

Privacy Preserving Personal Health Care Data in Cloud

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Abstract: Developing strategies to securely store data across cloud is a much focused topic of research in recent days. Cloud computing focuses on maximizing the effectiveness of the shared resources. Cloud storage provides a convenient means of storing and retrieval of huge amount of data. Personal Health Records (PHRs) should remain the lifelong property of patients and should be displayable conveniently and securely to selected caregivers. My PHR Machines a patient centric system that takes a radically new architectural solution to health record interoperability. Patients Can Upload their Medical data then they access and share through remote Virtual machine. We have made a literature survey on techniques to protect PHRs and find open prototype of My PHR Machines supports the use case of a real world patient scenario.

Keywords: Cloud Computing, Personal Health Records (PHRs), MyPHRMachines, Medical data, Virtual Machine

I. INTRODUCTION

Cloud computing offers unique opportunities for supporting long-term record preservation. My PHR Machines [1], a patient owned health record system prototype based on remote virtual machines hosted in the cloud. My PHR Machines is particularly promising for countries with a very heterogeneous architecture of systems across hospitals and other care institutions. In the view of developer PHRs should be portable. PHR systems typically offer functionality to share, visualize and analyze PHR data. Secure lifelong management of patient medical records since data are stored in the cloud and do not have to be carried around by patients.

The remainder of the paper is organized as follows. Literature review of several techniques prevailing in literature aimed to secure the electronic methods over past 15 years are discussed in Section 2. Section 3 gives the architectural representation of cloud based PHR storage systems. Section 4 briefs about Existing And Proposed Techniques Securing PHR. Section 5 gives a broad overview of discussion of experimental results carried out. Section 6 concludes the paper and outlines the future work.

II. LITERARY REVIEW

Richard S. Surwit, Lyle M. Allen, III, Sandra E. Cummings (2000) proposed "Systems, methods and computer program products for monitoring, diagnosing and treating medical conditions of remotely located patients" which explore the patient monitoring systems with medical conditions of remotely located patients are treated, diagnosed and monitored by a central data processing system to communicate with and receive data from particular patient monitoring systems which includes receiving and storing patient data along the medical

dosage algorithm to generate medical dosage for the stored patient. A central data processing consists of medial dosage algorithm, obtain each patient data and define medical prescriptions of each individual patient. Also modifications of medicine dosage and treatment information's are communicated directly to a patient or to a patient monitoring system.

Marc Edward Chicorel (2001) [21] proposes "Computer keyboard-generated medical progress notes via a coded diagnosis-based language" explained that A medical progress documentation system using an ordered "language" of codes which consists of at least two alphabets, when entered into a programmed processor in a specific arrangement it generate an expressive sentence showing predetermined, frequently used processes in a medical office.

Charlyn Jordan (2002) [22] proposed "Health analysis and forecast of abnormal conditions" explored that Tracking the health status of a patient and entering range of health record signals each signal are measured with the predetermined health indicative function defined to be in normal range to the health report of the patient taken at different time.

Jeffrey J. Clawson (2003) [23] defined "Method and system for an improved entry process of an emergency medical dispatch system" which explore a developed system for processing, receiving and responding to emergency medical calls by emergency dispatchers is defined.

PekkaRuotsalainen (2004) [24] in "A cross-platform model for secure Electronic Health Record

communication” defined that secure and sharing of distributed patient information. Roger J. Quy (2005) [25] in “Method and apparatus for health and disease management combining patient data monitoring with wireless internet connectivity” defined that a function which provides a method for a wireless health monitoring system for monitoring a health condition of a patient by connecting an internet enabled wireless device (“WWD”) to a health monitoring device.

