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ENHANCING MEDICAL HEALTH RECORD TOWARDS PATIENTS ORIENTED AND FINE GRAINED DATA ACCESS IN CLOUD COMPUTING SYSTEM

Sadeer Dheyaa Abdulameer [#1]

[#] *Faculty of computer science, Cihan university / sulaimaniya Kurdistan / Iraq*

Abstract— **Nowadays, the maintenance of the medical records of the patients is an emerging research study. The advent of Cloud computing have been incorporated in the medical systems, so as to upgrade the Medical Communication System (MCS). The medical records are outsourced to the third party system in the cloud environment. In this paper, we propose a novel scheme to maintain the health records of the patients in the cloud environment. The objective of the study is to enhance the interoperability of the medical records in the cloud environment. Firstly, a fine grained data access model is proposed, to secure the data in multiple data owner model. Secondly, an integration model is developed, to integrate the data from different sources like physicians and patients in chronological order. An experimental result will prove the effectiveness of the proposed model.**

***Index Terms*— Cloud computing, Medical records, Medical Communication system, Interoperability and fine grained data access model.**

I. INTRODUCTION

The healthcare industry in India has not been able to tap into the full potential of modern information technology to improve on healthcare delivery [7]. Accesses to patients' records are often difficult and cumbersome. The lack of proper access has cost the healthcare industry a huge fortune every year due to duplication and waste [7]. This is just one of the several challenges facing in the healthcare industry. Cloud computing technology has received tremendous attention in recent years. In simplest terms, cloud computing can be defined as a form of computing where shared resources, software, infrastructures and information are delivered to computers and other devices through network or an internet. The accesses to information or network shared resources are not limited by the user's physical location. Therefore, vital resources and people are connected irrespective of where they are around the world, provided there is network connectivity [3, 4].

The ability of cloud computing to facilitate the exchange of medical information between the healthcare stakeholders such as the pharmacist, doctors and all other healthcare institutions that are geographically isolated can help to modernize healthcare services [9]. Privacy, confidentiality, security and regulation problems have however curtailed the immediate adoption and implementation of cloud computing in the management of healthcare system. One of the reasons for the slow adoption rate is the inability to guarantee if the data are fully secured. Kuo [9] and Malin [10] stated that societal stigmatization and isolation may for instance cause some HIV and mental health patients to want their medical information to be strictly confidential.

Healthcare industry has recorded a significant improvement in the last two decades through advancement in information technology. Despite all success recorded, there are still concerns in many areas that affect almost every individual in the industry, and especially the patients who are direct beneficiary of all the successes also bear the brunt of lapses in the system. Some of the problems can be classified as lack of access to patient's medical records [7], limited medical personals in rural areas, high mortality rate [1]. The goal of this paper is to design and implement a cloud-based electronic medical record system that can be used to effectively manage the sharing of medical information.

The rest of the paper is organized as follows: Section I describe the present scenario of the healthcare systems; Section II describes about the related work of the healthcare model; Section III presents about the proposed model; Section IV presents the experimental analysis of the systems. At last, concluded in Section V.

II. RELATED WORK

The utilization of modern information technology in the delivery of healthcare is to enhance the availability and reliability of improved healthcare services to patients at a reduced cost. There exists a handful of published research that uses the adoption of cloud computing as a dependent variable to explore healthcare industry characteristics that are associated with the implementation of these technologies.

Padhy, et al. [14] designed and presented the implementation of a cloud-based healthcare information system model for rural communities; this system makes use of a cloud central server that accepts virtual machines as tenants. The tenants are secure facilities that store information in different healthcare centers. The configuration and connectivity of the system is based on the cloud data center location and the policy of the service provider. The internet is

the main link of communication between the rural healthcare center and the service provider. It also maintains the network traffic between the physical resources and the cloud. The authentication server uses the authentication and authorization mechanisms. The system can be used by other applications and across various devices to share information in near real-time situation effortlessly. However, there is no fail-safe mechanism in the model to ensure system reliability and availability. Also, small hospitals and private physicians do not have the IT requirements to support the technologies deployed in the system.

Saif, Wani, & Khan [17] proposed a system of engineering network solution for data sharing solution across healthcare providers for protecting patients' health information in an Electronic Health Record (HER) system. This system was implemented on a rolebased and signature-based delegation. The signature-based delegation provides a secure avenue for basic delegation and revocation, while the role based delegation yields dynamics in the face of delegates' status, availability and change. In addition to this, basic access control based on public key encryption techniques was also implemented. This ensures the sharing of data and also that the privacy of patients' data is protected across all collaborating healthcare centers but the introduction of proxy sign-in in the system exposes it to another high security risk.

