

Cloud Based Patient Referral System

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Abstract - In today's era of Globalization, where often patients and their medical help is located remotely, there is a need to smoothen these human efforts, Intelligent Systems based on Cloud-servers would be a better solution. Therefore, we have developed a Cloud-based Patient Referral System (PRS) where, the patients can scan, upload, manage and share their health information (prescriptions, x-rays and other documents) with their selective health care professionals based upon the doctors' profile, rating, and the effectiveness of his treatment. The healthcare professional can then view all aforementioned medical data of a patient from the cloud and comment on it, thereby saving both the time and money that would be otherwise required in case the patient needed to travel physically. Furthermore, if need be, the system is provided with an option of video call which would be of great help if used by the patient to discuss his case in detail.

Key Words: Patient Referral System (PRS), Cloud, Health records, Android Application.

1. INTRODUCTION

A referral can be defined as a process in which a patient at a one level of the health system, having insufficient resources (Knowledge, medications, equipment, skills) to manage a clinical condition, seeks the assistance of a better or differently resourced facility(healthcare professional) at the higher level to assist in.

Here are some alarming statistics that indicate the need for such a referral system:

- 46% of faxed referrals never result in a scheduled appointment.
- 55% of specialist visits are unnecessary.
- 50% of referring physicians do not know whether their patients actually see the specialist.

The referral management solution can provide widespread benefits and can help to address some of the system wide problems that are outlined above.

For many patients, a visit to a primary healthcare provider is just the first stop on a long journey through the healthcare system. When a certain disorder is diagnosed, the patient first consults his/her primary healthcare physician. If the physician is able to treat that particular disease/disorder then the patient has no need to consult another specialist.

But if the patient requires a specialist treatment , and if the specialist is located elsewhere then getting to the second stage of treatment-- moving from the primary physician to a suggested specialist -- can take a very long time. This may also require the patient to travel to the place where the respective specialist is available .i.e. spend additional time and money.

To this purpose, we have designed a system where the patients scan and upload their reports and can themselves select a medical professional based upon the doctors profile, rating, and the effectiveness of his treatment. The healthcare professional can then view all medical data of a patient from the cloud and send remarks based upon the studied reports, thereby saving both the time and money that would be otherwise required in case the patient needed to travel physically. Moreover if required, the facility of video calling is also provided.

Hence, we can evaluate the quality of medical care and provide faster consultations to the patients. By implementing the Patient Referral System (PRS) system in Cloud computing environment, we can decrease the cost of managing the infrastructure and thus promote efficient medical diagnosis.

2. EXISTING SYSTEM

Various systems for the above mentioned domain have been proposed to enhance the efficiency, effectiveness and advancement of information technology.

In [1], they describe a web-based personal health record (PHR) that can be used by patients to collect and manage their health information (e.g., medical history, past surgeries, medications, and allergies), to request self-referrals, and to store a record of their consultations.

[2] This paper proposes a data exchange system for e-referral system in Thailand, in collaboration with National Electronics and Computer Technology center in order to access data exchange problem and improve the effectiveness of the e -referral system. It is proposed in this paper to design a data exchange service by using a cloud based platform. It proposes to use the concept of platform as a service (PAAS) to provide a service for health institutes. Cloud computing has been used in this system as it will be effective to manage the system by using it. This system can be used to referral patients having similar health conditions between different institutes. Moreover this system uses less

bandwidth than other systems. It also defines a set of standards for exchange of e-health information.

[3] This paper describes the online referral system for emergency medical service support system using Smartphone devices and cloud computing technology. The referral system architecture consists of three different technologies, namely for the referral system was in the hospital will use cloud computing technology, where Graphics user interface will be presented in the form of web based, so that the hospital can freely control the availability of places for service emergency, as well as to monitor the movement of ambulances that will come from the health centre requesting referral to the hospital using the map. Referral mobile cloud models have been designed and successfully used over wireless networks. This study has tested the time taken between using reference features that have been built than using conventional means. The information obtained by the proposed model looks much faster than conventional models. However, the location of the place makes it impossible to get a good internet network. Thus usage of SMS technology in hospitals and health centres would be a better solution.

