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"MOBILE CLOUD COMPUTING FOR E- HEALTHCARE MONITORING"

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INTRODUCTION

Many healthcare professionals, hospitals and insurance agencies maintains the paper-based records, billing of the patients which is been converted later into computer-based billing and records which can be abused, modified or lost for malpractice done by frauds either for money or grudge. Hence the personal information of the patients is revealed, bogus information are entered and misused in traditional Healthcare system. Moreover Traditional healthcare system depends on the centralized server which is unreliable, insecure in accessing, storing medical data regardless of time, cost and location. Hence it is more complex and lack privacy and cost involved in integrating medical information is expensive. Given this scenario, Electronic Healthcare system is used to reduce healthcare differences and ensures adequate security and privacy. To overcome these issues introduce cloud computing concept in electronic healthcare monitoring systems.

Android operating system is used as a client application which focuses on two specific goals: the availability of e-healthcare applications and medical information anywhere, anytime and invisibility of computing Mobile Apps basically support Electronic Billing System, Electronic Health Record, Electronic Medical Record and Personal Health Record activities of patient and their medical history which can be accessed individually by patient, healthcare provider, healthcare payer by authenticating themselves with server side database. This application is developed by open source cloud computing technologies, to build an affordable, secure and scalable platform that support electronic healthcare monitoring system using Virtual Private Network connection. A VPN is a technology

that uses a public network reside in cloud storage to connect remote monitoring or users together while using a VPN connection, organization ensure security to protect the data as well as anyone can't able to read the encrypted data. Android healthcare monitoring application system has been developed for cloud server within the mobile Virtual Private Network of public network. This system can be established the flow of data between cloud server and android application securely.

OVERVIEW OF E-HEALTHCARE MONITORING SYSTEM AND CLOUD COMPUTING

The advancement of telecommunication in medical field makes the diagnosis and treatment of people easy. Now monitoring the health of patient details and to provide him treatment on time is possible. But their some issues related to physical data storage, privacy of accessing user data, security etc. But with the help of the cloud computing these issues are reduced now. Cloud Computing is an on-demand network access to computing resources such as networks, servers, storage, applications, and services which can be quickly accessed, managed by a service provider and any users can access the resources via the internet. This cloud model promotes availability and is composed of essential characteristics, deployment models, and various service models. Electronic healthcare monitoring system is accessed by all the participants' healthcare system such as patients, healthcare providers healthcare payers, health insurance and billing system using open source cloud which acts as a server that faces several challenges, like data storage, management (Eg. physical storage issues, availability & maintenance), interoperability, availability of resources, security and privacy.

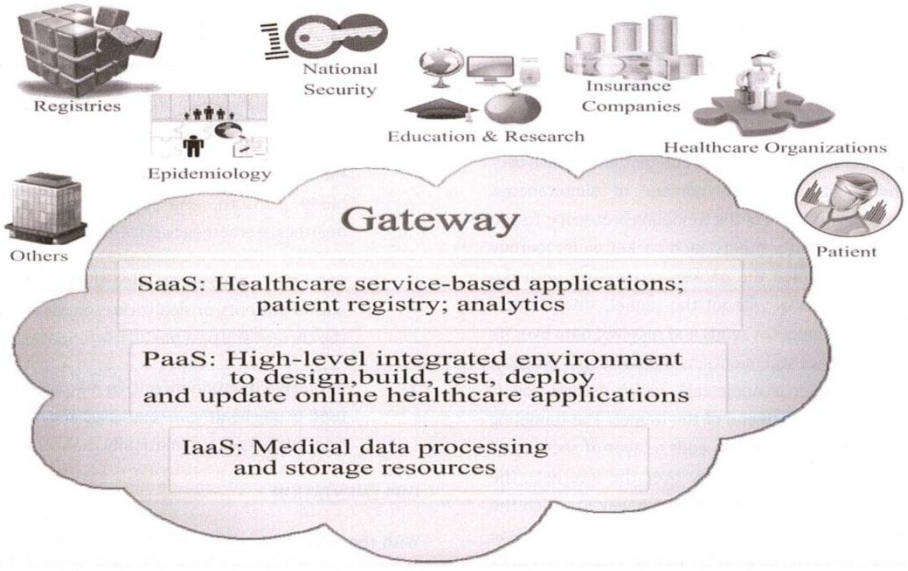

Figure 1. The generic architecture of e-Health Cloud

A data analytics framework can be used by various stakeholders to not only manage disease treatment but also improve the quality of patient outcomes. However, the security of data is paramount. Data use should focus on patients' protected health information for research, but their privacy should be protected in compliance with HIPAA (Health Insurance portability and Accountability Act). This federal act sets standards for protecting the privacy of your health information.

RELATED WORK

Some efforts were invested in the e-Health Cloud implementation models. One example is a practical e-Health Cloud implementation model to support the construction of HIS for small healthcare providers who cannot afford to have their own HIS systems. This solution imposes uniform standards of data sharing between existing HIS. The model suggests using a virtual private network (VPN) with the support of public networks such as the Internet to establish a private Cloud through which different hospitals can share HIS information. The VPN framework is easily implemented by adding a secure communication model to the existing HIS systems. This secure communication is used to connect to the Cloud for data transmission, storage and sharing.