An approach based on utility computing and Wireless Sensor Networks (WSN) was proposed by [16]. Wireless Sensor Networks (WSN) uses sensors that can be worn to gather vital indications that enable the easy collection and distribution of information to and from any mobile device. These two computing features were combined to develop a system that automates the collection, input and analyses patients' critical information through network of sensors connected to installed medical devices, which in turn deliver the records to the health center's cloud for storage, processing, and distribution. Medical specialists can use the information collected to monitor and observe patients anywhere through the internet (on a computer or mobile devices). The system makes use of micro controllers to evaluate data collected. However, there was no provision made for the confidentiality, integrity and privacy of patient data in this system. Also, the design has a complex architecture which may be difficult to implement in developing societies due to lack of infrastructural facilities.

III. ENHANCED FINE GRAIN DATA ACCESS MODEL FRAMEWORK

In this section, we explain about the enhanced fine grain data access model frameworks. The proposed algorithm is explained via five modules, namely,

i) Integration
ii) Cloud storage
iii) Secured cloud storage
iv) Key distribution
v) Data confidentiality.

A. Integration:

Integration is the first module in the cloud computing system. This module assists us to integrate the models from different sources, in order to achieve least cost maintenance. And also, the cloud service is rendered for the different developer platforms. Documents are generated and integrated to achieve interoperability of the data system. Then the documents are generated from different archetypes such as content, admin and demographics. From these archetypes, the server draws out the relevant information.

B. Cloud storage

Cloud storage is an important part of the computing process in the cloud. The role of cloud service providers is to offer infinite storage space for clients to host data. Their intention is to reduce the financial management of the data process. In some cases, it helps us to transform the data from local to remote system. Since, the data is outsourced to the cloud system. Security plays an important role in the cloud system. Privacy of the data is an important parameter in the cloud computing system. Before outsourcing the data to the cloud, it needs to be encrypted.

C. Secure cloud storage

In this part, we innovate a novel data sharing scheme that covers the key distribution of the system. A key distribution model is designed to achieve secure communication channels. The registered cloud users are owned by the private key, in order to maintain their privacy. The outsourced data may be prone to any sorts of vulnerable activities. If any users mislead the events, then they cast to the list of the revoked users. In order to avoid collusion attack, a fine grained data access model is introduced to eliminate duplicate copies of the data. The revoked users cannot be able to get the original data files once they are revoked even if they conspire with the unfrosted cloud.

D. Key Distribution

The advent of key distribution is to verify and validate the service to the registered cloud users. Relied upon the private keys of the user, the data services are offered. As the previous works, they studied about the secure communication channel. The same goal is achieved in our proposed systems.

E. Data confidentiality

Data confidentiality is an important parameter of the cloud security systems. In order to prevent the data from unauthorized users, some security mechanisms are involved. The concepts of dynamic groups are studied to enable multi-user scenario model. In specific to, the revoked users are unable to access the encrypted files.

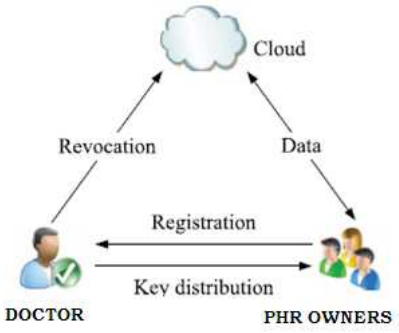

Fig.1. System Architecture

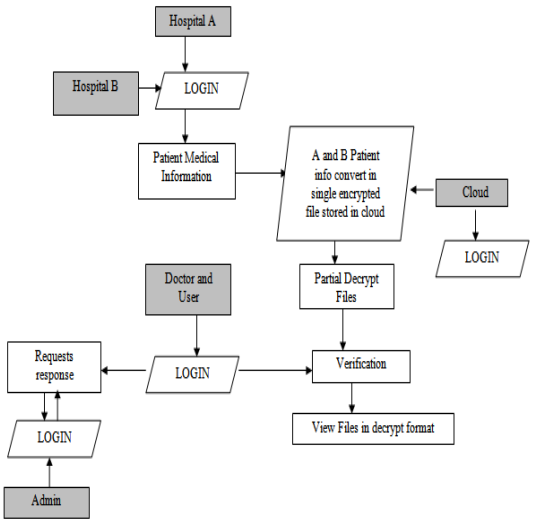

Fig.2. Workflow of the proposed model

IV. EXPERIMENTAL RESULTS

This section describes the experimental designs of the proposed model.

