

A Study on Web Based Sharing Of Medical Data over Cloud

¹A. Lakshmi Sharma K M, ²Madhuri kethari and ³C. Regis Britto Arokia Raja K,
^{1,3}Dept of Computer Science, Indian Academy Degree Collage, Bangalore, India
²Department of computer Engineering, DYPIET, Pune, Maharashtra, India

Abstract: In current scenario, in most of the healthcare systems storing of medical data has increased and that data can transfer between the doctors for further diagnosis, so it is essential to ensure that data will be secured when transferring these data in an insecure medium such as the cloud computing environment, here we are focusing on patient's medical file consisting of reporting images, family history, and the cause for disease which plays a important role for doctors to diagnosis. In order to store and retrieve all these medical data on a private storage system has become a challenge. In this paper, we present an overview of how these medical data can be stored and retrieved from cloud.

Keywords: Medical Imaging, Cloud Computing.

I. INTRODUCTION

In today's digital market, as we all are aware that everything is going digital. So why not the medical images should be the same. Initially all the images taken were on film based which does not give necessary information for an efficient medical diagnosis. For this reason, we need to convert the analog form of image into digital form which can be considered as a preprocessing for medical image processing. Moreover, the images in analog form will gives only information with respect to time, whereas the image in digital form will give us more and meaning information with respect to frequency i.e., anything that changes with time.

Let us now give a brief introduction to cloud computing. Cloud computing was introduced by the *Aamir Shahzad* in the year 1960s with his work on ARPANET to connect people and data from anywhere to anytime. The term *cloud* refers to a network or internet. The cloud is nothing but something which is present at remote location. Cloud computing (CC) is a distributed computing on internet or delivering the computing services over the internet. Cloud computing is nothing more than sharing of resources, software, and information connected to computers and other devices as a utility over a network. All these are the various ways in which we can define cloud computing.

Mobile cloud computing is the form of combining mobile devices and cloud computing to create a new infrastructure for storing massive amounts of data. Increased broadband coverage 3Gnd 4G along with Wi-Fi wireless networking provides better connectivity for mobile devices. The process of storing and retrieving medical data to and from cloud and mobile cloud computing has been the topic of interest. So, let us now briefly discuss about the related work and research challenges for the same. Fig1 shows the cloud based medical data storage between hospitals and physicians at remote locations. In such a scenario, proper authentication is needed to prevent from unauthorized access to healthcare systems. Privacy and Security are the major concerns that need to be considered in dealing cloud computing.

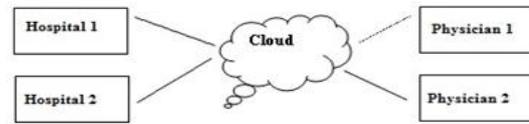


Figure 1: Cloud based medical data storage

II. BACKGROUND

The medical data stored in healthcare organizations is the most significant data than any other data. It is not enough to store all these data at one private institution or an organization. There is a need to transfer this kind of data from one end to other end for remote medical diagnosis and also for future medical staff education. In early days, the hospitals used to maintain paper-based record commonly known as traditional systems. In this kind of storage systems, always there is a chance of information loss; also more investment is necessary for backup and recovery. To overcome such drawbacks, nowadays many of the hospitals go for maintaining electronic based medical record which provides fast and efficient access for the users. *Equations*

The comparison of traditional (also known as paper based) and electronic based systems is summarized briefly. *Cost:* More in paper based systems to maintain records and less in electronic based as it requires less man power. *Security:* There is a loss of record in paper based systems due to human error or disaster such as fire or flood. In electronic based systems, they are vulnerable to unauthorized access to individuals, when the efficient security systems are not in proper place. *Reliability and Accuracy:* Difficult to read and understand records in paper based and also professionals find an insufficient space to update these kinds of records. Electronic based systems on the other hand, all records written in a standardized format which leads less confusion for both the end users. To overcome all these kind of issues, most of the healthcare organizations go for the cloud based storage systems. In such a scenario, security becomes the major challenge for transmission of medical data from one user to the other user.

III. CLOUD BASED MEDICAL IMAGE EXCHANGE

Cloud Based Medical Image Exchange provide on demand medical imaging information technology (IT) services from remote or remotely managed third-party platforms over a network. Medical imaging is the process used to create images of the human body (or parts and function thereof) for medical procedures seeking to reveal, diagnose or examine disease. Medical images are the main means of the healthcare diagnostic procedures. Medical images come from a board spectrum of imaging technologies such as computed axial tomography (CT), magnetic resonance imaging (MRI), digital mammography and positron emission tomography (PET), and they generate a large amount of image data and important medical information.

