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Securing Public Health Records in Cloud Computing Patient Centric and Fine Grained Data Access Control in Multi Owner Settings

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Abstract : The PHR is defined as the Public Health Record, this PHR enables the patients to manage their own medical records in the centralized way, and (PHR) emerged as a patient-centric model helps in the health information exchange. With the emergence of cloud computing PHR records are stored into the cloud, it reduces the operational cost. By storing the PHRs in the cloud, the patients lose the physical control to their personal health data, so that which makes it necessary for each patient to encrypt her PHR data before uploading to the cloud servers, in the encryption it is challenging to achieve fine grained access control to the PHR record in a scalable and efficient way , hear each patient, their PHR data should be encrypted so that it is scalable with the numbers of users . also there are multiple owners(patients) in a PHR system And all the owner would encrypt her PHR files using a different cryptographic keys, so it is important to reduce the key distribution, To enable the fine grained and scalable access control for the PHRs hear (AES) .Advanced encryption standard encryption algorithm is used.

Keywords : Cloud Computing, Cryptography, Encryption, Fine Grained and Scalable Access Control, PHR.

INTRODUCTION

Public Health Record (PHR) is an emerging patient-centric module for health information exchange, which is often outsourced to be stored at a third party application vendors, such as cloud providers. PHR enables patients to manage their own medical records, prior to storing the records in cloud server they are encrypted using encryption algorithm which ensures the patient's full control over their PHR. Storing PHRs in Cloud, the patients lose physical control to their personal health data, which makes it necessary for each patient to encrypt her PHR data before uploading to the cloud servers. A PHR Service allows a patient to create, modify, manage and control personal health records in a centralized place through the web, from anywhere and at any time, can also share the data with wide range of users.

LITERATURE REVIEW

An extensive literature survey is conducted to investigate the various approaches for managing the patient records. To keep sensitive user data confidential against un-trusted servers, existing solutions usually apply cryptographic methods by disclosing data decryption keys only to Authorized users. In order to achieve secure scalable and fine grained data access control in Cloud Computing authors used the combination of different types of algorithms viz., Attribute Based Encryption (ABE), proxy re-encryption, and lazy re-encryption [1].

A cipher text policy attribute based encryption scheme with efficient revocation, construction uses linear secret sharing and binary techniques as underlying tools are used, each user is assigned a unique identifier, therefore user can be easily revoked by using his/her unique identifier [2]

Multi-authority ABE scheme specifies that multiple attribute-authorities monitor different sets of attributes and issue corresponding decryption keys to users, and encryptors requires that a user obtain keys for appropriate attributes from each authority before decrypting a message. Chase M. et al., given a solution which removes the trusted central authority, and protects the users' privacy [3].

The challenges of preserving patients' privacy in electronic health record systems, security in the systems should be enforced via encryption as well as access control. Furthermore we argue for approaches that enable patients to generate and store encryption keys, so that the patients' privacy is protected should the host data center Be compromised [4].

EXISTING SYSTEM

In the existing system, PHR model has multiple owners (patients) who may encrypt their records according to their own ways. By using different sets of cryptographic keys each user obtains keys from every owner who's PHR has to be read would limit the accessibility since the patients are not always online.

Another method is central authority to do the key management on behalf of all PHR owners (patients), this requires too much trust on single authority.

DRAWBACKS OF EXISTING SYSTEM

1. There have been wide privacy concerns as personal health information could be exposed to those third party servers and to unauthorized parties.
2. Non-availability of authorization for the accessibility of health records which leads to an insecure data manipulation.

PROPOSED SYSTEM

A secured framework for patient-centric information and a suite of mechanisms for data access control to PHRs has been proposed. To achieve fine-grained and scalable data access control for PHRs, we leverage advanced encryption standard (AES) techniques to encrypt each patient's PHR file and use the security policy to allow the access of the data.

The following figure shows the block diagram of the proposed system.