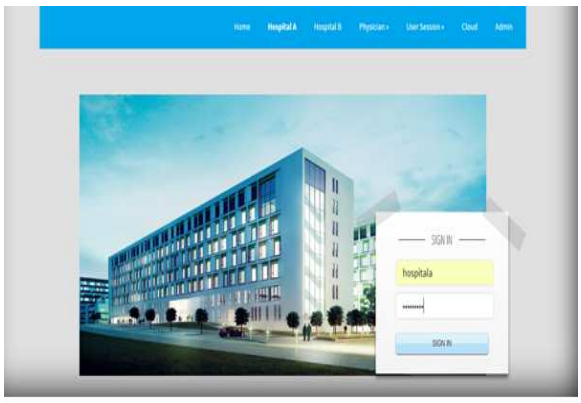

Fig.3. Login page of the system

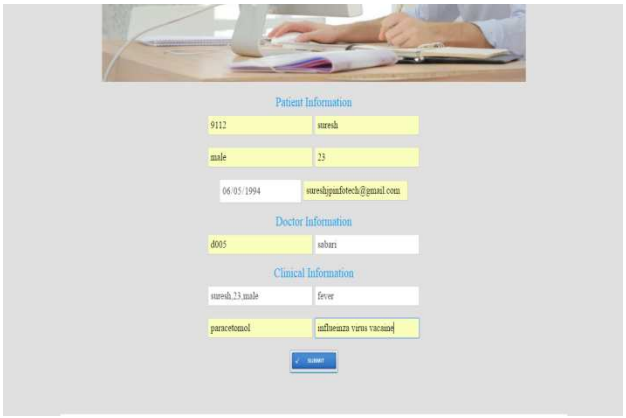

Fig.4. User registration with cloud

Fig.5. Viewing the patient's records

Fig.6. Viewing the report of the patients (Suresh) from hospital A

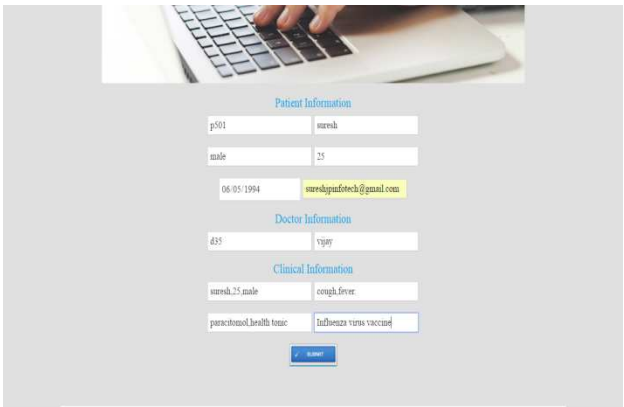

Fig.7. Accessing the data from other hospitals B.

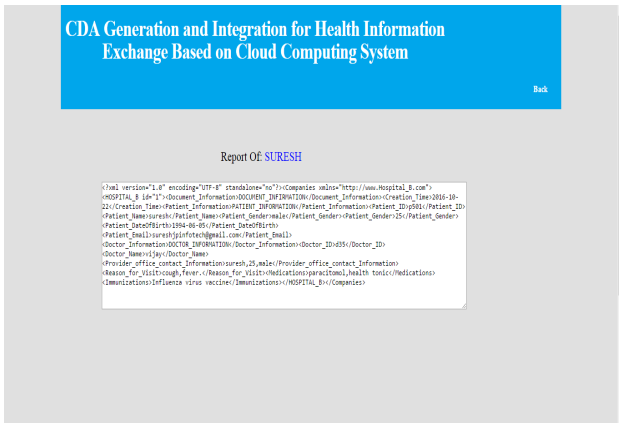

Fig.8 Viewing the report from hospital B.

Fig.9. Integrating two reports of same patients

Fig.10. Cloud admin

Fig.11. Sending the details to the patients

Fig.12 User's login by entering the secret key

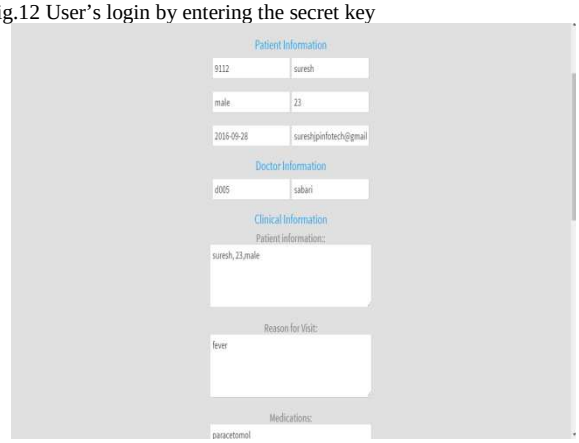

Fig.13. Viewing the patient's details

V. CONCLUSION

In this paper, a complete, robust and efficient cloud-based Medical Health Record (MHR) system has been designed and implemented. Cloud computing has been identified generally as the next big deal in computing infrastructure and it offers some benefits by allowing the use infrastructures like networks, storages, and servers, software such as application programs and platforms like operating systems and middleware services. Adapting the cloud technology to medical record management, reduces the cost of healthcare delivery through reduce administrative bottlenecks. This kind of system will give to physicians, patients and hospital administrator especially in developing world cannot be quantified. It is also hoped that synergy among health care stakeholders will produce results expected from health care organizations.

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