The MRI, Ultrasound scan and CT images are mainly stored in digital formats which are related with the patient data and

information. One of the main digital format used for medical imaging is DICOM (Digital Imaging and Communication in Medicine). It is a standard for handling, storing, printing and transmitting information in medical imaging. DICOM files can be exchanged between two entities that are capable of receiving image and patient data in DICOM format. A DICOM file consists of two parts, a file header and a data set part, as shown in Fig.1. The File header contains identification information while Data Set part contains the actual medical image. The header consists of a 128 byte File Preamble, followed by a 4 byte DICOM prefix. A Data Set represents an instance of a real world Information Object. A Data Set is constructed of Data Elements. Data Elements contain the encoded Values of Attributes of that object. The Transfer Syntax used to encode the Data Set shall be the one identified by the Transfer Syntax UID of the DICOM File Meta Information.

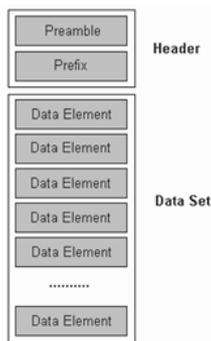


Fig.1 A DICOM File

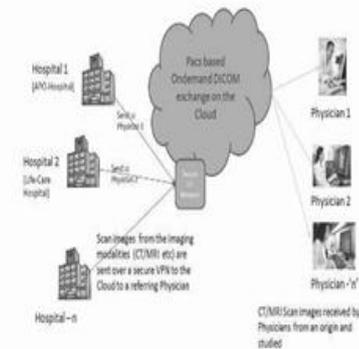
Cloud services enable storing, archiving, sharing and accessing images which allows the healthcare organizations to manage data more efficiently and cost effectively [1]. Cloud based medical image sharing is a very cost-effective investment in a lot of hardware. After confirming the identities of each provider, cloud medical image sharing can proceed over a virtual private network (VPN). As part of this connection, the provider receiving the image uses a password sent via email to log into the cloud server and see the studies. A secure cloud-based medical imaging exchange can speed access to pertinent current and historical imaging studies. It securely connects referral hospitals, physicians, and specialists online, enabling organizations to leverage their existing RIS and PACS systems. Hospitals that deploy a medical image exchange can view and share images and reports with their referral partners in real time, without relying on physical media such as CDs.

The sharing and exchanging of medical images through cloud can be of two paradigms [6]. The first method is to provide a set of services in the cloud that move medical images between sites on demand. The second method includes archiving the medical data in cloud so that original source sends images into cloud only once. Through the cloud, medical image sharing will help patient safety and satisfaction by cutting down on the number of duplicate tests, potentially saving money and protecting people from unnecessary side effects of repeated tests. The benefits of putting medical images in a cloud include

- a) **Data Portability:** With online patient health records, it is easier to access and share data between the patients and doctors and between the specialists.
- b) **Increased and Flexible Storage Capacity:** With cloud-based EMR, doctors and other healthcare professionals do not have to administer/upgrade their own hardware. Additional data storage is available as needed.

c) **Data Migration:** The main benefit of cloud technology is that data need to be migrated only once. Then the data can be accessed and utilized with any PACS. It is necessary for an organization to work with a vendor that can migrate data efficiently, since it is time and resource intensive criteria.

d) **Patient-Centric Connected System:** Consolidating and storing medical image information in single centralized repository in the cloud instead of multiple PACS in different sites means health care providers can quickly access and share images across various departments and organizations. The schematic diagram for sharing of medical images through cloud is shown in Fig 2.



IV. RESEARCH CHALLENGES

Nowadays in many health care organizations, the rate of storing dynamic medical data in cloud based storage systems has been increased tremendously. [16] Hospitals and professionals buy or lease storage capacity from providers to store all sorts of data in the cloud. Some of the research challenges that need to be focused are discussed here.

A. Privacy and Security

Providing data security and privacy for the medical records is a major challenge because it's all about the patient sensitive information relating to his medical health checkup routines. Further, there are more issues regarding security attacks. The most common attacks for security are active attacks and passive attacks. In active attacks, the attackers not only modify the contents of data but also system resources, whereas, in passive attacks the attackers only modify the contents of the data leaving the system resources untouched. Furthermore there are again various security services and security mechanisms that need to be focused when storing patient's sensitive information which includes name, address, and personal account number and so on.