[4] This paper proposes a personal health record (PHR) system that is patient centered. Cloud computing has been used extensively so that patients can get access to their records anywhere and at anytime. This system combines personal health records from different sources which includes the records measured by patients (blood pressure, diet, exercise habits), doctors records (allergies, medical history) hospitals records (ECG, medical advises) and other records from medical stores. This system can survive equation attack, external attack and reverse attack perfectly in cloud computing environment. This system also has a set of disadvantages like vulnerability to cyber-attacks. Users having their own personal data on the cloud propose a serious risk of the data being stolen elsewhere stored or hacked. These vulnerabilities lead to serious and grave consequences if their security is compromised.

[5] Here an e-healthcare management system is implemented where all the patient information is required to be archived in a central database. The system is based on service oriented architecture (SOA) and cloud services. SOA displays important advantages through presenting free conjugation stage impartiality standards based execution and solid deals for variant statehood.

[6] Management System for electronic referral documents and healthcare information exchanging has been developed. The system is based on ShizuokaEMR with healthcare information exchanging standard of HL7 (Health Level 7) and DICOM (Digital imaging and Communication in Medicine).

3. SYSTEM ARCHITECTURE

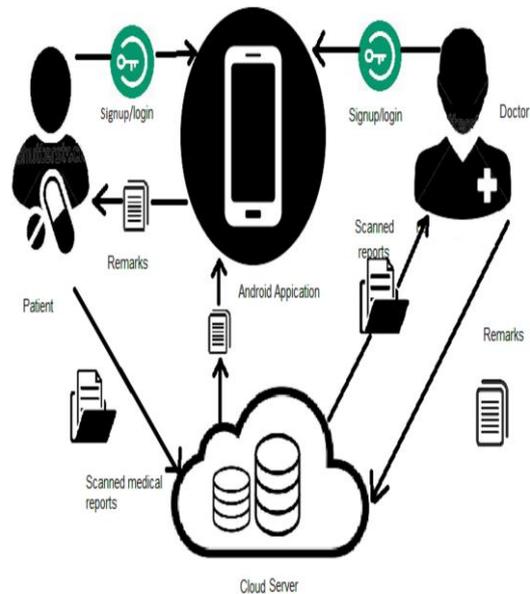


Fig -1: System Architecture

The proposed system has an Android Application where the patients and the doctor can enter their data and register to avail the benefits of the system. If already registered, they can simply login using their contact number provided while signing up. After entering the mobile number, an OTP(One Time Password) is sent to the respective numbers for authentication purpose.

After logging in, the patient can upload his/her medical data(reports, prescriptions, x-rays, etc) by simply scanning them through camera scanner. this data is then stored in the database i.e. the Cloud. The patient can then select a doctor from the particular category based upon the doctors profile, rating, and the effectiveness of his treatment.

The doctor then receives the medical data of the patient in the form of a folder. Then after studying the patient's case, the doctor can give remarks regarding the same, which helps the patient in further treatment. Furthermore, if need be, the system is provided with an option of video call which would be of great help if used by the patient to discuss his case in detail.

The flow of the system goes as shown in the figure below:

