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Framework for Primary Health Centers (PHC) using Cloud

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ABSTRACT: It is widely accepted in the recent years that the need of information and communication technologies in the health care environment will improve care delivery to a large extent. The Health Care Organization is one of the great service organizations in the world which mainly depends on Information Technology and Management Systems to provide better service and accuracy of information to their patients. Nevertheless the existing system are mainly focusing on information of patient health record and the electronic medical record inside the organization. In order to develop public oriented health care system we propose a framework for PHC(primary health centers) which is based on cloud computing infrastructures with semantic web and machine learning algorithm by collecting the medical data from various PHC located in various parts of India. The cloud-based storage makes the information available for everyone who's taking care of the patients, allowing doctors to view their patient history, diagnoses, treatment and also provide remote health consultation. Encryption techniques for service composition are used for the improvement of the proposed public health care platform.

KEYWORDS: Cloud computing, semantic Web, machine learning algorithm, service composition.

I. INTRODUCTION

The Cloud adoption in healthcare evolves a major chunk of healthcare services to move onto the Cloud, by focusing on providing cost effective and efficient healthcare services [1]. The healthcare industry has traditionally been considered to be a slow adopter of technology and there are applicable reasons for their careful approach. Many of the healthcare players have not adopted technology completely in their environments as yet and their primary focus has been on automation of back office systems, payment and reimbursement, digitisation of medical records, and business intelligence for regulatory compliance and accreditation. In many emerging/developing countries like India, IT budgets are very low. Investments in IT compete with other priorities like radiological equipment or operational expansion.

Benefits of cloud technology for healthcare - Transforming Service Delivery

The keys to transforming service delivery through the cloud require the following:

- Decreasing capital expenditure and leveraging existing assets
- Controlling ongoing development, delivery and operations costs
- Increasing the speed and flexibility of developing and providing new (differentiated) services
- Efficiently managing the customer relationships over the cloud (e.g. billing)
- Such challenges illustrate the complex interdependencies required to provide cloud services and currently no single service partner can deploy and manage all the services that end customers are demanding.

In late 1960s, the U.S. started the study of Hospital Information System(HIS), which supports the clinical and medical patient care activities in the Hospital, Administration of the Hospital(financial, personal, payroll etc.), Evaluation of Hospital



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performance and cost. By the year of 2004 many hospitals in the U.S. had finished the Electronic Medical Record (EMR). The EMR is a computer based information system which includes patient lists, lab result, appointment, radiology reports, and therapy notes.

The National committee on Vital and Health Statistics of the U.S. submitted a strategic report on National Health Information Infrastructure (NHII) [1] which explains the NHII from three dimensions; they are Personal Health, Medical Institution and Public Health. On January 20, 2004, The former President George W. Bush introduced the Electronic Health Records (EHRs) for all U.S. citizens which includes the collection of electronic health information about patients, where health information is defined as information pertaining to the health of an individual or health care provided to an individual.

The National Health Service (NHS) released a report of "Information for Health: an information strategy for the modern NHS[2] which helps to share the patients' health information among general practitioners and hospitals in real time. In Australia, the National E-Health Technology Architecture was introduced at the national level [3]. Its purpose is to lead the uptake of E-health systems and to coordinate the progression and adoption of E- health by delivering urgently needed integration infrastructure and standards. Through the establishment of patient-centered clinical information systems in the hospitals, the medical professionals can easily access the patient medical history very effectively. Similar work of regional health information was carried out in some European countries like Singapore, Japan, and other countries. For example, the Red System in Denmark manages 76 hospitals and clinics. In France the Grenoble Integrated HIS makes integrated management to three major hospitals and three medical colleges. In China With the development of IT the national project named "Jin Wei," has made great progress in the field of medical. According to the latest survey by the Ministry of Health, 84% of provincial-level hospitals, 37% of municipal-level hospitals, and 34% of county-level hospitals in China have established HIS.

