Sharing of Medical Information on Cloud Platform-A Review

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Abstract: *At present hospitals store the physical fitness data in paper printed format and these formats are saved in archives in a very irregular manner. The present work aims at the application of cloud computing in a secure way to share and store the medical information. With the stored information concerned physician will be able to build better and deeper referral networks of online medical information transfer system. It results in increase of volume and opens more transferred platform for exchange and collaboration of medical information.*

Keywords: *Cloud Computing, Sharing of Medical Information, Benefits, Challenges.*

I. Introduction

The Baby Boomer generation continues to age and by 2020 more than 1 000 million people aged 60 years and older will be living in the world [1].The present world population is 7 billion. It is expected to reach 9.3 billion in 2050 and 10.1 billion in2100 [2]. Advances in healthcare technologies mean people are living longer, but there are more chronic diseases and the medical records of patients also increase day by day. Enormous increase in medical records presents a big challenge for healthcare providers as they have to manage, share and process these data while reducing costs.

Medical record sharing system [3] enables medical records to be shared across all healthcare establishments. With quick and accurate access to essential medical information, medical staff involved in treatment can customize treatment to better meet patient's unique needs, wherever he is. The main advantages of sharing medical information are:

1.1 To improve the quality of care provided, ensuring the patient gets well faster.

1.2 To increase the safety. For example, ready access to information about patient's drug allergies and current medications enables doctors to prescribe medication accurately and reduces unnecessary side effects.

1.3 To reduce the cost for patients as doctors can view the results of any blood tests, x-rays, CT Scanesetc online. This eliminates the need for repeated tests.

In the past, film was the medium used to share medical images with multiple health care services [4]. But it was expensive, clumsy and inefficient. Later compact disc (CD) came into use in place of film [5]. The main advantages of CD are low costs, portability and high storage. CDs have a different viewer which differ in many ways and often are not intuitive to new users or occasional user to use them. Further, Discs can become defective and unreadable. Then new technology comes in existence like peer-to-peer (P2P) [6] systems and cloud computing systems [7] that are capable sharing the medical information through the cloud.

In this paper we describe the various challenges for organizing the medical record and the mechanism for medical information storing and sharing of medical information through cloud platform. The issue associated with sharing of medical images through cloud, the existing solutions, their limitations and the feature direction for this are described.

II. Traditional Medical Information System

Currently in the hospitals the physical fitness result will be recorded in the written form and saved in archives regularly. If people wants to access them, or the healthcare personal need them to conduct further data analysis, additional manpower are required to deal with [8].

Many of the current healthcare, medical information and emergency systems are still paper-based and stand alone systems that do not fully utilize the Internet, multimedia, wireless and real time technologies [9]. We can summarize the drawbacks for traditional systems as:

2.1 Lack of availability of global medical information sharing system that will be effectively used by all the emergency and healthcare organization [9].

2.2 Several of the medical healthcare organization that uses electronic medical storage system for storing patients' information is window-based [9].

2.3 Lack of availability of utilization of open source software, which results in expensive to maintain systems [9].

2.4 Lack of availability of support of multimedia, real-time and mobility technology [9].

2.5 Lack of availability of integration between medical and emergency systems [9].

2.6 Lack of availability of automatic generation for Plan of Care (the P*lan of Care* is a document created to finalize the treatment order) [9].

III.   Cloud Based Medical Information System

Cloud computing is an emerging approach for various medical imaging applications [10]. Cloud – based medical information sharing platform is becoming more prevalent in medicine. Ultimately online medical information sharing system allows physicians to build better networks for storing the increased volumes of medical information and a more open platform for sharing and accessing of medical information. Cloud computing has gathered specific attention from information technology vendors by providing massive storage applications and highly managed remote services. Cloud computing platform makes an exchange platform which is used by the all healthcare organizations and can be used as a storage center for the purpose of storing the medical records. Reliability and security are the main concerns about cloud computing. The effect ofcloud computing technology can be both positive and negative in data security.

IV.   benefits of sharing medical information on cloud platform

The benefits of putting medical information on cloud platform include the following.

4.1   *Ease of Access*

Despite the elegant name, cloud computing is a highly simple to use technology to add to medical organization. In fact, part of the application of cloud computing for many business enterprises is related to speed of the technology and ease of access. In comparison between traditional server-based storage system of medical records and the cloud computing based storage system of medical records, cloud computing based storage system of medical records is much better, faster and easier to access, as well as boasting lower downtime percentages. Likewise, because all of the medical information is accessible from the cloud computing based centralized system, the access of information can be possible from anywhere with internet connection [10].

4.2   *Cost*

Sharing of medical record on cloud platform is a cost efficient technology. In fact, some studies showed that use of cloud computing technology can decrease the costs of Information Technology industry by 20% annually through minimize the hardware, software and on-site IT costs. It is realized that the use of cloud computing technology for medical practice can be cost beneficial measure to increase the revenue for the office [11].

4.3   *Increases Productivity and Efficiency*

Purchasing cloud computing services to extend infrastructure investments and supplements already-stretched IT staff can make a healthcare organization much more efficient when it comes to labor, patient care, and IT resource management. In cloud computing technology there is no need to upgrade individual technology. Regulations compliance, backup systems and disaster recovery can be managed in centralized fashion. On the user end, physicians/healthcare professional save time when access the medical information from cloud and avoid long waiting time when physicians/healthcare professional access information from disconnected data storage systems.