The Mobile healthcare service is provided by the mobile health providers. The provider gives the facility of health monitoring according to patients convenience with the maximum use of mobile device. The main aim of this paper is to provide the patient's healthcare information stored in cloud server and to retrieve the date more securely using Virtual Private Network.

The VPN provide the high quality of connection for each user while handling its maximum number of simultaneous connections. The main use of the tunneling protocol is to add a layer of security that protects each packet on its journey over the internet. When the packet is travelling with the same transport protocol without the tunnel, this protocol defines how each computer sends and receives data over its ISP. Each inner packet still maintains the passenger protocol such Internet Provider or Apple talk, which defines how it travels on the LAN at each end of the tunnel. The tunneling protocol used for encapsulation adds a layer of security to protect the packet on its journey over the internet. The healthcare monitoring system provides a way in which the patient details are anytime, anywhere required and these data is highly secured because of Virtual Private Network connections [9]. A VPN is a technology for establishing a private data communication network in a public network relying on an ISP & NSP. According to networking types the VPN can be divided into a fixed VPN & mobile VPN. Fixed VPN: It provides users with VPN access through fixed communication network. Mobile VPN: It provides users with VPN access through such mobile communication network as a General Packet Radio Service (GPRS), Wide-based Code Division Multiple Access (WCDMA), Code Division Multiple Access (CDMA), Long Term Evolution - System Architecture Evolution (LTE-SAE) network. In General, a mobile VPN is described in service provider networks co-operate to dynamically extend a virtual routing area of a local service provider network to the edge of all visited service provider network and thereby enables IP address continuity for a roaming wireless device.

APPLICATIONS OF MOBILE HEALTHCARE

There are a few schemes of Mobile Cloud Computing applications in healthcare. For example, presents five main mobile healthcare applications in the pervasive environment [4].

1. **Comprehensive health monitoring services** enable patients to be monitored at anytime and anywhere through broadband wireless communications.
2. **Intelligent emergency management system** can manage and coordinate the fleet of emergency vehicles effectively and in time when receiving calls from accidents or incidents.
3. **Health-aware mobile devices** detect pulse-rate, blood pressure, and level of alcohol to alert healthcare emergency system.
4. **Pervasive access to healthcare information** allows patients or healthcare providers to access the current and past medical information.
5. **Pervasive lifestyle incentive management** can be used to pay healthcare expenses and manage other related charges automatically.

IMPLEMENTATION

With the advent of mobile devices, patients now have the ability to monitor their health indicators by the second and contact their physician with any concerns. Patients mainly track weight, vital signs, calorie intake, sleep patterns, etc. in real time. The dominant functionality of the application is to provide patients related data with a mobile user interface for managing healthcare information more securely using Virtual Private Network. The patients' data may reside at a distributed Cloud Storage facility, initially uploaded/stored by medical personnel through a Hospital Information

System. Cloud-based services are being used in the healthcare industry to exchange medical, financial and other sensitive data across healthcare information exchange networks. The content resides remotely into the distributed cloud storage in VPN in the public network; but access is presented to the user as the resources are located locally in the device. Patient Health Record Management: Information regarding patient's status, related bio signals and image content can be displayed and managed through the application's interface. The progressive coding allows the user to decode large image files at different resolution levels optimizing this way network resource and allowing image acquisition even in cases network availability is limited. The code for performing wavelet decoding on mobile devices in has been modified to support the JPEG2000 standard on the Android platform. Image annotation is also supported, using the multi-touch functions of the Android OS. Proper user authentication and data encryption :

User is authenticated at the Cloud Computing Service with SHA1 hashing for message authentication and SSL for encrypted data communication.

CONCLUSION

The development of this system is based on android open source platform, which provides cost effective and fast retrieval of healthcare related information to access more securely using Virtual Private Network reside on the public network. The presented system provide a secure connection to a centralized for cloud server with in the Virtual Private Network of public network, in which establishes the flow of data between cloud server and android application securely. To address the security challenges and policy for all patients and service providers who use mobile devices should be developed. Hacking and malware infections must be handled using application control and patching. Universal standards should be developed and regulations put in place to ensure privacy and security. The mobile health care system can improve the quality of patient care and reduce medical cost for both patients and hospitals.

Despite all the efforts, the e-Health Cloud is still in its infancy. The models so far proposed including the ones we discussed in this paper offer the beginnings of more comprehensive approaches that will satisfy the requirements of the healthcare providers and other relevant entities. Several approaches offer promising solutions, yet they need to clear out the wrinkles and enhance their techniques to be usable. The healthcare industry is huge and in desperate need of effective, highly available, secure and low cost IT solutions. Therefore, it is extremely beneficial for the cloud owners and service providers to invest in the e-Health Cloud and offer comprehensive services that will cater for this sector's needs and facilitate its operations.

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