It is clear that the former work, including each country's support projects and research, mainly focused on the information of the hospitals or medical institutions within the organization, including Health information system, radiology information system and EMR. In India, The new proposed cloud based public health care model needs to provide individuals with personal health information management services and to realize personal health risk evaluation and counseling, dynamic personal health checking and real-time early warning of seasonal diseases. The public health system in India comprises a set of state-owned health care facilities funded and controlled by the government of India. Some of these are controlled by agencies of the central government while some are controlled by the governments of the states of India. The governmental ministry which controls the central government interests in these institutions is the Ministry of Health & Family Welfare. Governmental spending on health care in India is exclusively this system, hence most of the treatments in these institutions are either fully or partially subsidized Primary Health Centre: The most basic units with the most basic facilities, and especially serving rural India

Therefore, there is a need for the public health care service systems for the society under the new computing technology, which provide remote health consultation, remote real-time checking, and remote diagnosis, personal health record (PHR), network-based health care training, and other personalized services for the public through the personalized health care system. In the proposed model, we develop a unique platform for public health services system under the new computing technology, which can support numerous health care services. To overcome the deficiency of the existing model which is based on simple application architectures and to take effective advantages of the service-oriented technologies, we design the platform based on the SOA and adopt semantic web services and related service composition technologies which supports branch and parallel structures as the means of implementation of the proposed public health care platform.

II. RELATED WORK

In the year 2008 the Google introduced Google Health [4] which supports to track, monitor the health condition of patient. This service allows the patient's health records into the Google Health system either by manually or by logging into their corresponding accounts at health service providers which contains health conditions, medications, allergies, and laboratory result. Once entered into Google Health system, it uses the information to provide the patient with a merged health record, and possible



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interactions between drugs, conditions, and allergies [5], but the Google health system was available to users in the U.S. This service was discontinued after January 1, 2012. In the year 2010 the Microsoft developed Health Vault which is a Web-based platform was launched in U.K. It helps the patients to collect, store, and share health information with family members and healthcare providers to manage their fitness, diet, and health [6], it is also known as patient health record system.

The above mentioned systems like Google Health, Health Vault are mainly aimed at helping patient to organize and manage their health information. But these systems are limited in terms of their scope of application, e.g., Google Health and Health Vault are only available to users of U.S and U.K.

III. PROPOSED SYSTEM

Our proposed framework for PHC (Primary Health Centres) contains various components like cloud platform, Body sensor networks and health care service provider. The patient's data are collected from every primary health centres located in various rural areas of India to the district centres. Later the district centres data are hereby sent to centralized data centre. We ensure that the data collected in the centralized data centres are highly secure. From the system architecture of the proposed framework for healthcare where the patients can securely manage his/her health records using the asymmetric key encryption techniques. Doctors, Patients, Public Health department, Insurance Providers, Drug Management were few of the tenants used in the service of this application. The health service system consists of a common repository from Multiple Healthcare Networks and Medical Institutions. It process unstructured data to structured electronic medical records (eMR's) for multiple tenants .It uses an electronic medical record with appropriate access control lists applicable based on tenant's permission on eMR's. The economic values of the health service system are

- Reduction in cost of hosting storage construction
- Statistical view of data for public health care departments
- Insurance claims can be of ease with electronic medical records from hospitals.
- High scalability and integrated graphic interface for multiple tenants
- Utilization of existing resources on cloud

From Fig 1, the architecture of PHC consists of three tier applications. The lower tier consists of the data collected from various PHC connected through the cloud. The middle tier contains two parts like cloud based healthcare service system for multi tenancy applications. It in turn consists of applications like public health, medical service, operation management, drug management service, medical insurance. The other part consists of data repository, structured data collector, data mining and presentation layer. The upper tier consists of the integrated user interface which in turn provides the secure patient information.