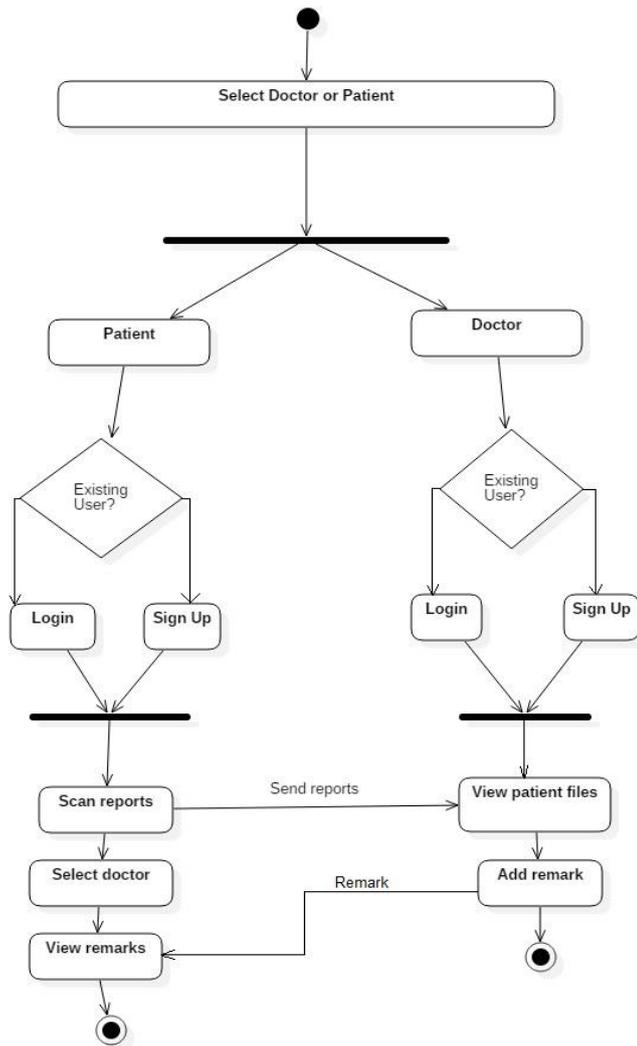


Fig -2: System flow-graph.

4. CONCLUSIONS

Patient Referral System is thus helpful in scenarios where expert medical help is not available to patients locally. The system helps patients to scan their reports and generate files very easily which they can send to a doctor selected from the application database of expert doctors and obtain a feedback from the expert upon the same. In a country like India, 80% of the people use Smartphone and the rest 20% have access to PCs and printers as well. Further, commoners do not have access to a personal computer and scanner neither is this level of sophistication met by them. Therefore, the system is apt in its context.

In future work, this system could be implemented on a global scale with integrated in-app payments.

ACKNOWLEDGEMENT

Our first and foremost acknowledgment is to our supervisor and guide Prof. A. M. Bagul . During this study, he supported

us in every aspect. He was the one who helped and motivated us to propose research in this field and inspired us with his enthusiasm on research, his experience, and his lively character. We express true sense of gratitude to our guide Prof. A. M. Bagul for his perfect valuable guidance, all the time support and encouragement that he has given us.

REFERENCES

- [1] Maisie Wang, Christopher Lau, Frederick A. Matsen, III, and Yongmin Kim, Fellow, "Personal Health Information Management System and its Application in Referral Management", IEEE TRANSACTIONS ON INFORMATION TECHNOLOGY IN BIOMEDICINE, VOL. 8, NO. 3, SEPTEMBER 2004.
- [2] Ruedeemart Jessadapattarakul, Chularat Tanprasert, Santitham Prom-on, Tiranee Achalakul , "Data exchange protocol for Healthcare in thailand", The Fourth International Conference on Future Generation Communication Technologies (FGCT 2015).
- [3] Tubagus Mochamad Teguh Hidayat1, Suhono Harso Supangkat," Mobile Cloud Design of Referral for Emergency Medical Service Support System", School of Electrical Engineering and Informatics Bandung Institute of Technology Bandung, Indonesia.
- [4] Chia-Hui Liu, Fong-Qi Lin, Dai-Lun Chiang, Tzer-Long Chen, Chin-Sheng Chen, Han-Yu Lin, Yu-Fang Chung, Tzer-Shyong Chen , " Secure PHR Access Control Scheme for Healthcare Application Clouds" 2013 42nd International Conference on Parallel Processing.
- [5] Rasha Talal Hameed, Omar A. Mohamad, Omar T. Hamid, Nicolae Tapus Design of e-Healthcare Management System Based on Cloud and Service Oriented Architecture, The 5th IEEE International Conference on E-Health and Bioengineering - EHB 2015.
- [6] Ayuko SHIGETA, Yasuzo SUTO and Kiyoshi NOSU," Development of Management System for Electric Referral Documents and Healthcare Information Exchanging Based on Standardization Protocols", Course of Information and Communication Technology, Tokai University 317 Nishino, Numazu City, Shizuoka Prefecture, 410-0395 Japan.