Avner Amir, Avner Man (2006 a) [26]in “System and method for administration of on-line healthcare” define A healthcare administration system provides the management of anamnesis and medical records, data analysis, guided diagnosis, medical treatment and clinical investigation. It has common medical information protocol (CMIP) used for the controlling, monitoring and treatment process and its outcome by means of a medical protocol. Christopher Alban, Kiang Seow (2007) [28] defines a “Clinical documentation system for use by multiple caregivers” they explain that A computer based system for recording, storing, accessing and retrieving clinical documentation where the care setting is provided.

Brian A. Rosenfeld, Michael Breslow (2008) [29] in “System and method for accounting and billing patients in a hospital environment” explored that a system developed for accounting and billing patients in hospital environment. Patient identifier is associated with the billing service provided by the hospitalized unit.

Jacquelyn Suzanne Hunt, Joseph Siemienczuk (2009) [30] in “Process and system for enhancing medical patient care” explored that a system that abstracts selected information. Traditional electronics medical records involves in analysis of a determined medical complaints shared by multiple patients.

Richard J. Schuman (2010) [31] defines “Health care computer system” which define the A hospital bed, patient and nurse call system. A hospital network is provided. Communication is provided over a packet based communication network.

Kanagaraj, G.Sumathi, A.C. (2011) [32] in “Proposal of an open-source Cloud computing system for exchanging medical images of a Hospital Information System” proposed clinical information system through the cloud can provide the essential details to the health care Avula Tejaswi, Nela Manoj Kumar, Gudapati Radhika, Sreenivas Velagapudi (2012 a) [33] in “Efficient Use of Cloud Computing in Medical Science” explored that redesign of medical system with the advent of cloud computing is handled to carry out the information of the patient details in sophisticated manner with less cost and minimum time. They explained the implementation of the cloud computing in hospitals for better cure for the diseases use cloud security protocol for record management. Only authenticated doctors can access.

Carmelo Pino and Roberto Di Salvo (2013) [35] in “A Survey of Cloud Computing Architecture and Applications in Health” explained that cloud computing act as an important alternative to ensure high performance data processing and manage the tool in easy manner.

K.S. Aswathy, G. Venifa Mini (2014 a) [36] in “Secure Alternate Viable Technique of Securely Sharing the Personal Health Records in Cloud” proposed a cloud environment for resource sharing it involves in exchange of personal health record between multiple caregivers.

III. ARCHITECTURAL REPRESENTATION

The architectural representation of cloud based PHR storage is represented in Fig 1. The portal plays an important role in uploading copy of data, remote access maintenance, start/stop operation. PCAS access is used to provide and show copies. The cloud takes the responsibility of mounting the PHRs.

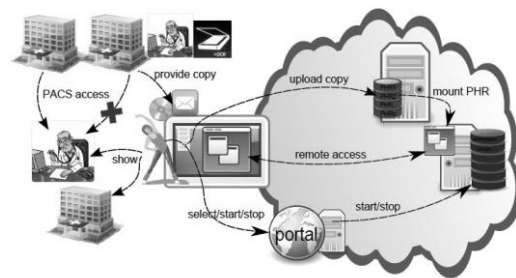


Fig. 1. Architectural example Cloud Based PHRs storage

Architectural representation of My PHR Machine consists of two components evolution and storage with which client directly interacts with My PHR Machine. The first component of My PHR Machine consists of web portal which in turn interacts with Virtual Box Hypervisor. Virtual Machines are connected together with Virtual Box Hypervisor. The second component of My PHR Machine, storage consists of VM Repository which houses VM Data and Private Network folders as indicated in Figure 2.