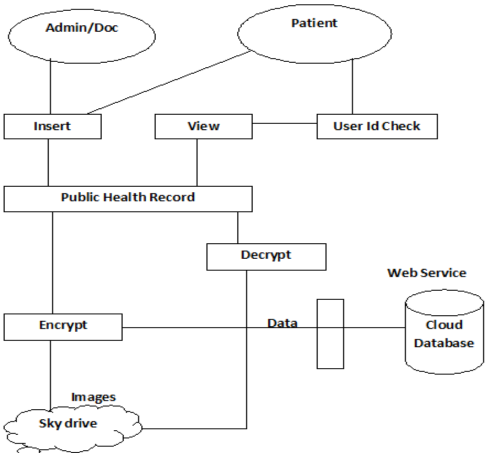


Fig 1: Block diagram of the proposed system

ALGORITHM

Advanced Encryption Standard (AES) is a symmetric block cipher which uses the same key for both encryption and decryption. The algorithm allows a variety of block and key sizes, and not just the 64 and 56 bits of DES block and key sizes, the block and key size can be chosen from 128, 160, 192, 224, 256 bits… The AES standard states that the algorithm can only accept a block size of 128 bits and a choice of three keys 128, 192, 256 bits.
For encryption the number of rounds depends on the chosen key length. The key length 128 bits uses 10 round, the key length 192 bits uses 12 round, the key length 256 bits uses 14 rounds.

For encryption each round consist of following 4 stages

1. Substitution Bytes
2. Shift Rows
3. Mix columns
4. Add Round Key

For decryption: each round consists of the following four stages

1. Inverse Shift rows
2. Inverse Substitute bytes
3. Inverse Add Round Key
4. Inverse Mix Columns

Step1: The substitute bytes stage uses an s-box to perform a byte-by-byte substitution of the block, there is a single 8-bit wide s-box used on every byte, this s-box is permutation of all 256 8-bits values, s-box constructed using defined transformation of values in GF(2^8),

Step 2: The shift rows stage provides a simple permutation of the data, the state is treated as a block of columns, this step provides for diffusion of values between columns. It performs a circular rotate on each row of 0,1.2 and 3 places for respective rows,
Step 3: Operates on each column individually, each byte is replaced by a value dependent on all 4 bytes in the column

Step 4: The add round key stage which is simple bitwise XOR of the current block with a portion of the expanded key,

MODULES

System is comprised of the following modules

1. *PHR Owner/ patient module*
2. *Data confidentiality module*
3. *Cloud Server module*

*PHR Owner/patient module***:** The main goal of this module is to provide secure patient-centric PHR access and efficient key management at the same time. The key idea is to divide the system into multiple security domains (namely public clouds and private clouds according to the different users' data access requirements.
PHR service providers encrypt patients' data, PHR services should give patients (PHR owners) full control over the selective sharing of their own PHR data.

*Data Confidentiality module***:** The owners upload encrypted PHR files to the server. Each owner's PHR file is encrypted both under a certain fine grained and role-based access policy for users from the public clouds to access and under a selected set of data attributes that allows access from users in the private clouds. Only authorized users can decrypt the PHR files.

*Cloud storage module***:** The main function of cloud server is to create an interface between the application and users. The authentication of the user name and password is carried out. If user is authentic then he/she gets access to his/her records.

ADVANTAGES OF THE PROPOSED SYSTEM

The proposed system has the following advantages

- Provides higher level Data confidentiality
- On-demand revocation
- Write access control
- Scalability and usability
- To provide user friendly environment
- To provide easy and faster access information
- Quickly find out information of patient details

It provides an easy platform for medical data sharing between healthcare and patient.

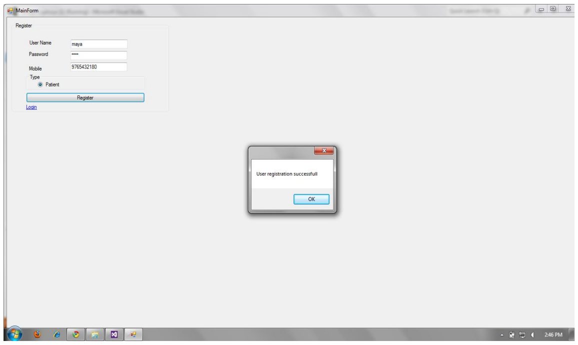
APPLICATIONS

The applications of the AES system spans the following areas

- Multi level Hospital Management
- Health Care Website
- National health data center
- Any time access of medical data
- Privacy protections of patients

