse Login



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Figure 5 and 6 represents the doctor login and nurse login. From the figure it is observed that the login systems has assessed when the username and passwords are signed.



The clinical summary is a valuable communication tool that supports continuity of patient care by providing relevant and actionable information.

Welcome Roshni

User ID :	UID1003
User Name :	Roshni
Date of Birth :	20-07-1999
Age :	23
Mobile :	9876543210
Email Id :	v.roshni.jose@gmail.com



Figure 7: Patients details

From the figure 7 it is noted that the patient's details are shown as user ID, user name, and date of birth, age, mobile number, Email Id.

4 Conclusion

In this paper, the proposed technique provide a new, secure Blockchain Foundation for Internet of Things applications in the health sector. Blockchain technology is getting more and more attention and it has been extremely successful with crypto currencies. The suggested system offers a high degree of EHR integration, interoperability and sharing amongst patients of healthcare providers as well as practitioners. The proposed scheme is adopted by any government, which has a cloud computing infrastructure and provides treatment services to the majority of citizen patients. Future work includes implementing and evaluating the Encryption and Decryption process in the Blockchain framework. In addition, no computational overhead is completed by the government authority and multifactor applicant authentication have been identified and proofed. In this work, a readable message is encrypted to produce it unreadable so that it cannot be read by unauthorized individuals. A decryption procedure is then created to restore an encrypted message to its original (readable) format. As a result the suggested work of Blockchain enhance IoT systems' stability and it has the capacity to reduced costs and enhanced the efficiency.



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