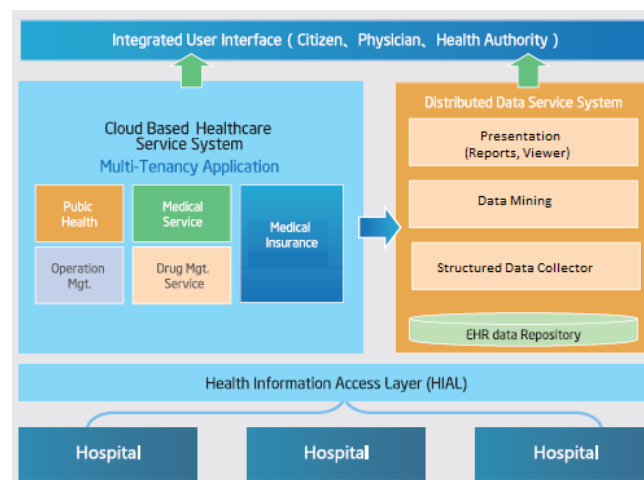


Fig1: Framework for Primary health care centres

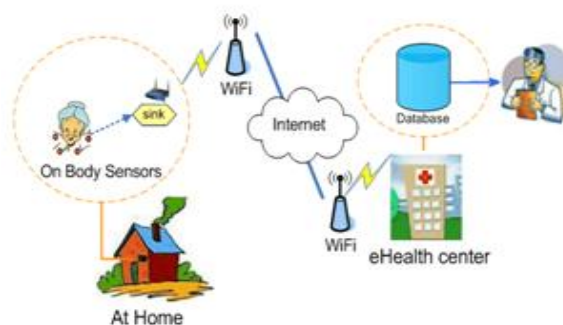


Fig 2: Major Components of PHC

Body Sensor Network is a branch of wireless network[7] especially used for continuous monitoring and logging vital parameters of patients suffering from chronic diseases like diabetes, asthma, heart attacks etc., Patient can alert the hospital even before they have a heart attack through measuring changes in their vital signs.

Cloud Platform: The practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer. The cloud in health care platform includes EMR Repository and Patient Health data acquired from BSN. Health Care Service Provider: A health care Service provider is an individual or an institution that provides preventive, curative, promotional or rehabilitative health care services in a systematic way to individuals, families or communities.

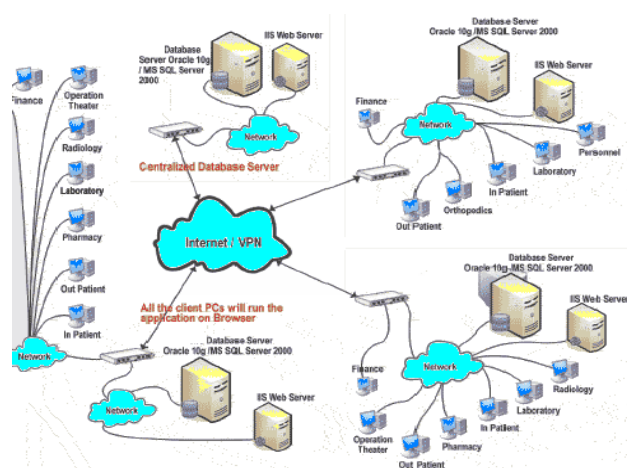


Fig 3: E-Health care Data centre architecture

The proposed framework for PHC has adopted many technologies for security and privacy like Username and password/finger identification to authenticate the entrance authority and distinguish at the user level. Before transmission or communication, important data including personal profile, vital signs, and medical images are encrypted to improve data security and privacy.



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IV. CONCLUSION

Cloud technology will greatly assist in the governmental electronic process by providing information from one place to other place, together with software to manipulate the data. It has been appealed and definitely demonstrated that cloud computing is the only option. In this paper, we proposed a framework for PHC using health cloud. We addressed an often neglected problem like the data collection from the PHC to central cloud server and the security issues involved in that. We have shown how the data are collected from the PHC located in various parts in India and highlighted the key encryption techniques. Our future work will address the open challenges like Trustworthy cloud.

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