RESULTS AND ANALYSIS

The following figures show the sample outputs of various forms used in the system

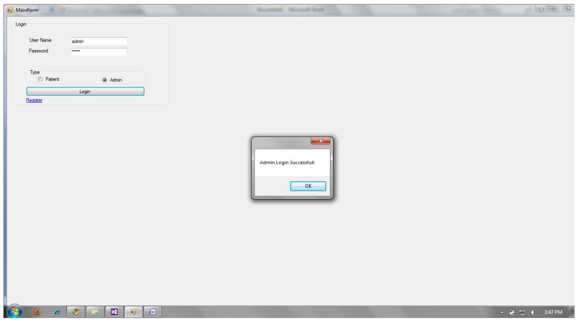

MainForm

Register

User Name: maya
Password: ****
Mobile: 9765432180
Type: ● Patient

User registration successfull

Fig 2: Patient registration

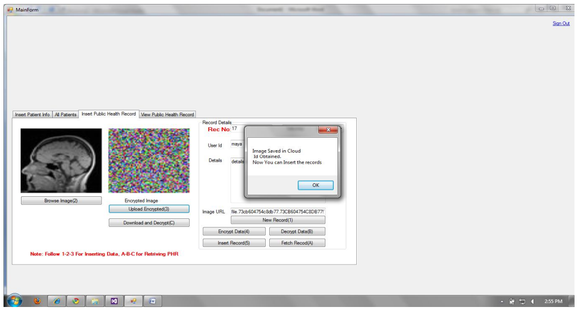

MainForm

Login

User Name: admin
Password: *****
Type: ○ Patient ● Admin

Admin Login Successfull

Fig 3: Admin login

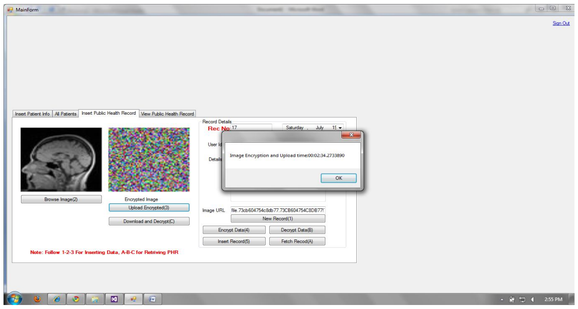

MainForm

Record Details
Rec No: 17
User Id: maya
Details: details
Image URL: file.73cb604754c8db77.73CB604754C8DB77!

Image Saved in Cloud
Id Obtained.
Now You can Insert the records

Note: Follow 1-2-3 For Inserting Data, A-B-C for Retriving PHR

Fig 4: Encryption

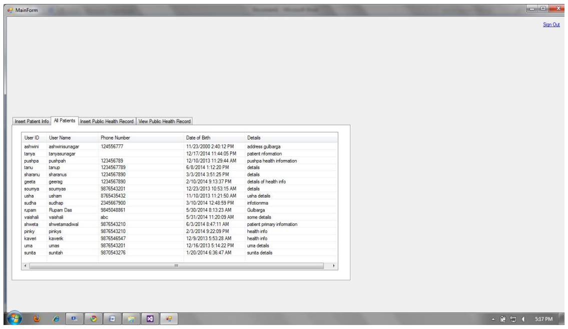

MainForm

Record Details
Rec No: 17
Saturday , July 19
Image URL: file.73cb604754c8db77.73CB604754C8DB77!