B. Data Confidentiality

The other major challenge is the data confidentiality. The data stored on cloud should be of high confidential such that the most important information will be shared only for the authorized individuals and not for everyone. The leak of data will however leave a negative impact on patients, which as a result degrades the fame of the organizations.

C. Integrity

This kind of the challenge is nothing but the data integrity. The data so far stored on cloud will be modified only by the authenticate users and not by all others. In general, data integrity means only the authorized users have access to modify the contents of the data stored on cloud and thus preventing it from the unauthorized access.

D. Availability

Assures that system work promptly and service is not denied to authorized users. This means that the system is available all the time only to the authorized users and not to the unauthorized users.

CONCLUSION

In this paper we discussed about the need to store medical data on cloud based storage system. There are various storage mediums existing in the healthcare industries and we selected the advanced method of storing the data on cloud computing. This medical data can also be transmitted from one end to the other end by using cloud computing. The future scope of this study is to focus on the security issues in transmitting medical data on cloud computing. Medical Imaging and Cloud computing could become the most data and computing intensive activities in future. Cloud is an emerging approach for various medical imaging applications. In this paper we discussed about cloud based medical imaging mechanism and analyzed the various security issues associated with this approach. We examined the current solutions and discussed their limitations. Finally we discussed the future directions for research.

Reference

- [1] Chang-Won Jeong & Woo-Hong Kim "The development of a medical image information system environment using data synchronization based on cloud computing" Springer Science Business Media New York 2015.
- [2] Pierfrancesco Bellini & Ivan Bruno "Mobile Medicine: semantic computing management for health care applications on desktop and mobile devices" Springer Science Business Media, LLC 2010.
- [3] Sun-Ho Lee and Im-Yeong Lee "A Secure Index Management Scheme for Providing Data Sharing in Cloud Storage" J Inf Process Syst, Vol.9, No.2, June 2013.
- [4] Zeeshan Siddiqui & Abdul Hanan Abdullah "Smart Environment as a Service: Three Factor Cloud Based User Authentication for Telecare Medical Information System" Springer Science Business Media New York 2013
- [5] Zhian Zhu "An Efficient Authentication Scheme for Telecare Medicine Information Systems" Springer Science Business Media, LLC 2012
- [6] Muhammad Khurram Khan and Saru Kumari "Cryptanalysis and Improvement of "An Efficient and Secure Dynamic ID-based Authentication Scheme for Telecare Medical Information Systems" Published online 10 June 2013 in Wiley Online Library.
- [7] Luis A. Bastia Silva and Carlos Costa "A PACS archive architecture supported on cloud services" Published online: 16 June 2011
- [8] Chia-Chi Teng, Jonathan Mitchell, Christopher Walker, Alex Swan, Cesar Davila, David Howard, Travis Needham "A Medical Image Archive Solution in the Cloud" School of Technology Brigham Young University Provo, UT, USA ccteng@byu.edu
- [9] Chao-Tung Yang, Chiu-Hsiung Chen, Ming-Feng Yang "Implementation of a medical image file accessing system in co-allocation data grids" published in 2010 Elsevier
- [10] RANDOLPH C. BARROWS, JR., MD, PAUL D. CLAYTON, PHD "Privacy, Confidentiality: and Electronic Medical Records" Received for publication: 11/2/95; accepted for publication.
- [11] S. Gritzalis, J. Iliadis, D. Gritzalis, D. Spinellis, S. Katsikas "Developing Secure Web-based Medical Applications" Medical Informatics, 24(1):75-90, 1999.
- [12] Fatma E.-Z. A. Elgamal, Noha A. Hikal "Secure Medical Images Sharing over Cloud Computing environment" (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 4, No. 5, 2013
- [13] Abhishek Kumar Gupta, Kulvinder Singh Mann "Sharing of Medical Information on Cloud Platform-A Review" IOSR Journal of Computer Engineering (IOSR-JCE) published in April 2014
- [14] "Impact of Cloud Computing on Healthcare" published in 2012 at Cloud Standards Customer Council
- [15] G. Kanagaraj and A.C. Sumathi "Proposal Of Sharing Medical Images In An Opensource Cloud Computing