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SECURE ACCESS CONTROL OF PERSONAL HEALTH RECORDS IN CLOUD COMPUTING USING CRYPTOGRAPHIC TECHNIQUE

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Abstract— Personal health record (PHR) is an emerging patient-centric model of health information exchange, which is often outsourced to be stored at a third party, such as cloud providers. However, there have been wide privacy concerns as personal health information could be exposed to those third party servers and to unauthorized parties. Yet, issues such as risks of privacy exposure, scalability in key management, flexible access, and efficient user revocation, have remained the most important challenges toward achieving fine-grained, cryptographically enforced data access control. In this paper, we propose a novel patient-centric framework and a suite of mechanisms for data access control to PHRs stored in semitrusted servers. To achieve fine-grained and scalable data access control for PHRs, we leverage attribute-based encryption (ABE) techniques to encrypt each patient's PHR file. Different from previous works in secure data outsourcing, we focus on the multiple data owner scenario, and divide the users in the PHR system into multiple security domains that greatly reduces the key management complexity for owners and users. A high degree of patient privacy is guaranteed simultaneously by exploiting multi authority ABE. Our scheme also enables dynamic modification of access policies or file attributes, supports efficient on-demand user/attribute revocation and break-glass access under emergency scenarios. Extensive analytical and experimental results are presented which show the security, scalability, and efficiency of our proposed scheme

. ***Index Terms*—Personal health records, cloud computing, data privacy, fine-grained access control, attribute-based encryption**.

I. INTRODUCTION

A PHR service allows a patient to create, manage, and control her personal health data in one place through the web, which has made the storage, retrieval, and sharing of the medical information more efficient. Especially, each patient is promised the full control of her medical records and can share her health data with a wide range of users, including healthcare providers, family members or friends. Due to the high cost of building and maintaining specialized data centers, many PHR services are outsourced to or provided by third-party service providers, for example, Microsoft HealthVault.1 Recently, architectures of storing PHRs in cloud computing have been proposed in [2], [3].

While it is exciting to have convenient PHR services for everyone, there are many security and privacy risks which could impede its wide adoption. The main concern is about whether the patients could actually control the sharing of their sensitive personal health information (PHI), especially when they are stored on a third-party server which people may not fully trust. On the one hand, although there exist healthcare regulations such as HIPAA which is recently amended to incorporate business associates [4], cloud providers are usually not covered entities [5]. On the other hand, due to the high value of the sensitive PHI, the third party storage servers are often the targets of various malicious behaviors which may lead to exposure of the PHI.

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II. EXISTING SYSTEM

Due to the high cost of building and maintaining specialized data centers, many PHR services are outsource to or provided by third party service providers, for example, Microsoft health vault. While it is exciting to have convenient PHR services for everyone, there are many security and privacy risk.

A. Disadvantages of Existing System

There have been wide privacy concerns as personal health information could be exposed those third party servers and to unauthorized parties.

Department of veterans Affairs database containing sensitive PHI of 26.5 million military veterans, including their social security numbers and health problems was stolen by an employee who took the data home without authorization.

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III. PROPOSED SYSTEM

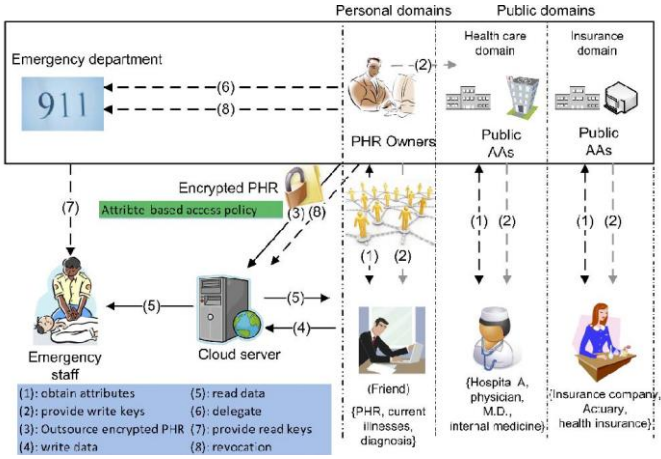
To assure the patients control over access to their own PHRs, it is a promising method to encrypt the PHRs before outsourcing .In this paper, we propose a novel patient-centric framework and suide of mechanisms for data access control for PHRs, we leverage attribute based encryption (ABE) technique to encrypt each patient's PHR file.