4.4   *Scalable to Cost-Effectively Meet an Organization's Needs*

With medical information archive volumes increasing exponentially, many medical organizations are in confusion how they will manage and pay for potentially big amount of future data storage. Cloud computing services work on a pay-as –you-go policy, with the user paying for the amount of capacity actually used. For the medical organizations this may be a cost-effective way to increase storage and compounding needs as the organization grows, paying for storing the medical information as an expense without making additional capital investments [12].

4.5   *Creating a More Connected, Patient-Centric System*

Storing the patient medical information in one centralized repository in cloud has good advantage instead of storing the medical information in multiple soiled PACS at different geographic location. With the help of storing the patient medical information in one centralized repository in the cloud the healthcare professional can quickly access and share medical information about a patientacross the various departments and organizations .The healthcare professional is able to create a comprehensive picture of patient's health status and enabling with better care [12].

V.   Challenges In Sharing Medical Information On Cloud Platform

Although sharing of medical records on cloud platform makes thetransfer of medical information faster and improves patient care, but the biggest stumbling block to widespread use of cloud computing technology for the sharing of medical record is still fear and unease about technology. Some of the challenges in sharing of medical information on the cloud platform are mentioned here.

5.1   *Distributed Denial of Service Attacks*

One of the main security threats in Sharing Medical Information System is Distributed Denial of Service Attacks. This attack is a threat to the availability of cloud infrastructure and its resources. Hacker exploits weakness in cloud defense methods, utilizing cheap, easily accessible tools to launch these attacks. The cloud computing service providers and cloud computing technology operators are not well prepared to defend against such types of distributed denial of service attacks. Firewalls and IPSs provide the layer defense policy, but they are designed to solve security problem that are not sufficient to provide defense against distributed denial of service Attacks. Existing solutions mainly concentrate to mitigating these attacks by keeping a small attack surface, monitor traffic regularly, blocks whatever traffic makes such type of attack as soon as possible and block access to ports that only need to be accessed from specific locations, as this attack become more threatening, cloud computing technology operator and cloud computing service provider must find new way to specify and avoid distributed denial of service attacks.

5.2   *Confidential Data Leakage*

Confidentiality of medical information stored in cloud is a top security issue. Cloud computing service providers should have to take steps to protect the confidentiality of stored information in their data centers because of high costs from disclosure of stored information in data centers which results violation and loss of reputation of cloud computing organization. Confidentiality of data cannot be maintained and protected easily because of lack of visibility, sharing of information and attacks of malicious insiders.

5.3   *Security issues in Sharing of Information in Cloud*

Security is a main concern when cloud computing service providing organizations are ready to develop cloud computing technologies. Security refers to physical, technological or administrative safe guards or tools used to protect identifiable health data from unauthorized access or disclosure [13]. The main data security components are privacy, confidentiality, integrity and availability.

5.4   *Zero Tolerance*

Due to encryption or watermarking, spots will appear in medical images retrieved from cloud. This may lead to wrong interpretations like presence of tumor outgrowth etc. On the basis of these details doctors may give fault diagnosis. For preventing this zero tolerant images is needed in which watermarking techniques should be performed carefully. It requires extreme care when embedding additional data within medical images because this information must not affect the image quality [10].

VI.   Related Works

Cloud computing is an architecture for providing computing service via the Internet [14]. Cloud Computing has become another buzzword after Web 2.0 [15]. Cloud Computing is an emerging approach for accomplishing the demand of expensive software in IT industry. Cloud computing eliminates the need to maintain the expensive computing hardware. Virtualization can improve overall system security and reliability by isolating multiple software stacks on their own VMs [16]. The clouds provide an alternative for clusters, grids, and supercomputers to the scientist [17]. Cloud computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the data centers that provide those services. The services themselves have long been referred to as Software as a Service (SaaS) and Some vendors use terms such as IaaS (Infrastructure as a Service) and PaaS (Platform as a Service) to describe their products[18]. With the significant advances in Information and Communications Technology (ICT) over the last half century, there is an increasingly perceived vision that computing will one day be the 5th utility after water, electricity, gas, and telephony[19].

In [20], authors proposed a healthcare web service broker approach that facilitates the exchange of patient records using web service architecture. This approach provides doctors with complete patient medical records, which reduce the cost of medication, by avoiding tests duplication and decreasing the waste of healthcare resources as well as reducing medical errors.

In [21], authors proposed a Web Service-Based Integrated Healthcare Information System (WSIHIS) to address the interoperability issue in existing HISs, in WSIHIS web service plays a role of middleware that hides all languages, database and platform differences from users and developers. The main objective of the paper is

to show how web services and Microsoft.Net technologies are used to deal with system and language interoperability.

In [8], authors build a platform which integrates the expert system with the web-based medical information analysis platform. The main objective of this paper is to show how web-based medical information analysis platform allows the physicians to diagnose and analyze on the health checkup data on any device connected by internet.

In [22], authors presented MyPharm Machines, which allows patients to build lifelong personal health records. The records can be shared by the patient with any stockholders interested in those.
In [23], authors proposed a modeling process for medical web service, furthermore they defines requirements of a web service based middleware for the execution of medical web service basis protocols. They also focused on the composition of web service using BPEL and define requirements to model IHE transactions as medical web service.

VII. Conclusion

It is concluded that:
7.1   It is observed that sharing of medical information on cloud platform is feasible.
7.2   It is observed that sharing of medical information on cloud platform is economical.
7.3   It is observed that sharing of medical information on cloud platform is quite efficient.
7.4   It is observed that sharing of medical information on cloud platform is more flexible in use.
7.5   The potential of sharing of this (medical information on cloud platform) process should be exploited further for the benefit of human beings.

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