Image Encryption and Upload time:00:02:34.2733890

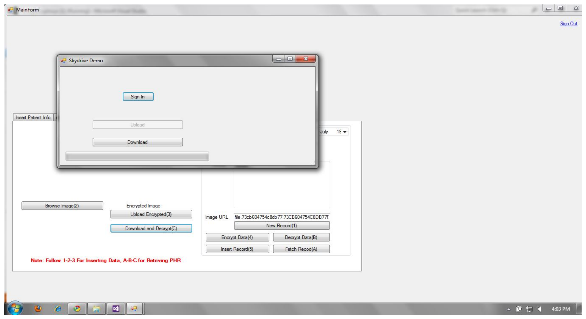
Note: Follow 1-2-3 For Inserting Data, A-B-C for Retriving PHR

Fig 5: Encryption Time


MainForm

User ID	User Name	Phone Number	Date of Birth	Details
ashwini	ashwinisunagar	124556777	11/23/2000 2:40:12 PM	address gulbarga
tanya	tanyasunagar		12/17/2014 11:44:05 PM	patient nformation
pushpa	pushpah	123456789	12/10/2013 11:29:44 AM	pushpa health information
tanu	tanup	1234567789	6/8/2014 1:12:20 PM	details
sharanu	sharanus	1234567890	3/3/2014 3:51:25 PM	details
geeta	geerag	1234567890	2/10/2014 9:13:37 PM	details of health info
soumya	soumyas	9876543201	12/23/2013 10:53:15 AM	details
usha	usham	8765435432	11/10/2013 11:21:50 AM	usha details
sudha	sudhap	2345667900	3/10/2014 12:48:59 PM	infotionma
rupam	Rupam Das	9845048861	5/30/2014 8:13:23 AM	Gulbarga
vaishali	vaishali	abc	5/31/2014 11:20:09 AM	some details
shweta	shwetamadiwal	9876543210	6/3/2014 8:47:11 AM	patient primary information
pinky	pinkys	9876543210	2/3/2014 9:22:09 PM	health info
kaveri	kaverik	9876546547	12/9/2013 5:53:28 AM	health info
uma	umas	9876543201	12/16/2013 5:14:22 PM	uma details
sunita	sunitah	9870543276	1/20/2014 6:36:47 AM	sunita details

Fig 6: View all patients

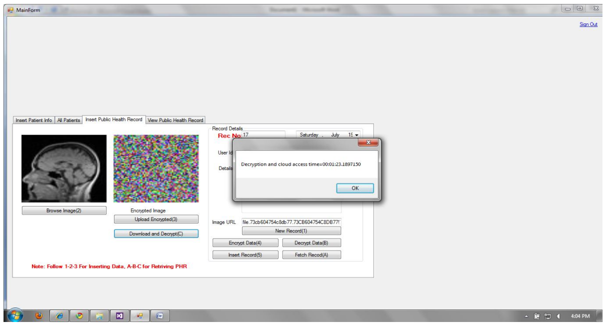

MainForm

Skydrive Demo

Image URL: file.73cb604754c8db77.73CB604754C8DB77!

Note: Follow 1-2-3 For Inserting Data, A-B-C for Retriving PHR

Fig 7: Decryption


MainForm

Record Details
Rec No: 17
Saturday , July 19
Image URL: file.73cb604754c8db77.73CB604754C8DB77!

Decryption and cloud access time=00:01:23.1897150

Note: Follow 1-2-3 For Inserting Data, A-B-C for Retriving PHR

Fig 8: Decryption time

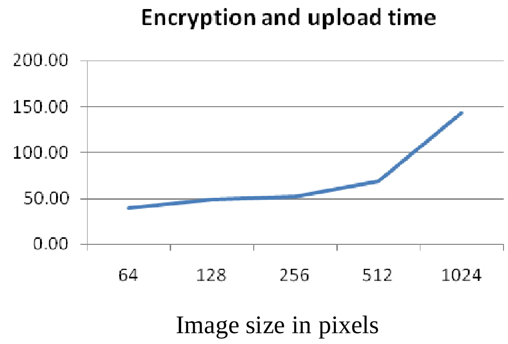


Fig 9: A line graph of encryption and upload time(sec) verses image size in pixels

CONCLUSION

The proposed method overcomes the drawbacks of the existing system and provides higher security level by using Advanced Encryption Standard (AES) encryption algorithm. This approach allows the users to maintain the data in a secured cloud environment by meeting the goals like data confidentiality, write access control, on-demand revocation, etc.

It also makes sure that the secret data of the patient is accessed and used by only authorized persons, providing highest level of security.

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