We propose a novel patient-centric framework and a suite of Mechanisms for data access control to PHRs stored in semi-trusted servers. To achieve fine-grained and scalable data access control for PHRs.

A. Advantages of Proposed System

We focus on the multiple data owner scenario, and divide the users in the PHR system into multiple security domains that greatly reduces the key management complexity for owners and users .

B .System Architecture



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C. Module Description

1. Registration

In this module normal registration for the multiple users. There are multiple owners, multiple AAs, and multiple users. The attribute hierarchy of files – leaf nodes is atomic file categories while internal nodes are compound categories. Dark boxes are the categories that a PSD's data reader has access to.

Two ABE systems are involved: for each PSD the revocable KP-ABE scheme is adopted for each PUD, our proposed revocable MA-ABE scheme.

PUD - public domains
PSD - personal domains
AA - attribute authority
MA-ABE - multi-authority ABE
KP-ABE - key policy ABE

2. Upload files

In this module, users upload their files with secure key probabilities. The owners upload ABE-encrypted PHR files to the server. Each owner's PHR file encrypted both under a certain fine grained model.

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3. ABE for Fine-grained Data Access Control

In this module ABE to realize fine-grained access control for outsourced data especially, there has been an increasing interest in applying ABE to secure electronic healthcare records (EHRs). An attribute-based infrastructure for EHR systems, where each patient's EHR files are encrypted using a broadcast variant of CP-ABE that allows direct revocation. However, the cipher text length grows linearly with the number of un revoked users. In a variant of ABE that allows delegation of access rights is proposed for encrypted EHRs applied cipher text policy ABE (CP-ABE) to manage the sharing of PHRs, and introduced the concept of social/professional domains investigated using ABE to generate self-protecting EMRs, which can either be stored on cloud servers or cell phones so that EMR could be accessed when the health provider is offline.

4. Setup and Key Distribution

In this module the system first defines a common universe of data attributes shared by every PSD, such as "basic profile","medical history", "allergies", and "prescriptions". An emergency attribute is also defined for break-glass access. Each PHR owner's client application generates its corresponding public/master keys. The public keys can be published via user's profile in an online healthcare social-network (HSN). There are two ways for distributing secret keys. First, when first using the PHR service, a PHR owner can specify the access privilege of a data reader in her PSD, and let her application generate and distribute corresponding key to the latter, in a way resembling invitations in GoogleDoc. Second, a reader in PSD could obtain the secret key by sending a request (indicating which types of files she wants to access) to the PHR owner via HSN, and the owner will grant her a subset of requested data types.

5. Break-glass module

In this module when an emergency happens, the regular access policies may no longer be applicable. To handle this situation, break-glass access is needed to access the victim's PHR. In our framework, each owner's PHR's access right is also delegated to an emergency department ED to prevent from abuse of break-glass option, the emergency staff needs to contact the ED to verify her identity and the emergency situation, and obtain temporary read keys. After the emergency is over, the patient can revoke the emergent access via the ED.

D .CONCLUSION

In this paper, we have proposed a novel framework of secure sharing of personal health records in cloud computing. Considering partially trustworthy cloud servers, we argue that to fully realize the patient-centric concept, patients shall have complete control of their own privacy through encrypting their PHR files to allow fine-grained access. The framework addresses the unique challenges brought by multiple PHR owners and users, in that we greatly reduce the complexity of key management while enhance the privacy guarantees compared with previous works.

We utilize ABE to encrypt the PHR data, so that patients can allow access not only by personal users, but also various users from public domains with different professional roles, qualifications and affiliations. Furthermore, we enhance an existing MA-ABE scheme to handle efficient and on-demand user revocation, and prove its security. Through implementation and simulation, we show that our solution is both scalable and efficient.

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