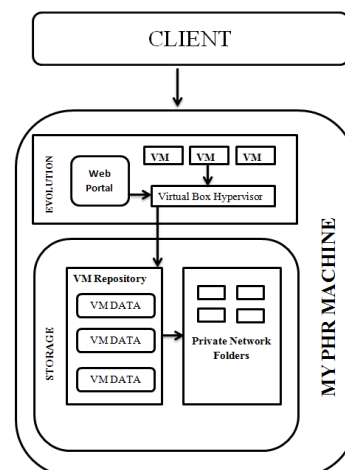


Fig. 2. Technical Architectural diagram of Cloud Based PHRs storage

IV. EXISTING AND PROPOSED TECHNIQUES SECURING PHR

Existing techniques for securing PHR are Paper based PHRs, Electronic device based PHRs and Web based PHRs[1]. PHR systems typically offer functionality to view the PHR data. PHR platforms provide no technical measures for preventing data abuse by the plug-ins that are contributed by third party software vendors. In this system access control mechanism and security issues occurred. PHRs should also be portable so as to enable easy updation and retrieval. PHR systems typically offer functionality to share, visualize and analyze PHR data. Secure lifelong management of patient medical records since data are stored in the cloud and do not have to be carried around by patients.

V. DISCUSSION AND RESULTS

My PHR Machines allows patients to build PHRs which are robust across two dimensions namely:

1. Space Dimensions
2. Time Dimensions

Two Use cases are also taken into consideration:

1. Spatial and Temporal pervasiveness.
2. Privacy related aspects.

The basic network model for the cloud data storage and four different network entities

1. User
2. Cloud Storage Server (CSS)
3. Cloud Service Provider (CSP)
4. Data owner

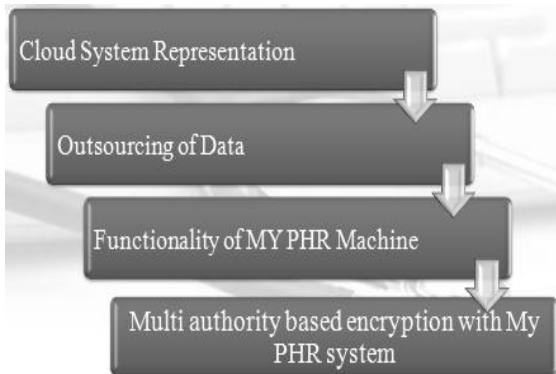


Fig. 3. Modular Workflow of Cloud Based PHRs storage

The process of multi authority based encryption with MyPHR system starts with a cloud system representation. After outsourcing of data the functionalities of MyPHR machine are carried out.

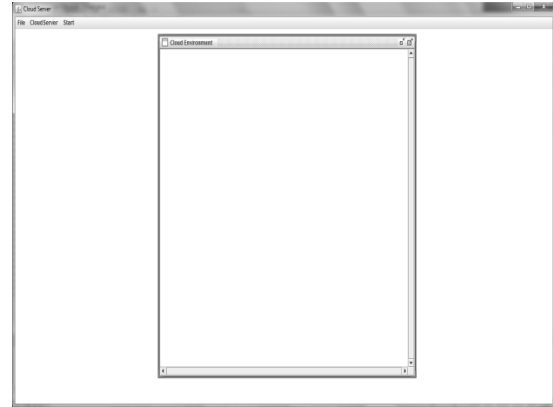


Fig. 4. Snapshot of Cloud Environment and Cloud Server



Fig. 5. Choosing the SD manager option in Cloud Environment



Fig. 6. Creating a new SD Manager in the developed Cloud Environment

Cloud storage services provide, very large volume of storage to outsource user data. Data kept on clouds can also be shared to users that the sharing is authorized by the data owners. Cloud storage provider helps to enforce the authorization policy for data access.

Advantages of the proposed system include:

1. Increased Security of information.
2. Minimizing the treatment cost.
3. Minimize Patient waiting time.
4. No need to carry the medical records manually.

VI. CONCLUSION

In this paper, an extensive study is carried out on managing medical database in cloud. Several approaches of cloud computing and high-performance computing models have been studied and the results were observed. Algorithms pertaining to ensuring security to electronic health records in cloud have been studied along with the computation overhead involved in implementing the algorithms for real and synthetic patient medical records.

Also we have implemented the modular workflow based PHRs storage in Cloud Environment.

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